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August 22, 1996

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TITLE

MANAGEMENT REPORT - OPERATIONS SUBJECT 1

AUTHOR

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R. S. Bell
Manager
REACTION SECTIONMANAGEMENT REPORT - OPERATIONS SUBSECTIONA. PRODUCTION1. Statistics

Statistics are provided under separate cover by D. L. DeNeal

2. General

Prospects this month for exceeding both production and time operated efficiency forecasts by a considerable margin are good. This improved production picture is due mainly to fewer water leaks and ruptures and improvement in tube replacement rates. Tube replacement is beginning to catch up to requirements. No outages for the repair of water leaks were necessary during the month.

The overall operation and production outlook for the future is considerably brighter than it has been for many months. The only visible cloud of any consequence is that of ruptured slugs which, although not likely to give any trouble this month, can quickly increase to disastrous proportions if not properly controlled, as was demonstrated during December of 1955.

B. PLANT OPERATION AND MAINTENANCE1. Slug Rupture Experience

With only six ruptures this month, (one at C, one at D, two at DR and two at KE) production losses due to ruptures are not yet critical. However, the fact that two of these were in the K Reactors and one at C is strong evidence that the problem should not be minimized. At either of the K Reactors or C Reactor, where production rate is high and removal by "quickie" is very difficult or totally impossible, it is quite clear that even a few ruptures can deal a severe blow to the HAPO production effort.


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*This applies to input production. Output will fall below forecast due largely to a delay in reducing goal exposure.

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1. Slug Rupture Experience (Continued)

The ending of the low g/t program next month sharpens the necessity of finding other means for preventing ruptures in high powered tubes. If no other relief measures can be devised, it could become necessary to reduce specific tube powers which would, of course, mean power level reductions. It remains to be seen how effective the presently planned method of selective discharge of high factor tubes can be. The amount of uranium available and concentration goals set by the Commission will be controlling factors. Prospects are that within a few months as river temperatures go down, allowing higher tube powers and concurrently as the large amount of low concentration metal now in the reactors begins to reach higher exposures, a sharp increase in rupture rates can be expected. The severity of this increase will depend, as noted above, on the effectiveness of planned control measures which, while not new in principle, will be operating under a different set of conditions. Results therefore cannot be forecast with much assurance.

The remarkably beneficial effects on production of a 'no rupture condition can hardly be over estimated. In contrast the definite far reaching deleterious effects of ruptured slugs on production, efficiency, safety, morale, and radiation exposure are becoming more and more apparent. Some cost aspects of this subject are treated in Document HW-44878, The Relationship of Slug Ruptures to Maintenance and Operational Costs, which was issued this month.

2. Tube Replacement Program

To date this month, approximately 370 tubes have been replaced: 202 at H during the outage ending August 9, 100 at F and 70 at B. A 100-tube outage is scheduled for D the last week of August. Considering the serious trouble experienced in early tube replacement efforts at H, the most recent H outage was phenomenally successful. Two Hundred and two tubes were replaced at an average rate of 30.8 tubes per day with no stuck splitter trouble and very little other trouble. This is a new record not only for H but for all reactors. Main factors responsible for this improvement are an improved broach with clean-up ring, allowing for dispensing with the vacuuming operation, and generally improved technique, tools, and morale.


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2. Tube Replacement Program (Continued)

Below is given a detailed summary breakdown of the tube replacement picture:

TUBE REPLACEMENT - 1956

Reactor	Jan	Feb	Mar	Apr	May	June	July	Aug	Total Re-placed year To Date	Ready For Replacement Sept 1, 1956
B	20	50	105	0	0	39	0	60	275	40
C	9	4	3	2	0	2	5	0	25	0
D	61	53	121	61	43	63	61	100	565	135
DR	4	4	5	0	11	0	6	0	30	0
F	123	61	57	135	63	236	102	106	895	135
H	37	0	0	64	0	49	74	202	425	80
	254	172	301	262	117	389	248	468	2215	390

D, F, and H Reactors are the only ones which are not caught up and in good shape: F and H will be caught up by mid September and D will be caught up by mid October.

There has been an appreciable increase in tube replacement rates during the last two months, when replacements have been scheduled for approximately 100 per week.

For First Quarter ----- 242 Per Month
 For Second Quarter ----- 256 Per Month
 For July and August ----- 358 Per Month

Techniques and equipment now developed and being perfected for isolation of water leaks and replacement of tubes on a scheduled basis appear adequate to keep the leak problem under control. In view of this improved prospect, made still better by the expected benefits of low pH water, the only foreseeable difficulty to be guarded against, where tube replacement is concerned, is neglect of long range planning. There will be a tendency to relax on the tube program as its urgency diminishes. The crew will be reduced and to some extent disbanded and disorganized. Gearing up for such a program requires time and planning. If rushed, experience has shown that it can be painful. It is important, therefore, that tube monitoring and forecasting be accurate enough to provide information on tube replacement a number of months in advance of the need and that this information be properly factored into manpower, equipment, and production planning.

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3. New Type Slug Performance

As noted in last month's report, cored slug performance at D Reactor is not living up to hopes and expectations. Between 30% and 50% of the cored charges in newly replaced tubes have been found to be stuck at 75% of goal exposure. On this basis, they would, of course, be unacceptable. Experience at F on the other hand has been more favorable. It is probably too early to draw any firm conclusions, but prospects are not encouraging.

The new I and E slugs, currently under test at C are being followed with interest. Here again any conclusions would be premature but initial experience has been satisfactory.

Ball 3X Systems

Design Change No. 142, 'Removal of Unused Ball 3X Components' was approved August 15. It provides for electrically isolating the pulse integrator circuits and for de-energizing the 440 control voltage contacts, thus eliminating the inter-tie between the Ball 3X system and the No. 2 safety circuit. These changes apply to B, D, DR, F and H Reactors. Action on this change will be left up to individual areas.

Action on recommendations by Manufacturing Engineering for improving the reliability of the Ball 3X systems is being deferred. No action to procure funds has been initiated and while it is still felt that the proposed changes are desirable, it is believed that they can best be accomplished by the individual Processing areas after reorganization. However, one of the changes, the relocation of the 3X pressure switches, should be acted upon at once since it can be combined with CG-558. The CG-558 project will provide new switches and install them at the new location if Operations will re-locate the sensing lines. Individual estimates are being prepared and will be forwarded to each area for individual action.

At C, borescoping of two vertical rod channels has shown that there is some separation of the graphite blocks in the central region (vertically) of the reactor. During ball drops a number of balls are held up in these cracks and later during operation become highly irradiated. On subsequent drops they become mixed with the recovered balls and cause a very serious handling problem giving readings as high as 100R/hour. For this reason, voluntary dropping of balls at C for test purposes has been discontinued. The Mechanical Development group has been requested to devise a means for testing the hopper gates without dropping the balls into the channels.

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4. Ball 3X Systems (Continued)

The ball washing and blending program at present rates will require four to six months to complete. Consideration is being given to increasing the crew size to speed up this work. Data on the ball blending program has been forwarded to 100-F. Personnel assigned to that reactor will coordinate the program after September 4.

5. K Area VSR's

The status of the K Area VSR problem remains essentially unchanged. During the month, KE experienced trouble with a rod on which the newly designed latching mechanism was installed. During recovery from a scram, the rod fell into the reactor with the result that recovery was prevented. Inspection of the mechanism indicated that the trouble was probably due to mismatching of the mechanical components rather than a basic design fault. The new mechanism was removed for further study and testing and will be re-installed later.

6. Outlet Water Thermocouples

The insulation on thermocouple lead wires in all areas is deteriorating, due largely to the effects of rear face heat. Plans are underway to provide for replacement in each area as necessary and much of this work will be done in conjunction with CG-558. At C Reactor, it will have to be handled on a separate basis. There, plans are currently being made to install terminal strips for replacement leads.

The lead wires from the rear face thermobulbs in the K Reactors are also showing deterioration and loss of insulation. The cracking of the plastic coating allows moisture to get to the connector which distorts the balanced bridge circuit, resulting in faulty temperature readings. At KW it is estimated that about 90% of the leads are affected. At KE, 15% of the leads are affected. By a judicious use of spare lead wires, the life of the systems is expected to be about 6 months for KW and 10 to 15 months for KE. Immediate efforts are being directed toward procurement of replacement leads.

7. K Area V-13 Valves

Lubrication and exercising of the V-13 valves at both K Areas has continued during the month with the result that the current appraisal of valve reliability is considerably better. During daily tests on the KE valve, no failures or reluctance were encountered. The KW valve, tested on approximately a

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7. K Area V-73 Valves (Continued)

weekly schedule, also functioned satisfactorily. Both valves are now provided with bleed lines and testing is being continued under conditions which allow simulation of actual operating conditions. Since these valves have continued to function properly on all tests, some of the urgency of this situation has disappeared. Lubrication and exercising will be continued probably reducing the frequency of exercising since it is necessary to take the cross-tie out of service for a short time during each test. It is also tentatively planned at some future time, when it can be accomplished in conjunction with a scheduled outage of both K Reactors, to disassemble and inspect at least one of the valves with a representative of the manufacturer present.

8. Helium Consumption and Gas Loss

While all areas are still experiencing considerable gas loss, strenuous conservation measures applied during the month have succeeded in attaining sizable reductions in the consumption of the more critical and costly helium. Helium consumed by all areas during August will be 21% (440,000 cu. ft.) less than last month. With a saving of about \$11,000 in helium cost.

Loss through rear face leaks and during startup purges continue to be the main sources of loss. Immediate preventive measures taken have been aimed at cutting loss through gas pressure reductions and more efficient and economical use of gas during startups. Long range development work on feasible methods for repair of neoprene gas seals and the sealing of rear face bellows leaks by the injection of silicone grease are being pursued.

9. Reactor Instrumentation

Of major concern during the past year, has been reactor startup instrumentation. Indeed it has perhaps been the prime concern above all other operating problems. It still has a high order of importance due to its direct bearing on reactor operating safety, but the progress made, particularly during the past six months has largely taken it out of the "critical" category.

All reactors are now equipped with proportional counters which give a performance considerably better than that required by the standards. More important, reactor personnel have been thoroughly impressed and sold on the vital importance of these instruments and the necessity for keeping them in top working order.

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9. Reactor Instrumentation (Continued)

At DR, development work is being continued on the new, more sensitive proportional counter, the sub-critical monitoring device employing a fission chamber, and the period meter designed to operate on either of these instruments. Reports from Operations people at the DR Reactor are strong in their praise of all of these devices although the present model of the sub-critical fission chamber device has not been on test for a long enough time to allow anything except a preliminary evaluation. The important thing is that here, for the first time, the Chief Operator is able to "see" the neutron flux properly during all stages of startup and follow the rise in neutron population density from pre-startup sub-critical until the temperature-actuated power level instruments take over. Such a system of instrumentation has been badly needed for a long time, and when fully developed and installed at all reactors, will fill a need which has been sorely felt, providing much additional insurance against unsafe startup incidents.

Development and installation of octant monitoring systems to provide proper control during operation is also being followed up.

10. Reactivity Requirements

As operation at higher levels continues (now at the C and X Reactors and post CG-558 at the older reactors) the need for more reactivity to recover from scrams becomes more critical. Considerable lost production results if this problem is not properly met. For example, C Reactor failed to recover from two scrams recently because of low reactivity. At the time of the latest scram (August 16) recovery time was only 13 minutes. As an immediate remedial measure at C some flattening advantage has been sacrificed to gain recovery time. On a long range basis, the possibility of gain through spike enrichment of the center of the reactor by one or more C columns is being investigated.

11. Poison Control Facility

The experimental poison control unit installed at DR continues to present operational difficulties. Failure of the ball valves due to galling of the seat and the valve stem is the major problem. Improved valves are now installed for test. There has been no recent action toward completing the installation of the poison control facility in other areas, although the preliminary work has already been done. Completion awaits procurement of satisfactory valves.

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C. NEW PLANTS AND FACILITIES1. CG-558

Planning for the CG-558 outage at B is progressing in a more satisfactory manner than reported last month. Several planning meetings have been held and considerable preparation is being made toward organizing procedures, work schedules, work force agreements etc. for the outage.

At DR, testing of the new 190 pumps continues. Initial operating and acceptance tests on two pumps have been completed. Work on the tie-in of the 107 outlet lines to the new DR outfall is 60% complete. Work seems to be moving forward at about the expected rate, except at F and H where outside work is lagging slightly. Installation of toggle valves at F and H are essentially complete.

2. CG-651 - Continuous Charge-Discharge Equipment - C Reactor (Slug Development and Demonstration Unit)

Installation of this facility, originally scheduled for completion in November, is experiencing disturbing delays. Project Maintenance indicates that unless additional Electricians are made available, the 112 tube installation cannot be completed until mid-March of next year. Such a delay would greatly reduce the value of the installation which was justified as a proving ground and demonstration unit. If purchase requisitions for the full-pile installation are issued as scheduled next April, experience with the demonstration unit would be nil and valueless.

3. CG-642 - Continuous Charge-Discharge Equipment - C Reactor

Design work is continuing. No satisfactory method for minimizing personnel exposure rates during contact charging of process tubes has yet been devised. Development of a remote charging device would require a separate project. This problem is being referred to the new Mechanical Development operation.

D. PERSONNEL, ORGANIZATION AND ADMINISTRATION1. Safety and Radiation

There is substantial evidence of continued improvement in safety performance within the subsection. Medical treatment injuries for the month to date show a decline in most areas. Housekeeping is improved and the impetus behind the various safety programs in progress is strong. A review of Lapse of Radiation Control Experiences for the past four months also shows a decidedly declining trend in lapse of control incidents, with 22 in April, 21 in May, 13 in June and 9 in July. Evidence is that August will also show a low number of such incidents.

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2. Personnel, Organization and Administration

Reorganization D' day is approached by the Operations Subsection with a full complement of personnel with the exception of one supplemental crew shift supervisor. The moves occasioned by reorganization are under way and will be essentially complete by the first week in September. Morale of all Operations personnel is holding up well under the stresses of change and with only a few exceptions the general mood is one of satisfaction and anticipation. Some future adjustments will be necessary and a few individuals may require relocation but considering the magnitude of the changes being made, cases of dissatisfaction are remarkably few. These are being handled on an individual basis. Employees in general are entering the new organization with interest and in the spirit of a challenge to be met.

Personnel development work has continued unabated through the month. The last of a series of eight operator tests was issued August 21. When this has been completed, the results for all tests will be tabulated by the Supplemental Crews Unit which has also been responsible for the preparation of the tests.

The first steps were taken this month to arrange for a series of employee psychological tests. Preliminary planning was carried out at a meeting by representatives of the subsection with Drs. Fuqua and Conant. One test is immediately available for use and Dr. Conant has agreed to select and prepare others as required. I will pass the details pertaining to this program on to Mr. Fitzmaurice for future coordinating by his group.

Present union relations within the subsection are healthy and satisfactory. There is every reason to believe they will continue that way. It is important to future good relations that programs such as the above be introduced carefully, with adequate explanation and preparation of the affected personnel.

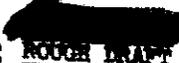
E. LONG TERM ANALYSIS AND PLANNING

As noted last month, we have not recently placed a great amount of emphasis on this subject. Long range planning on items necessary for the continued operation and maintenance of the reactors has, of course, gone forward without slackening. The development of new ideas for cost savings and better equipment has been automatically pursued. These continue to bear fruit, and will be carried on within each area. There are strong indications that the competitive spirit engendered by the new organization will provide its own special impetus to this type of thinking and planning. The lines of progress now laid out in the individual areas will be fitted into total planning as the new organization gels.

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E. LONG TERM ANALYSIS AND PLANNING (Continued)

It is important that we lose as few of the benefits of past thinking and experience as possible. At the same time, the new managers must not be hampered with old bones, rusty chains and red tape. To this end, the Unit Heads of the areas have been asked to serve as a link with past thinking and planning and a source of information as needed by the new Operations managers.

Summarizing, it can be affirmed that the Operations Subsection is in better shape from all standpoints than at any time during the past year. If the balance of the month goes as expected, safety, production, and operating efficiency will reflect this with the highest records yet attained under tube replacement conditions.

Operations Subsection
REACTOR SECTION

AR Maguire:jmb

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G-66-08

DON'T SAY IT --- Write It!

Attached to Next Report

DATE 8-31-56

TO A. R. Maguire

FROM C. G. Lewis *C. G. Lewis*

This paragraph was inadvertently left out of the Management Report for this month --- didn't want you to miss it:

"Finally, after almost two and one-half years, the crib valve gates and operating mechanisms are being replaced. The technique required for getting this job underway was the almost daily questioning or needling by me, of the Maintenance Superintendent to schedule this work. This is ridiculous. If all jobs of equal or greater importance required this kind of followup, we would make very little plutonium around the 100 Areas."

CG Lewis:be

+ "SAFETY CONSCIOUSNESS PAYS - WITH ACCIDENT FREE DAYS" +

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AUTHOR

A. R. McGuire

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R. S. Bell
 Manager
 REACTOR SECTION

MANAGEMENT REPORT - OPERATIONS SUBSECTION

A. PRODUCTION

1. Statistics

Statistics are provided under separate cover by D. L. DeNeal.

2. General

Both input and output production will probably exceed forecast by considerable margins this month. This is due primarily to high time operated efficiencies at several reactors coupled with continuation of the level improvement at the K Reactors. KE will most likely establish a new input record. Time operated efficiency this month will be the same or slightly below last month due to the large discharge schedule and several miscellaneous outage causes. In general, tube replacement, ruptures and water leaks, the normal causes of high outage time, are considerably better than last month.

B. PLANT OPERATION AND MAINTENANCE

1. Slug Rupture Experience

Slug rupture experience was considerably improved this month with only four regular and one "C" metal ruptures experienced to date. This improvement is due to seasonal increase in water temperature (low tube powers) along with the effect of low metal concentration in high tube factor tubes from prior rupture prevention programs.

The occurrence of a sixth rupture at KW has indicated an increased randomness in the distribution of the ruptures there which casts some doubt on their being caused by temperature cycles. If cycling is not the cause (this has been largely corrected) then we can expect an increase

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1. Slug Rupture Experience (Continued)

in rupture rate as the current tube power increase program continues. The two regular ruptures experienced at C Reactor were both central zone tubes near the fringe which were being raised to the new goal (approximately 500 g/t) concentration as a result of cessation of the low g/t program. These slugs ruptured at 35% and 40% g/t respectively, indicating that a considerable increase in rupture frequency can be expected at 105-C unless a further effluent temperature reduction of 5°C is soon put into effect.

The scheduled end of the low g/t program in September will cut off one of our most successful rupture prevention techniques. However, studies along these lines by I. L. Huffman have indicated that we may still benefit from some rupture prevention by extending the so-called 400-800 program to discharge of metal in high factor tubes. Although not as many ruptures will be prevented as when discharged at 250 g/t, considerable benefit will still be experienced without creating a metal shortage. It has been estimated that between the metal remaining from the original 175 tons on this program, (approximately 100 tons) and that set aside for contingencies in forecasting, that the required metal is available.

Tube Replacement Program

A total of approximately 235 tubes (75 at E, 60 at D, and 100 at F) have been replaced to date this month. The 5-tube outage at H during the first of the month was quite successful. Since H is experiencing considerable leak troubles, the program was speeded up and a 200-tube outage was planned for July 22 but was deferred a week due to the uncertainties caused by hot slugs on the rear elevator and due to overall time operated efficiency considerations. The deferment of the H outage probably will cause a similar one week deferment of the next 100-tube F outage presently scheduled for August 5.

The large scale tube replacement program for F Reactor (decided in June to remove 500 leak-prone tubes) has progressed to the point where two outages have been completed with about 340 tubes replaced. The program to date has been encouragingly effective in reducing process tube leaks and it appears that the goal (increasing time operated efficiency to 75-80 percent by the end of September) will be realized.

Since tube replacement rates have improved, more tubes are being scheduled for replacement each week. Current scheduling (based on the tube corrosion forecast of June 22) indicates that the problem areas will be caught up (less than 60 backlog) as follows:

B - August 25
D - September 15
F - September 1
H - August 4

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2. Tube Replacement Program (Continued)

The deferment of H outage will, of course, change this approximately one week but the detailed plans have not been made yet.

3. Cored Slug Performance

A stuck slug problem has developed recently involving mostly cored slugs with aluminum end plugs irradiated in new tubes. The problem has been most pronounced at D and F Reactors. Data analysis and back-seating experience have provided a basis for discharging this material before an appreciable number become stuck. This involved discharging 252 tubes with an average concentration of 495 at D and 206 tubes with an average concentration of 905 at F. The overall metal loss to date is approximately 2.5 tons. The evaluation of information will be continued and more metal probably will have to be discharged to prevent future stuck charges.

4. Ball 3X Systems

As a result of the meeting held last month between Operations and Maintenance, a request for an engineering study and project proposal has been sent to Projects and Personnel Development aimed at correction of Ball 3X deficiencies at 105-C. During routine testing at C Reactor during the month, another blocked channel was experienced. The balls dropped into the reactor, but had to be vacuumed out by removing the VSR tips. Work on clearing this and another channel in the same condition will be held in abeyance until other factors having a more serious effect on personnel exposure and overall operability are corrected.

The ball washing and blending program is proceeding slowly at C reactor due to the make shift equipment, but several charges of balls have been cleaned and blended to the 70-30 composition at F Reactor. A procedure will be written assigning F Reactor responsibility for ball recovery and blending following reorganization.

Some time was lost at D Reactor following a recent outage because of short in the 3X electrical system indicator circuits. A decrease in trouble from this source may be expected in the future at all old reactors since a proposal for a design change to eliminate or isolate unnecessary or obsolete circuitry is in process of preparation.

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5. K Area V-73 Valves

These valves continue to be a source of trouble and uncertainty regarding the status of crossic backup at the K Reactors, despite the increased emphasis on lubrication and exercising. Although Process Change Authorizations have been written which permit lubrication and exercising under carefully controlled conditions during operations, it has become apparent as a result of tests during the most recent outage at KW that neither exercising nor lubrication will solve the difficulty which keeps these valves from functioning when there is a differential pressure across the valves. As a result of a meeting between Process, Maintenance, and Operations, it is expected that Maintenance will request the services of a factory representative in the near future to help solve this problem.

6. K Area VSR'S

Despite all the work done on these units, they continue to be a source of trouble. Sluggishness in rod raising time at KW cause raising times of 13-20 minutes on some rods. This is probably tied in with binding on the ISA switches, and their planned removal may correct this problem. At KE four rods failed to trip the lower limit switch on a scram on 7-3-56. Ball hoppers on two of these rods tripped as a result of the malfunction and prevented recovery from the scram. VSR No. 22 at KE, which was partially irradiated during reactor operation in June has been removed from the reactor and preparations are being made to install a replacement during the next KE outage.

Discharge of Irradiated Slugs on D Elevator

During start up preparation at K Reactor on July 17, following the isolation of a tube leak, a charge of irradiated metal was flushed into the D elevator. There was no overexposure to personnel. The rear face crew had completed the rear face valving following completion of the leak testing and had reported rear face valving back to normal. They then lowered the D elevator to the 0 foot level to remove some dummies. While they were removing the dummies, the front face supervisor completed returning the front to normal, following some work on the front in repairing cap leaks. He then reported to the control room that valving was normal front and rear, OK to raise the water pressure. Control room personnel notified Power to make the first pressure increase, and notified the rear to look out for leaks. This is normal procedure. However, this inspection is normally made from the 30' labyrinth.



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7. Discharge of Irradiated Slugs on D Elevator (Continued)

At this time the chief on the rear notified the control room that they were at the 0 foot level, but before any further action was taken one of the tube caps came off. The chief immediately notified the elevator so that no personnel were present when the irradiated slugs flushed out. The cap which came off was one which had been removed and replaced on one of the headers (row 10) tested during the leak test. The reactor remained down approximately 20 hours to evaluate the situation and to make preparations for removal of the pieces. Following receipt of advice from Technical that no difficulty would be encountered by leaving the slugs on the elevator, operations were resumed and removal efforts continued during operation. New holes were drilled through the rear wall and to date all pieces but one have been pushed off the elevator. Removal of this remaining piece may be difficult because of difficulty in locating it. However, it is anticipated that it will be removed before H Reactor's next scheduled outage on 7-29. As soon as it is removed, the reactor will be shut down and the missing cap replaced, using the Quickie Procedure, in order to eliminate the outlet temperature limits imposed while operating with the open tube. This incident will be reported formally this week.

C. NEW PLANTS AND FACILITIES

1. CG-558

The approach of the CG-558 outage at B Area is causing considerable concern because of lack of information on procedures, responsibilities, etc. on which to base operational planning for this outage. A letter has been written to Manufacturing liaison representatives to enlist their support in obtaining the needed information. This has also been included on the list of items requiring solution prior to the September 4 reorganization date, and JS McMahon has promised his active support in resolution of the problem.

The new CG-558 penallits have been installed at F Reactor resulting in considerable increase in the reliability of the penallit system there. Other preparations for the outage at B Area are going forward with pre-fabrication of thermocouple wire bundles about 30% complete.

2. CA-512

Revision V to the CA-512 Project has been approved by the AEC. Of most importance to Operations is the making available of money for WMR revisions and the procurement of additional magazines for change discharge operations.



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D. PERSONNEL, ORGANIZATION AND ADMINISTRATION1. Safety and Radiation

Safety performance continues at a satisfactory level with no disabling injuries and a comparatively low number of medical treatment injuries. So far this month only four lapses of control have been experienced by Operations. Attendance at Safety and JEB training courses continues at a satisfactory level.

Personnel, Organization and Administration

There is nothing new to report on these fronts this month. Everyone is anxiously awaiting notification of ~~their~~ ~~new~~ assignments under the new reorganization, and this will be done as soon as balancing of supervisory strength is achieved. This can now be done since the new area managers have been announced.

Procurement of extra operators for safety reasons and radiation exposure control is complete. The new operators are being trained, but afford some help in vacation coverage even prior to completion of their training. In the long run this should make a further reduction in Operations overtime requirements.

E. LONG TERM ANALYSIS AND PLANNING

Very little emphasis has been placed on this subject this month because of the impending change in organization. It is felt that each area manager will devote considerable time to this following reorganization, for the individual areas. However, each area is currently preparing a list of items to be used in the preparation of the program document requested by AB Greeninger, and this document will, of course, become the basis of long range planning for the Operations portion of each plant.

AR Maguire: Job

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DATE

June 22, 1956

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MANAGEMENT REPORT - OPERATIONS SUBSECTION

AUTHOR

A. R. MAGUIRE

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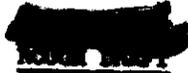
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June 22, 1956

R. S. Bell
 Manager
 REACTOR SECTION

MANAGEMENT REPORT - OPERATIONS SUBSECTION

A. PRODUCTION

1. Statistics:

Statistics are provided under separate cover by D. L. DeNeal.

2. General:

A new high operating level was achieved at 105-KE during the month as a result of improved flattening and improvement in operating techniques. In general, it is anticipated that forecasts for both time operating efficiency and input production will be exceeded this month by even larger margins than achieved last month. Present indications are that time operating efficiency for June will be higher than for any month since June, 1955. This is despite a rather extensive tube replacement program.

B. PLANT OPERATION AND MAINTENANCE

1. Slug Rupture Experience

Rupture experience continues to be favorable this month, rupture rate being slightly lower than last month. A predicted ten ruptures for June will top the low of eleven for April.

Although this picture is rosy at the present time, and will probably continue so for the next 2-3 months, it is anticipated that rupture frequency will increase again in September or October as soon as the recently discharged high feeder tubes at all reactors again reach high concentrations. This is necessitated by the curtailment of the low g/t program. It is worthy of note that two ruptures this month at 105-C occurred at 218 and 206 g/t concentration, and one rupture at D at 210. Since the curtailment of low g/t has already resulted in conversion (or start thereof) of 800 tubes in the fringes of C Reactor to high (450-500 g/t) concentration material, a sizeable increase in the rupture rate may be



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1. Slug Rupture Experience (Continued)

anticipated. Although it is not immediately necessary, an outlet temperature reduction at C to 93°C may be required in the Fall of the year to offset the effects of increased concentration.

It is noteworthy that C, DE, and B Reactors, which are on a so-called arbitrary 100°C limit, are all enjoying high time operating efficiencies and high production despite the lower effluent temperatures. This emphasizes again the profound effect of high rupture rates on production, costs, and morale.

Two of the seven ruptures experienced so far this month occurred at the K Reactors, one each at KE and KW. The KE rupture was the first one for KE, so none of our reactors are virgins any longer. The KE rupture was in general the same type of split incurred at KW, but is from a different lot of material. These ruptures at KE and KW are very likely a result of high temperature cycling resulting from cycling problems connected with graphite coring and flattening difficulties. So far there is no reason to believe that they are the result of tube power increases.

2. Tube Replacement and Tube Leaks

The tail end of a record breaking May tube replacement outage was completed at D and outages were conducted at B, H, and F for tube replacement during the month. Improvement in tube removal and replacement techniques at H make it possible to start scheduling replacement outages for 60 or more tubes per outage at this reactor. The continuation of tube leaks at F, despite the large number of tubes already replaced, made it necessary to re-appraise the situation there. As a result of this appraisal, the following program was decided upon and is currently underway. A document covering these recommendations was written and forwarded to WK MacCreedy.

- a. 220 tubes in the zone of greatest external corrosion and leak producers were scheduled for replacement in one two week (or slightly longer) outage. It is anticipated that this will prevent a large number of new leaks.
- b. It is planned to run the reactor for two weeks and then shut down to replace the next 100 most leak prone tubes. Unless we are absolutely forced to do so, we will not



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2. Tube Replacement and Tube Leaks (Continued)

- b. shut down during this two week operating period unless leaks develop which cause the reactor to lose enough reactivity to make operation impossible or unless the 115 Building equipment cannot keep the inlet moisture below the dew point of the inlet water. It is felt that this approach is justified since F Reactor has not been dry for over a year, and it is questionable whether the continual shutting down to look for and correct leaks would be as beneficial as running long enough (two weeks) to make the next batch of tubes ready for economical replacement. Even with this approach, which should result in removal of all leak prone tubes (both internal corrosion as well as known bad Van Stones, external corrosion areas, and anodized (pitted) tubes) within the next three months, a metal loss of 10 tons will still be experienced. This program should result in making possible a time operating efficiency of 75-80% at F Reactor by September, which otherwise would not be achieved until February, 1957.

Except for the leaks experienced at F Reactor, and one leak outage at H, the other reactors remained dry during the month.

The tube corrosion report by Technical mentioned in last month's report is now complete in rough draft form and is scheduled for issuance before month end. A meeting was held with Technical to obtain a preview of the contents of this report (on internal corrosion) and use was made of the data in planning the tube removal program at F and in making an up to date forecast of tube corrosion for FY 1957. This forecast is tabulated below:

Area	Critical Index	Retubed 8/1/55 To 7/1/56	Backlog As Of 7/1/56	Cumulative At End Of			
				1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
100-B	44	217	90	105	135	170	210
100-C	42	-	0	0	0	0	0
100-D	37	581	255	280	300	315	340
100-DR	37	-	-	5	10	20	40
100-F	32	982*	335**	355	360	365	375
100-H	35	160	332	355	405	445	465
TOTALS		1940*	1012**	1100	1210	1315	1430

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2. Tube Replacement and Tube Leaks (Continued)Assumptions

1. All areas on pH = 7.0 water by 7/1/56
2. Temperatures: Same as present except a 10° decrease for three months after CG-558.
3. Time Operating Efficiency from W. G. Albert's forecast

*Includes 220 scheduled out during current F Area outage.

**Includes 280 scheduled out of F Area leak prone region in July and August.

It should be noted that predicted corrosion from the forecast is less than indicated on our prior forecast of June 1, which was based on incomplete information from the Technical study referred to in the foregoing paragraph.

Ball 3X System

The continued lack of progress in the Ball 3X System renovation program at C Reactor resulted in a meeting during the month between the writer, R. T. Jessen, Frank Vlacil, C. G. Lewis and J. F. Nesbitt to define the problems involved and to come up with a satisfactory program for correcting the undesirable conditions existing. As a result of this meeting, it was decided that a request for an engineering study and project proposal would be prepared by C. G. Lewis to result in the necessary design revisions and project work to make the C Reactor Ball 3X System operable under all probable operating conditions. It was also proposed that the systems at KE and KW be re-examined to determine whether or not they will stand up over long periods of time, especially if the reactors become wet. The main problem continues to be operability of the ball valves, but the many other items listed in the C Reactor Monthly Ball 3X Renovation Program Status Report are nearly as demanding in their need for solution and correction.

Ball 3X performance at other reactors continues to be satisfactory. One hopper of balls in No. 63 VER channel dropped at KE during the month due to a defective ISA switch, but was recovered without incident. The hoppers in the rear of F Reactor which are gas purged continue to remain dry. Blending of balls at F to achieve a 70-30 mixture from the present 100% boron balls is contemplated in the near future. Some progress has been made in washing and blending balls at C Reactor with the homemade ball washer and blender.

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3. Ball 3X Systems (Continued)

Trouble was again experienced at 105-D with the Ball 3X system getting wet during a rainstorm because of the leaky roof. A minimum outage was required to dry out the system. Now that Minor Construction is back at work, it is planned to correct the roof problem during the July tube removal outage. The pulse integrator circuit has been isolated and the Ball 3X tie-in to the No. 2 safety circuit has been eliminated at 105-D, thus removing two serious trouble sources. It is planned to do this work at F and B as soon as possible.

4. Effluent Systems

Work has resumed on repair of the 107 tank curbing at 107-KW with the return of construction forces. Routine checks on the test wells at 107-C have revealed that these tanks are leaking. A letter has been written to Engineering requesting their assistance on evaluation of the seriousness of the problem. Work in conjunction with Project CG-558 has started again at several reactors on installation of new 66" effluent lines. Repairs to junction boxes at B Area continue to remain satisfactory.

5. K Area VSR'S

Although no new work was accomplished during the period on physical correction of known deficiencies on the K Area VSR's, engineering work in this regard is progressing. Performance has been generally satisfactory at both reactors as a result of repairs already completed, but an incident was experienced at 105-KE when No. 22 VSR remained in the unit during a period of operation. This incident has already been covered very thoroughly in a report forwarded to you earlier in the month. Preparations have been completed to remove the portion of the rod not already removed, during the July outage at KE, and to store this rod in the inner rod room for radioactive decay. An opening in the rod room roof was designed for this purpose.

6. Instrumentation

Despite the normal amount of difficulty with Beckmans at some reactors, flux monitors in general performed satisfactorily during the month. Difficulties experienced with the temperature monitor at KE resulted in a minimum outage when the whole temperature monitor failed during

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6. Instrumentation (Continued)

operation. While one defective tube was found, the reason for the complete failure of the power supply has not yet been discovered. This is still under investigation, but the system is currently satisfactory.

Gas Loss

Considerable effort is being directed at all reactors towards reduction of gas loss. Varying degrees of success have been achieved. The main source of gas loss at the present time continues to be from leaking rear face bellows, particularly at those reactors undergoing extensive tube removal. Efforts are still in progress to design a satisfactory rubber sealing device to take care of these leaks, and no great progress is expected in gas loss reduction until this is achieved. Two reactor leaks at all reactors have been chased down and corrected to the point that they are becoming negligible. Of course, C Reactor continues to have the problem of gas loss through the ball valves in the Ball 3X system, a problem mentioned earlier in this report.

C. NEW PLANTS AND FACILITIES

Project work has resumed at most reactors in a feeble and half-hearted manner with the cessation of the strike. Some of the early efforts of the construction forces have resulted in improved housekeeping at some of the reactors.

Trouble is still being experienced with the gamma monitor systems at B and F Reactors, and the new dew cell moisture detection systems also remain inoperable or unreliable at these reactors. Installation of GU-558 penellit gauges is taking place at F Reactor during the current tube removal outage. This should correct a major defect and source of concern since the existing F gauges were in bad condition.

PERSONNEL, ORGANIZATION AND ADMINISTRATION1. Safety

Despite two accidents of the near serious variety, safety and radiation performance in the subsection has been very good this month. The fifth in the series of operator tests has been completed with 87% of the operators achieving a passing grade. The 6th test of the series is currently in progress. Programs are being carried on at the various reactors to help

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June 22, 1956

1. Safety (Continued)

correct deficiencies in operator knowledge indicated by the tests already completed. Supervision continues to show a high degree of interest in safety with many additional supervisors completing scheduled safety training courses. Interest and participation in the "Theme of the Month" program remains at a high level throughout the subsection.

Personnel

Morale throughout the subsection appears to be in good shape. The number of grievances remains low, and several discussions with the Chief Steward and others on various problems have resulted in a better understanding between the Union and management. Procurement of the 16 operators from Separations to provide the coverage required for reactor safety during vacation periods is nearly complete. The program of rotation of Chief Operators to equalize radiation exposure has begun and a schedule has been arranged to carry this on routinely for the next several months. Similar rotation has, of course, been carried on with the operators for some time, but the need was not so great as it is for the Chiefs.

Training of the recently acquired monthly roll personnel for extra coverage and training is progressing nicely, and it is anticipated that we will be in excellent shape for supervisory coverage prior to the planned reorganization in September.

Administration

Overtime use continues to be satisfactory. A slight increase may be anticipated this month as a result of need for minimum crew coverage until the newly acquired Utility Operators are trained sufficiently to be of use for this purpose. It is expected that these people will be effective in overtime reduction during the month of July.

While on this subject, I would like to get a "brag" in for my superintendents and their crews. As a result of their joint and whole-hearted efforts and cooperation, we have reduced overtime over 60% from our 4th quarter of calendar '55 levels, have gotten time operating efficiency up over 70% for the past three months with a possibility of over 75% this month, have reduced ruptures to a tolerable level and minimized lost time from the few incurred. Morale is good at all reactors and some indications of decreasing absenteeism are making their appearance. Certs for the

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June 22, 1956

3. Administration (Continued)

subsection last month were below standard costs, and input production has exceeded goal for the past three months with promise of being even higher this month. All in all, I'm real proud to be working with a bunch of fellows who get in there and pitch when the going is tough, and pool their knowledge, energy and loyalty to bring about real improvement in our operations. I'm sure that the new "Area Managers", whoever they may be, can start their new jobs with a feeling of confidence with fellows of this caliber to support them.

E. LONG TERM ANALYSIS AND PLANNING

We have recently given much consideration to economic factors involved in the continued operation of our plant as compared to the Savannah River Works. As pointed out by Ivan Huffman, economic differences would have to be extremely severe to have an adverse effect on our continued operation, but another factor has recently reared its ugly head which could have a profound influence on our continuing in the plutonium business. This, of course, is the recent emphasis by the AEC on the reduction of annual and even of weekly exposure limits. The increased manpower requirements under the proposed (or possibly even lower) limits could well become intolerable, even if operation could be sustained at all under these conditions.

It is realized that the present period of reorganization is not a very fruitful time to start a new major effort, but it appears to us that some sort of task force should be set up to begin the basic and fundamental "blue sky" thinking that must be done to prepare for this low exposure limits problem which is assuredly approaching. As discussed in our cost meeting, the need for creative thinking along the lines of automation is exceedingly important, and it would probably be well, at an early date, to canvass the company for experts on automation to assist us in a solution to this impending problem. In the meantime, we in Operations will start gearing our efforts towards cataloguing and studying any and all ideas which we can produce ourselves or solicit from others, and will try to be prepared to do our part in any group effort subsequently begun along these lines.

AR Maguire: Job

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May 23, 1956

R. S. Bell
Manager
REACTOR SECTION

MANAGEMENT REPORT - OPERATIONS SUBSECTION

A PRODUCTION

1. Statistics:

Statistics are provided under separate cover.

2. General:

Input production is slightly above official forecast at the time of this report, and should meet or exceed official forecast by month end. Time operated efficiency is also better than the goal figure at this time and should exceed the goal by month end.

It should be noted at this time that the fiscal year production bogey will not be met. Level restrictions imposed on the K Reactors by cross-tie power limitations, and the decreased time operated efficiency at the older reactors due to tube removal problems which could not be anticipated last June due to the incomplete technology on tube corrosion existing at that time, are the principal factors.

B. PLANT OPERATION AND MAINTENANCE

1. Slug Rupture Experience

While slug rupture rate is slightly higher than last month (11 - April, 12-13 predicted May 1, the efficacy of our current rupture prevention technique in alleviating the high rupture rates of January and February, continues to generate optimism in this respect.

The effluent temperature reduction program remains highly effective with no ruptures during May at H and F Reactors, 2 at B and 2 at C. Despite a gradual rise in inlet water temperature, the input product remains at goal forecast or better at B, C, and H even with the decreased effluent temperature. 105-F, of course, has not achieved this high production

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1. Slug Rupture Experience (Continued)

because of low time operated efficiency resulting from leaks and tube replacement.

The second rupture prevention method, early discharge of rupture-prone material on the 400-800 goal basis has been essentially completed. There is no doubt that this has prevented some ruptures, but its continued effectiveness is low because programs of this type require ruptures to determine what is rupture-prone.

Finally, the conversion of high factor tubes at all the old reactors to low concentration production is nearly complete and promises to be our best overall long range rupture prevention technique. The program was expanded this month by converting 40 tubes to low at 105-B in addition to those already converted to low at D (460), IR (910), F (310) and H (800). Studies currently underway regarding effect of increasing concentration of low power tubes at C may result in lowering of additional tubes at other reactors or of extending the period during which this program can be used. It will also make a slight increase in 105-C's reactivity giving them a few minutes additional scram recovery time.

With the exception of two ruptures at C and one at H (charging machine damage) all six other ruptures to date have been above 600 concentration.

2. Tube Replacement and Tube Leaks

As previously indicated by tube replacement forecasts, tube replacement should be on a 'caught up' basis during the third quarter. Possible exceptions to this are H Reactor, which has not really begun replacement yet, and F Reactor, which has cracked and pitted Van Stone flanges, external corrosion and anodized tubes to consider besides the forecasted internal corrosion. It is anticipated that these trouble factors may add up to 250 tubes at F beyond the calculated internal corrosion replacements.

Technical has completed the 702 KEPM study on internal corrosion on all reactors except IR, KE, KW, and none of these are pressing from the tube replacement standpoint. These data are complete to May 1 of this year, but exist as two separate answers which must be totaled to obtain the complete picture. Information from E. G. Wittebreck indicates that these totaled and evaluated data, together with a six months prediction forecast, will be reported in a tube replacement document to be available before the end of June.

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2. Tube Replacement and Tube Leaks (Continued)

The current status of the program has resulted in some decrease in tube removal effort, with the maintenance time thus made available being expended on essential reactor maintenance. It is planned to continue this program of scheduling essential maintenance work to catch up the back log as tube removal status permits.

Leaking tubes were detected and replaced at several reactors during the month. The Helium detector was used successfully at D and F Reactors (2 outages at F) and with less success at H and DR. H required 2 outages to locate one leak. Use of the detector at DR was hindered by leakage of rear face air containing He into the system via rear ball valves. At H, the existing He leak detection system pulled insufficient vacuum on the lower headers to obtain a good test. This is true of all other reactors on lower headers except F, which has a jet installed to lower the water in the relief riser and thus permit a higher vacuum on the lower headers. Completion of the leak detector installation project, which includes installation of these jets as well as permanently installed leak detection equipment should greatly minimize reactor outage time as well as overtime for tube leak detection.

3. Ball 3X Systems

Ball 3X renovation efforts at C Reactor during the month consisted of placement of orders for stainless steel buckets and chain for the ball elevator, and mock-up and testing of a ball valve with a hydro-meter operator. Three additional air cylinder operators have also been ordered for testing on the mock-up. The existing ball conveyor has been put in satisfactory operating condition, at least temporarily, by taking up slack in the conveyor chain by adjustments to the idler gear.

There is nothing unusual to report from other reactors on the Ball 3X system. Tests continue to be run as specified by Process Standards. Examination of the gas purged ball hoppers at 105-F show that this system is apparently more successful at keeping the balls dry than was originally anticipated. This of course is extremely important at F in view of the continued presence of leaking tubes and moisture in the reactor atmosphere.

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3. Ball 3X Systems (Continued)

3X ball recovery, washing and blending has remained at a standstill pending completion of fabrication of some shop built washing equipment at 105-C. This equipment was scheduled for its first test during the latter part of this month.

Red SCP coils at H were found to have overvoltage. This was corrected by adding two resistors in series with each coil.

4. K Area VBR'S

No additional work has been done on VBR improvements, but the remaining improvements worked out by Manufacturing Engineering are scheduled to begin in June. Improvements made so far are highly successful as evidenced by successful recovery from 17 screws (mostly unexplained panellit screws) at the two reactors. In only one instance a slow rod drop resulted in dropping a channel of balls via the LSA switch.

5. Reactor Instrumentation

Piping to the gas analyzer at 105-C has been revised to permit analysis of a sample of inlet gas since passage of gas through the reactor results in reaction of all O_2 present to form CO_2 . To detect the quantities of O_2 permitted by Process Standards, the Beckman Company has been requested to supply new elements capable of analyzing in the ranges of 0-1 % and 0-5% O_2 .

Further testing of the sub-critical monitor at 105-D has shown this to be a highly satisfactory instrument. A sensitivity of 1-5 watts indicates each successive HBR and VBR pull. The logarithmic counting rate meter, semi-logarithmic recorder and direct reading period meter with fast trip mechanism are invaluable operating aids and relieve the operator of necessity for manual plotting of period data. These latter three components may be attached to the PC with a slight decrease in sensitivity (10-50 watts).

A dosage rate integrator for personnel has been fabricated and placed in service at 105-TR. If it proves reliable, it will provide a valuable aid in computing employee exposure time and will remove many of the uncertainties of present timekeeping procedures.

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5. Reactor Instrumentation (Continued)

Revisions to the temperature monitor at 105-D were completed, increasing instrument reliability, speeding up response time and simplifying maintenance work. The temperature monitor at KE gave five spurious trips which would have resulted in scrams had it been in the safety circuit.

Trouble is still being experienced with Nos. 2 and 3 Beckmans at KE and with Nos. 1 and 3 at KW. All of these instruments are left on bypass as much of the time as standards will permit, while investigation is continued to determine the cause of erratic performance.

Considerable difficulty has been experienced with failure of old DR-H panellit gages now installed at F. Because these failures have not been of a fail safe nature, inspection schedules have been increased to a daily basis. Plans have been completed and orders issued to replace these gages during June with new CG-558 gages having either Marcoid or Hamlin switch bottles of the types currently on test (300 of each) at 105-H. Both types have proven satisfactory so far at H. It is believed that this work can be completed and the gages for B also readied on time for CG-558 outage installation at 105-B. There has been only one failure of the test gages at H, and this was not in the switch bottle. Considerable trouble with panellit failure has been experienced at KE, causing several scrams. 103 mercury separations were corrected, all components in row 13 were replaced, and now relay resistances and transformer voltages have been checked. This work has apparently corrected the source of trouble.

6. Reactor Operation

The continued existence of a high gas loss rate continues to be an operating sore spot. High gas leakage is experienced at all reactors troubled with large scale tube replacement, and is believed to tie in with damaged bellows resulting from tube work. Corrections of HER seals at 105-H have decreased the leakage rate there. An extensive leak detecting program is underway at 110-115-B and it is planned at F to remove the gas buildings as a source of loss. Leakage at 105-C is apparently tied in with the faulty ball valves on the Ball 3X System.

Although graphite temperature cycling has been alleviated considerably at KE, it continues to be a level limiting problem at KW. Some relief has been experienced as a result of some reduction in far side enrichment, and it is believed that improved instructions and greater coordination of anti-cycling efforts by the reactor physicists in conjunction with the chief operators will eventually produce the desired results.

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C. NEW PLANTS AND FACILITIES

Most project work is at a standstill because of the strike. Evaluation of the effect of the strike on justification for projects and on other effects of the delay has been made and passed on to Projects and Personnel Development.

Project CG-578 (Gamma Monitor)

Trouble is still being experienced at B Reactor with flow control on this equipment, and at F Reactor from effluent vapor problems from leaks in the system.

Project CG-583 (Moisture Monitor)

This equipment is operable but unsatisfactory at 105-F due to questionable vacuum pumps and lack of recorders. The system has been entirely unsatisfactory at 105-B with leaking vacuum pumps putting air into the reactor atmosphere. It has been temporarily disconnected, and gas analyses are dependent on frequent Orest analysis.

D. PERSONNEL, ORGANIZATION AND ADMINISTRATION

1. Organization

D. S. Lewis was transferred to the New Plant Contact Engineering Group, J. T. Baker from DR to K Reactor and JEM Miller took over as Superintendent 100 Operations, 105-DR, during the month.

2. Personnel

Leo Stebbins, Pile Operator at 105-H, will retire on May 31. 16 additional operators have been requisitioned to permit meeting minimum manpower safety requirements for hot reactor startups during vacation season. Procurement is expected to be complete by June 11. Arrangements have finally been completed for transfer of Carl Higby and Glen Robinson from Process to Operations. This will be accomplished during June and will complete procurement of 8 back-up supervisors for the Operations Subsection. G. S. Spencer is on a temporary assignment in 105-H while assigned to the jury duty panel at Proesser. He is demonstrating his administrative abilities by helping with administrative jobs in the writer's office during his free time from jury duty.

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3. Administration

Safety - Emphasis on safety is being maintained at a high plane to overcome the upsetting factors of sale of houses and reorganization. Performance has been good with several reactors reporting no medical treatment injuries for the month. Unit superintendents are attending weekly roll safety meetings and sponsoring unit programs to improve safety interest. Supervisory safety courses are being well attended. The fifth in the series of operator training tests has been completed and is being evaluated. The sixth should be issued by month end. This program continues to give indication of increase of operator awareness to job responsibilities and nuclear safety aspects of the job. It continues to be a most worthwhile program. A program has been worked up by E. T. O'Sullivan and is currently being evaluated to reduce the number of lapses of radiation control by specialized radiation training. If adopted, it will require part time use of one monthly roll man in addition to our present force, but in view of our ever increasing problems, complexity of operation and general training needs, this may in the long run become a subsection necessity.

Manpower Development - Friday meetings of supervisors and chiefs continue to be well planned and well attended. Participation of exempt personnel in company-sponsored development courses continues at a high level. Development work by frequent informal contacts between supervision at all levels, starting with the writer, is continuing vigorously.

Overtime - Overtime reduction predictions made last October as a result of procurement of additional personnel from Separations have exceeded expectations. The reassignment of these people to the Supplemental Crews to provide more flexible coverage, coupled with an increasing effort upon the part of all levels of supervision to eliminate overtime, has resulted in overtime reduction to 1500 hours last month with a promise of even further reduction this month. It is hoped that we will soon reach our goal of 1200 hours, which is to be the lowest realistic amount for meeting peak charge-discharge loads and varying requirements for rupture removal and other overtime work. This considerable reduction has been achieved with a minimum of hard feeling and little or no Union difficulties. In general, morale reduction in overtime pay, reorganization and the housing disposal, morale appears to be good in the subsection. An example of this is the recent organization (with formal charter and incorporation papers etc.) of the M.O.P.S., Manufacturing Operations Personnel Society, a group organized for the sole purpose of promoting recreation and sociability among Section personnel. The organization was sponsored and pushed by non-exempt people, but not only operators but also clerks, stewards, chief operators and all levels of supervisors were included among the charter

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3. Administration

Overtime (Continued) members. Free legal service in drawing up the charter was obtained from the EAMC lawyer by the Reactor Chemical Workers chief steward. A dance will be held by the group (similar to the last two, we hope) in the near future. Charter members donated one dollar each to offset organization costs. There are about 25 charter members. All Section personnel are invited to join, but only for fun.

E. LONG RANGE PLANNING

Work along these lines, except as noted during the foregoing on rupture prevention, overtime reduction, and safety improvement, is held in abeyance pending assignment of additional personnel to the organization study.

Operations Sub-Section
REACTOR SECTION

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R. S. Bell
 Manager
 REACTOR SECTION

MANAGEMENT REPORT - OPERATIONS SUB-SECTION

A. PRODUCTION

1. Statistics

Statistics are forwarded under separate cover by D. L. DeNeal.

2. General

Production performance of the sub-section this month is considerably improved over the past several months. It is anticipated that by month end several new records will be set for both production and operating level. These improvements are attributed to a marked decrease in the rupture rate, to some improvement in tube removal performance, and to removal of the arbitrary cross-tie limit at the K Reactors permitting level increase at KE. It is also predicted that an improvement in time operating efficiency will result in about 75% time operating efficiency for the month.

B. PLANT OPERATION AND MAINTENANCE EXPERIENCE

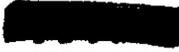
1. Slug Ruptures

The sub-section has enjoyed its best performance of the past 13 months so far as freedom from ruptured slugs is concerned. With 6 ruptures to date this month, it is likely that we will have 8 ruptures by month end.

This improvement in performance can be tied in with three main efforts devoted to rupture prevention, but cannot positively be isolated as directly attributable to any one of the three. These efforts are a) discharge of rupture-prone material at less than goal concentration on the 400-800 program, b) reduction of effluent temperature by 50C at certain reactors and c) conversion of rupture-prone high tube factor tubes to low goal concentration production.

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1. Slug Ruptures (Continued)

The utilization of metal on the 400-800 program is tabulated below:

Reactor	April		Ruptures				To Date	
	Gross	Net	Jan	Feb	Mar	Apr	Gross	Net
100-D	3	1	2	5	1	1	12	10
100-DR	16	1	9	7	5	2	85	11
100-F	1	1	7	2	2	0	30	13
100-H	18	1	8	14	6	1	83	13
Total	38	4	26	36	14	4	260	47

It has been shown by charts prepared by the Production Planning and Scheduling Group that ruptures occur almost predominantly in high tube factor tubes. To prevent ruptures possibly occurring for this reason, an attempt is being made to convert as many as possible of these high factor tubes to low (250 g/t) production. This effort will be continued until the AEC requirement for low concentration material ceases or until some other factor makes this mode of operation untenable. At present, the thing most likely to disrupt this program will be lack of manpower, which will be discussed later. Tabulated below are the figures for conversion of high power tubes to low goal concentration production:

Reactor	Tubes In High Power Rupture Prone Range*	Percent Conversion
100-D	925	3%
100-DR	975	80%
100-F	375	63%
100-H	1050	0%

*Above 575 KW at D, DR, F
Above 675 KW at H

Finally, the reduction in outlet temperature by 50C at C, DR, and F Reactors has almost certainly had a bearing on this program. B Reactor, of course, has been operating at this reduced temperature for several months because of the TBI limits. It is significant that rupture rate has decreased at all of these reactors since temperature reduction, and that production has increased except where excessive down time caused by tube replacement outages has been a controlling factor. It is the writer's belief that effluent temperature alone, aside from its part in tube power, has a decided effect on rupture rate. This has been shown almost conclusively by performance at

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1. Slug Ruptures (Continued)

C Reactor with operation at similar tube powers, but with decreased effluent temperature. The annual increase in inlet temperature will soon be taking place and since this will result in decreased production at the lower effluent temperatures, there will probably be considerable pressure to raise the limits back to 105°C. These efforts will be resisted at least until it can be proved that the operation of high factor tubes at low goal production can offset the increase in rupture rate resulting from raising effluent temperatures. If this can be done, it may also be possible to obtain some high goal material from C Reactor.

2. Tube Replacement

Tube replacement outages continued to be scheduled at the rate of 60 tubes per week except during the week of April 8 when 15 tubes were removed at H Reactor and 21 were reinstalled. Improvement in tube installation rates at H is encouraging, but is by no means improved enough to duplicate performance at other reactors. It is significant, however, that no stuck splitters were encountered on any of the 15 tubes removed. The main factor in successfully retubing at H is apparently the use of a bullet nose mandrel for pulling in the new tubes. A rotary end mill type broach also was used to broach a channel with good success, permitting installation of the new tube with hand pushing. Future outages at H will be divided between tube removal and replacement of tubes in problem tube channels until all of the 30 problem channels are back in production.

F Reactor was scheduled down for tube replacement twice this month in an attempt to remove all suspect tubes from a leak-prone region which has produced about 39 leakers in the past several months. These leakers have been predominantly the result of external corrosion, and have caused the continual low time operated efficiency at F because of the almost constant need for leak checking. It is believed that this condition will be largely alleviated following removal of the remaining 60 tubes in this trouble area during the current outage.

New residual tube wall calculations are being run on the IBM 702 EDPM based on more complete data than were used for the original calculations. These data should become available in time to make a re-evaluation of the tube replacement program for May.

Based on present calculations and low pH water, a quick forecast through June, 1956 was run. The total number of tubes ready for replacement between

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2. Tube Replacement (Continued)

April 1, 1956 and June 30, 1957, follows:

100-B	145-205
100-D	315-350
100-DR	35-40
100-F	245-305
100-H	415-500
Total	1155-1400

The two figures shown are for two-fold and three-fold reduction in corrosion rate for low pH water.

Since this covers a 15 month period, it can be seen that the average replacement rate should be 75-95 tubes per month. At the present rate of 180 per month we should be caught up by July, 1956. This, of course, is exclusive of H Area which will require more than 60 per month and has not yet reached this replacement rate.

Of general interest is the fact that there is fairly good agreement between calculated residual tube wall thickness, probolog results, and actual measurements on those tubes not effected by external corrosion or low pH water. As previously noted, the low pH water causes a 2 to 3 fold reduction in corrosion rate as evidenced by tubes removed from the far side of F Reactor. Currently efforts to provide low pH water (7.0) at all reactors are being held up by the Minor Construction strike, but at present only H Reactor and the far side of F are using this low pH water.

3. Ball 3X System

Routine tests of Ball 3X system operability continue at all reactors to indicate the required degree of safety and conformance with Process Standards. The Ball 3X system renovation program at 105-C is lagging considerably behind desired performance. While all hoppers are currently operable in compliance with standards, progress on improvement of ball valve operability, replacement of ball elevator buckets and chain with stainless steel components, and other similar improvements needed for remote operability, is undesirably slow. An engineer has been assigned to study the problem of replacement of the ball valves with a more satisfactory valve, and consideration is being given to making the ball trough slider valve gas tight to use it as the gas seals instead of depending on the 45 ball channel drop ball valves for this purpose.

Attempts at ball washing and recovery at 105-F ball washing station are hampered by inadequacies in the design of this equipment. Personnel and

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3 Ball 3X System (Continued)

equipment scheduling problems are the main deterrent to successful ball recovery. It is likely that this equipment will have to be made portable for use at the area where ball washing is required, to overcome the scheduling problem. Lack of success with this equipment has left at a standstill the attempts to reclaim balls from 105-C and 105-H which were contaminated during ball drops last Fall. This has also resulted in practically no progress in achieving the desired 70%-30% boron steel-steel ball mixture of spare charges currently specified by Process Standards. Success of this effort is essential to maintain a spare ball charge at all times for any reactor. 22,000 pounds of boron steel billets is currently available on the plant and could be made up into balls for approximately 15 hopper charges, but no immediate action is contemplated in this regard. It is likely that this boron steel will be excessed unless some immediate action is taken to set it aside for this purpose.

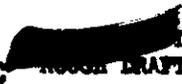
Two ball drops were experienced at KW during the month. The first resulted from an electrical switching error on April 12 when returning the system to normal following electrical work during an outage. 19 hoppers dropped on this occasion and resulted in 12.5 hours of outage time for recovery. Later in the month all hoppers dropped following failure of the motor generator set for instrument electrical supply which was tripped out by turbo-generator tests in the 19 Building. This drop also occurred during reactor outage and did not result in any lost time. The cause of these drops is a deficiency in the electrical design which permits reverse current flow in the seismoscope circuit when the motor generator set fails. It is believed that installation of a time delay relay in the reverse current relay circuit may correct this problem and effort is currently directed towards this end by Manufacturing Engineering personnel.

K Area VSR's

Considerable improvement has been noted in the performance of the K Area VSR's following installation of cushion orifices at the top of the VSR rod cylinders during the month. Successful recovery from five scrams and lack of difficulty on normal start-ups indicates that these orifices are saving much wear and tear on the rod latching mechanisms. Modifications of the VSR-LSA circuits will be started as soon as materials are available. Designs for the new LSB and the revised latch assembly are being developed by Manufacturing Engineering personnel.


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5. Reactor Instrumentation

At 105-D a new PC test installation consisting of three chambers in a thimble has been placed in B test hole. This installation includes a scaler, amplifier, logarithmic chart recorder and a period trip which at present is tied into the annunciator circuit. At DR two fast scanning Brown temperature recorders have been installed. These instruments permit traversing the entire reactor temperature-wise in 6.5 minutes. This should greatly aid heat control during reactor startup. High speed balance motors installed in the Nos. 2 and 3 neutron sensitive Beckmans should increase the value of these instruments by reducing time lag between Beckman meter and recorder. The No. 3 flux monitor at KE failed during the month. Studies are under way to determine the most suitable location for a replacement chamber. Five trips on the KE temperature monitor would have resulted in scrams had this device been in the safety circuit. It is believed that replacement of the variable resistance potentiometers with fixed resistors will tend to correct this problem at both KE and KW. A safety circuit survey has been completed at both KE and KW aimed at seeking out and eliminating causes for safety circuit trips caused by undesirable electrical ties in these circuits. The survey has resulted in many recommendations for improvement which are currently being considered by the Process Sub-Section.

6. Effluent Systems

Concern over the excessive leakage from the 107-B north basin resulted in an inspection of this facility by Design Engineering personnel at our request. The basin shows definite signs of settling and leakage at expansion joints. It was recommended that a monitoring system be installed to check on the basin structure and that a diversion ditch be provided to run off the water leakage. It was also stated that planning should begin for replacement of these basins, probably within a five year period. While this inspection was made only at B, the recommendations are probably just as applicable at D and F.

7. Operation

A high pressure cross-tie flow test was conducted at the K Reactors on April 11, 1956. This test established that a backup flow of better than 19,000 gallons per minute was available to the operating reactor in case of failure of the NPA power supply and emergency power generating facilities at one reactor. With this flow assurance established, the arbitrary tube power high pressure cross-tie limit was removed at KE and a program of tube power increases was initiated on April 16. It is planned to increase tube


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7. Operation (Continued)

powers in increments of 125 KW per tube over a period sufficiently long to process a pilot batch of about 30 tons of metal from charging to 800 MWD per ton goal exposure. The first such period should be completed about September 5. Level raises will be made as possible during this time at not more than 100 MW per day if reactivity and outlet temperature limits permit. KW will follow this same program at an interval of about three months. This program resulted in an initial increase at KE to 2300 MW, but reactivity conditions and graphite temperature trouble make it apparent that the increased tube power limit will probably only result in holding our former 2200 level during the next few months.

C. NEW PLANTS AND FACILITIES

1. CG-558

Work on this project has been essentially stopped by the Minor Construction strike. The most notable effect of this strike, operations wise, besides delay in the start of the major outage at 105-B, is the extremely undesirable housekeeping condition that cessation of work by Construction forces has left around the several reactors where CG-558 work was in progress.

2. CG-640

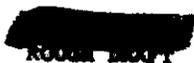
Same as above.

3. CG-651 and CG-642

Design work on these projects concerned with charge-discharge while operating is continuing. The CG-651 design does not include a new charging machine, but one will be needed for this 112 tube test facility. Financial means of providing this machine have not yet been determined. On CG-642, Engineering has finally come up with a design for trajectory control, which meets our requirements. This consists of a 20 inch pipe elbow which can be remotely located in front of the tube nozzle being discharged to divert the slugs to the chutes.

4. CG-578 - Gamma Monitor

This installation is still causing trouble at B and F Reactors. Flow adjustment, electrical circuitry and effluent vapor problems are of chief concern.

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5. CA-512 - Revisions 4 and 5

The items listed for Revision 5 to Project CA-512 have been discussed informally with the AEC. The request to provide for disposal of the Beta Monitor equipment was deleted from the revision, and all other requested items were either added to Revision 4 or included in Revision 5. Details will probably be included in the Projects and Personnel Development Sub-Section report.

D. PERSONNEL, ORGANIZATION AND ADMINISTRATION1. Safety

Strong emphasis on safety continued at all reactors during the month. At each reactor special programs are underway designed to increase safety consciousness and to reduce injuries. Among the more notable items are:

- a. Active participation in providing programs for the Theme of the Month program.
- b. Continued attendance of superintendents at shift safety meetings.
- c. Participation of supervision in safety training courses.
- d. Individual intra-area contests on safety and housekeeping.
- e. Review and comment on Plant Safety Bulletin by all units.

2. Personnel and Training

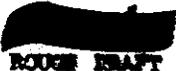
The 4th in a series of 8 tests to determine the status of process and equipment knowledge by pile operators has been completed and is being evaluated. The 5th test in this series should be underway by month end. The popularity of these tests with the men is increasing, and it looks as though this is becoming an excellent training aid.

3. Overtime

Considerable effort has been expended at all reactors towards the reduction of overtime. In addition, as mentioned last month, a transfer of all but essential operators to the Supplemental Crews to increase manpower versatility has been accomplished. It is predicted that these efforts will result in less than 2000 hours of overtime this month, which is within the goal established for overtime reduction. This effort has been realized with difficulty,

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3. Overtime (Continued)

and can only be maintained by an increase in the work force. As pointed out by the unit superintendents, many work factors are suffering from this reduction. It is felt at this time that we must request relaxation from Mr. Johnson's manpower ceilings immediately if we are to avoid serious trouble during the Summer months. The reasons for this request are listed below.

a. Safety

The reduction in crew size at some reactors has resulted in a bare minimum of personnel to run the reactor. It takes 5 operators minimum to fulfill the various functions necessary to recover from a scram. Since all reactors have been stripped to 5 or less operators per crew, this will mean each reactor will be two short of the number required for safe recovery from a scram after vacations begin or if anyone is absent because of illness. It appears that we need to put in training immediately 18 men for this reason. This is 2 per reactor to cover vacation relief and 2 to bring 105-DR up to a 6 operator standard crew. 16 of these men could be placed on the Supplemental Crews and doled out as needed by the reactors.

b. Production

As noted under Rupture Experience a program has been instituted of placing the high factor tubes in the old reactors on a low concentration goal basis to eliminate a source of ruptures. This will be more necessary than ever as soon as it becomes necessary to raise effluent temperature back to 105°C because of decreased production. However, as soon as D, DR, F, and E Reactors get into full swing on this mixed high low program, they will require additional help to handle the additional production and work that goes along with a low g/t program. It has previously been demonstrated that a full reactor low program requires at least one extra Utility Operator per shift and two to three extra on Days. With this high-low program (which is designed to prevent ruptures), from 1/2 to 1/3 of the production from each reactor on the program would be low g/t material. It is therefore essential that at least 2 men per reactor or 16 men be added to the crews to take care of this need. Thus, we should request for immediate consideration, for rupture prevention and safe reactor operation without increase in overtime requirements, a total of 26 additional operators. Considering our present manpower ceiling to still be 421 people, this would increase the total to 447, leaving room for seven monthly roll people still being


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b. Production (Continued)

sought under our existing ceiling. This total is still below the ceiling figure forecasted for the 1st quarter of FY 1957, but should be approved immediately so that the personnel may be prepared from current 200 Area excess and trained before vacation demands put a serious strain on our available manpower. In this same vein, our efforts to fill the extra supervisor on shift job with 8 supervisors (3 additional) should also be pushed to the hilt in order to have this job properly organized and filled by trained people prior to the impending reorganization.

E. LONG TERM ANALYSIS AND PLANNING

The foregoing paragraphs on overtime and organization for safety and rupture prevention cover the thoughts of the writer on long term analysis and planning to take care of ruptures and the overtime situation.

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R. S. Bell
 Manager
 REACTOR SECTION

MANAGEMENT REPORT
OPERATIONS SUB-SECTION

A. PRODUCTION

1. Statistics

Forwarded under separate cover by D. L. DeNeal.

2. Time operating efficiency and input production goals will probably be met or improved upon by month end.

A change was made during the month in the basis for calculating time operating efficiency for the daily report. The reported figure in the future will be based on the previous 30 day average rather than average for month to date. This will still give a correct month to date figure at month end, but will remove the wide and meaningless fluctuations previously experienced at the beginning of each month.

Similarly, work is continuing on seeking better methods of segregating and reporting reactor down time. It is our desire to make each cause of outage time stand out so that it cannot escape the searchlight of publicity, inspection and criticism.

B. PLANT OPERATION AND MAINTENANCE EXPERIENCE

1. Ruptures

Rupture experience to date this month has shown a gratifying improvement over that of the past several months. The 13 ruptures incurred so far this month point out a probable 21 ruptures by month end.

Although several factors are contributing to this improvement, it is believed that the major benefit is derived from the discharge of selected tubes at less than goal (800) exposure on the so called 400-800 program.



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March 23, 1956

1. Ruptures (Continued)

Figures which tend to substantiate this belief, and also give an idea of the extent of use of the 175 tons of uranium originally allocated to this program are tabulated below:

Reactor	January No. Ruptures	February Tons Metal Used			March Tons Metal		
		Gross	Net*	Ruptures	Gross	Net*	Ruptures
100-D	2	38	9	5	3	1	0
100-DR	9	29	4	7	56	8	5
100-F	7	26	3	2	6	2	2
100-H	8	60	12	14	0	0	4

* The net tons indicates the amount of additional metal required to discharge below 800 goal concentration, or the portion of the 175 tons used.

Besides the 400-800 program, especially at C Reactor and possibly at DR and F, the reduction of outlet water temperature by 50C has probably also had a beneficial effect, especially on reduction of "hot spot" side failures. The decrease in "between the ribs" type at H Area is believed, at least in part, to result from a program of frequent hot purges. It is believed that the purging removes scale from the portion of the slug between the ribs, and that the improved heat transfer in these areas of excessive water temperature has had a dampening effect on slug corrosion.

Of general interest is the fact that successful quickie discharges have been minimal during the month. Of the total ruptures only 3 at H and 1 at F and 1 at DR were removed by "quickies", all others resulting in minimum or longer outages. This points out rather forcefully the fallacy of increasing power levels to a predetermined economical limit in which probable use of successful "quickie" discharges is included as a factor. The failure of "quickie" discharges is about equally divided between stuck charges and failure of the cap removal equipment to remove the cap.

Information is tabulated below on number of ruptures, area involved, and concentration of material:

	<u>B</u>	<u>C</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>	<u>KE</u>	<u>KV</u>
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March 23, 1956

1. Ruptures: (Continued)

	<u>B</u>	<u>C</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>	<u>KH</u>	<u>KW</u>
300-500								
500-500				1				
600-700	1			3		2		
700-800				1	1	2		
> 800					#1			
Total	1	1		5	2	4		

*FF-105-570-A - Ruptured at 2250 - Badly Stuck

2. Tube Replacement

Improvement in tube replacement rates noted at the end of last month continued throughout this month, although an occasional stuck splitter still holds down the overall rate. It has been possible to start up some reactors scheduled down for 60 tubes prior to the scheduled start up time. This accounts for some improvement in time operating efficiency.

H Area continues to be a major problem in the tube replacement program. One outage of an exploratory nature was scheduled so far this month in which Process and Technical made joint efforts to discover the cause of tube installation difficulty, and to test methods and equipment aimed at removing the causes of tube insertion troubles at H. These efforts were generally unsuccessful and a second trial outage is scheduled for next week.

A new tube replacement forecast was completed on March 12 by Production Scheduling to take cognizance of several changes in the bases for prior forecasts. The figures tabulated below are the cumulative numbers to be removed by the time indicated.

	<u>March</u>	<u>2nd Quarter</u>	<u>3rd Quarter</u>	<u>4th Quarter</u>
100-B	65	180	225	390
100-D	80	435	525	540
100-DR	-	10	25	60
100-F	210	240	300	360
100-H	<u>170</u>	<u>300</u>	<u>380</u>	<u>380</u>
	525	1165	1395	1730

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2. Tube Replacement (Continued)

These figures are reduced somewhat from previous estimates, due primarily to the following causes:

- a. Reduced temperatures at DR and F.
- b. Replacing tubes at F on a basis which considers low pH test on far side.
- c. Lower estimated time operated efficiencies (more realistic).
- d. Lower pH at H Reactor.

It is quite probable that this forecast will have to be redone completely in another month because we have been informed that Technical plans to recommend pH 7.0 water at all reactors (decrease of 2 to 4 in corrosion).

At the current replacement rates, and under existing conditions, the replacement program should catch up with corrosion by about August, 1956.

3. Ball 3X

Efforts towards renovation of the Ball 3X system at C Reactor consisted mainly of replacement of several ball valves under the unit. Subsequent testing revealed that these new valves also failed to perform in a satisfactory manner, and Process is now looking into the possibility of replacement with an entirely different type of valve. Attempts to recover contaminated balls with the hot ball separator have been unsuccessful at both C and H Reactors. The separator works, but only on clean balls. Plans are underway to drum up and remove hot dirty balls to F Area to be cleaned in the ball washer, followed by separation of the hot balls in the hot ball separator at that area.

Wet balls have again been encountered at F Reactor indicating that the experimental hopper gas purging system has not been effective. Ball drop tests in these hoppers and throughout the section generally, have indicated that balls flow from the hoppers in a satisfactory manner.

The Ball 3X recovery equipment was thoroughly tested at both K Reactors during the month due to inadvertent ball drops. The balls dropped at KW during an unscheduled outage when a switching error was made during a functional test of the seismoscope trip circuit. The balls were dropped at KS following a scram caused by opening of the cross tie valve to KW due to an electrical switching error. When the V13 cross tie valve was reclosed rapidly it set up a water hammer. A violent pressure fluctuation resulted causing the balls to drop. The balls were recovered without incident within minimum outage time in both cases. The cross tie valves at both reactors


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3 Ball 3X (Continued)

have now been equipped with coils which prevent the valves from being closed rapidly. KE has been so equipped for some time, but KW personnel were not aware that the special parts required had been received for installation until after this incident.

4. Effluent Systems

The leaking No. 19 junction box piping at 105-B is now in a satisfactory condition but still requires a little work (a welded patch) for completion. Inspection of the north 107-B basin revealed serious leakage at both expansion joints and at a newly developed crack in the wall in the northwest corner of the basin. Although leakage continues at the 107-F basin, no immediate action is indicated. Inspection of 107 tanks at the K Areas mentioned in last month's report is in progress. Some cracks and defects have been found but the extent of the damage and action required have not yet been completely evaluated. The new CG-558 effluent lines will be tied into the cushion chambers at both B and D Reactors prior to month end.

Thermocouples and Temperature Monitors

An order has been placed with the Bristol Company for the type of thermocouple wire specified for replacement of existing faulty wire. The initial portion of 2000 feet is expected to be received on April 23 with additional deliveries of 2000 feet every two weeks until the order is complete. This will permit rewiring during the June CG-558 outage. Wire has also been ordered as a separate order for replacement of 250 thermocouples at 109-C. An improvement in the rewiring method may permit replacement of up to 1000 thermocouples with the wire originally ordered for 250.

Operation of the K Area temperature monitors has been relatively trouble-free during the month. One resistance thermometer was replaced at KE due to low resistance to ground, but no complete failures have been encountered except in elements damaged by adjacent tube work. The planned installation of fixed resistors in place of trimmers in the temperature monitor circuit may improve reliability enough to put this instrument in the scram circuit.

6 Vertical Safety Rods

In general, the rods in the older areas continue in a satisfactory condition. At the K Reactors some improvement has been noted as a result of recent repairs, but malfunction of the rod latches and LSA switches remains the major cause of failure to recover from scrams. At a recent meeting involving

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6. Vertical Safety Rods (Continued)

Process, Maintenance, Expansion Liaison and Operations personnel, a program was outlined and agreed upon for correction of the latching mechanism, LSA limit switches and the air lift system. Work will proceed as soon as firm cost estimates are obtained (preliminary estimates are \$12,000/reactor) and work orders are approved. It is believed that this cost may be reimbursed as a portion of Project CA-512R.

C. NEW PLANTS AND FACILITIES1. CG-558

Work is proceeding generally on schedule at all reactors. New effluent lines are scheduled for tie in to cushion chambers at B and D prior to month end. Trouble is still being encountered with Gamma Monitors at B and F Reactors despite recent work at these locations. An excessive amount of operator time is required at nearly all reactors to keep this equipment properly adjusted. The new FCC charging machine has been built and tested, both on mock up and on K&R Reactor. The on-pile reactor test was discontinued due to failure of one of the parts. It is anticipated that the fault can be corrected with no difficulty.

2. CG-642 and 651 - Continuous Charge-Discharge

Main effort on CG-642 recently consisted of meetings and a design review to make sure critical aspects of the design have not been overlooked. Little progress has been made by the Design Section during the month in establishing an agreed on design criteria for Project CG-642.

3. Miscellaneous Project Proposals

It is anticipated that after evaluation of the 4th prototype temperature monitor that final specifications for the zone temperature monitor will be written by the end of April. Procurement of rear face components is being expedited to permit installation during CG-558 major outages.

The project proposal for metal loaders should be forwarded to the AEC in the near future. Engineering has been requested to prepare a project proposal for a central dummy decontamination facility. The project proposal for the helium leak detection system for water leak detection is in Financial's hands and should soon be presented to the AEC. The writer wishes to stress that all three of these projects are rather vital to economical, efficient operation and should be pushed to completion as rapidly as possible.

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D. PERSONNEL, ORGANIZATION AND ADMINISTRATION1. Exempt Appraisals

Appraisal contact discussions have been completed by nearly all units as of this date, and it is anticipated that all will be complete by month end.

Safety

Safety effort continues to receive primary emphasis. Unit Superintendents are attending shift safety meetings, nearly all reactors are going full blast on their safety programs (which cover a wide variety of types and fields of interest) and many supervisors have been scheduled to attend the various training courses being offered on safety. Unit Superintendents generally are meeting more frequently with Safety Engineers, and of course, some phase of safety is discussed at every staff meeting.

Recruiting

S. L. Nelson went on a recruiting tour during the month at the request of the Technical Personnel Unit. He visited the University of Idaho and Ricks College.

Organization

Although this old drum has been beaten almost to death, the writer feels that he would be derelict in his duty if he didn't continue to use it until some results were achieved

- a. The writer's personal work load continues undiminished (and just as time consuming) as it has for the past several months. It is almost safe to say that unless suitable assistance is supplied soon, or an actual reorganization takes place, that sufficient time will not be available to properly plan a program to permit satisfactory accomplishment of appraisal performance requirements.
- b. It is my belief that the job of Analyst 100 Operations, is underrated. The men on this job fulfill an extremely important function in the surveillance and analysis of reactor data and incidents, and in the preparation of plans for and coordination of outages, which is deserving of a higher level than it now possesses. The appraisal standards for this job are more severe than on the Supervisor I job, and it is entirely possible for a zone 3 appraisal Supervisor I to become an Analyst and be appraised at a 1 or 2 on nearly the same caliber of work. It is the writer's belief that this difference should be recognized and rewarded. We often decry the level discrepancies between jobs in Reactor and comparable jobs in Engineering or Radiological Sciences. The writer would like to point out that correction of this condition, like charity, should begin at home.

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E. LONG TERM ANALYSIS AND PLANNING

At the expense of begrudging proper emphasis on other phases of the job, considerable time has been allotted recently to analysis of the rupture problem and its relationship to anticipated power level increases at the K Reactors. Proposals for such level increases have been submitted by both Unit Superintendents. These have been analyzed, discussed with the superintendents individually and together and have been passed on to O. C. Schroeder for review and comment. Following all of this, word was received of the removal of the cross tie limit and of Technical proposals for power level increases.

As a result of all the analysis, planning and consideration noted above, it is our conclusion that it is not economical or desirable to run the K Reactors on a power level limit based on the expectation of incurring any number of ruptures per month. Study reveals that initial incidence of ruptures inevitably results in a deterioration of operations with resultant losses of production and operating efficiency increased costs and lowered morale. If it is humanly possible to do so, we would like to propose that one of the K Reactors, only, be subjected to the program of determining the optimum conditions of power level and concentration that will permit operation with no ruptures, other than those resulting from statistical failure due to metal quality. It is realized that some ruptures must be tolerated to realize this optimum condition but following our most recent discussions we believe we have a plan to accomplish this with the minimum possible number of ruptures. Its activation is somewhat dependent on obtaining C. A. Priode's concurrence on a program of gradual lowering of the goal concentration to the forecasted 500 MW/Ton which will become goal concentration in September.

A full fledged discussion of this proposal is a little long winded for this report, but it will be discussed with Technical at the scheduled meeting on Monday, March 26, regarding K Area Power Level Raises. I would be happy to discuss it with you prior to that time if you wish.

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FILE DESIGNATION

TITLE

MANAGEMENT REPORT - OPERATIONS SUB-SECTION

AUTHOR

A. R. Maguire

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Manager
REACTOR SECTION

MANAGEMENT REPORT - OPERATIONS SUB-SECTION

A. PRODUCTION

1. General:

It is anticipated that the sub-section goals for time operated efficiency and input production will not be met for the month. This is caused mainly by an increase of about 6% in unscheduled down time for tube removal resulting from unanticipated difficulties encountered in removal outages at B, D and H Reactors. Also, rupture removal and leak testing have been large time consumers this month. An all time high record for output production will probably be achieved.

2. Statistics:

Production statistics are supplied under separate cover by D. L. De-Neal.

B. PLANT OPERATION AND MAINTENANCE EXPERIENCE

1. Ruptures:

Rupture rate this month is slightly higher than last month. The occurrence of 32 ruptures to date this month indicates the probability of 42 ruptures by month end. Eight successful "quickie discharges" were accomplished, all at H Reactor. Information is tabulated below on number of ruptures, location, type material and concentration:

	<u>B</u>	<u>C</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>	<u>HE</u>	<u>KW</u>
< 100		1 (C Metal)				1 (C Metal)		
100-200		1 (C Metal)				1 (C Metal)		
200-300		1						
300-400								
400-500								

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1. Ruptures: (Continued)

	<u>B</u>	<u>C</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>	<u>KE</u>	<u>KV</u>
500-600		1 (PT-593A)*	1			2		
		1 (PT-607A)**						
600-700			2	4				
700-800	1		1	1	2	9		
> 800						2		
TOTAL	1	5	4	5	2	15	0	0

*This material was regular metal being used as a control on cored metal with aluminum end plugs.

**This material was 5/8" cored Ike material. (These two PT's resulted in loss of 57.9 hours of production).

Removal Time - PT Ruptures	57.9 hours	28.95 hours/rupture
C	12.6	3.15
Regular	159.6	6.14
	230.1 hours	7.18 average

It is interesting to note that low concentration regular metal failures have nearly disappeared, with the bulk of the ruptures occurring in the 600 to 800 concentration range. It is also of interest that eight of the fifteen ruptures at H Reactor were cap failures - a type not previously encountered during recent months.

A considerable degree of relief from the rupture problem is anticipated as a result of the recent decision to make 175 tons of metal available for discharging rupture-prone material at concentrations down to 400. Operations and Technical have been cooperating in the effort to make best use of this leeway, with Operations providing data and Technical making correlations and recommendations. All known factors involved in rupture proneness are correlated, and specific discharge recommendations are made for each reactor based on these correlations. Variables considered are type of metal, charge date, tube factor, concentration, tube wall thickness and location in reactor. On this basis, 50 tons of metal have been discharged at B and H Reactors at less than goal concentration, using 12 tons of the 175 tons available. Similarly, current recommendations have resulted in scheduling for discharge at first opportunity as indicated in table below:

<u>REACTOR</u>	<u>B</u>	<u>F</u>	<u>H</u>
Tons scheduled	29	10	18
Tons extra metal requirement	8	2	5.4
Ruptures averted	19-24	2	11.5

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1. Ruptures: (Continued)

It is anticipated that this method of scheduling will achieve maximum rupture reduction with minimum utilization of the available metal. Correlations to permit discharge of rupture-prone material at other reactors will be completed as rapidly as possible.

Finally, it is becoming apparent that the K Reactors, particularly KE, are nearing the rupture threshold. The equilibrium concentration at these reactors is nearing the 800 level, and at recent discharges at KE difficulty has been encountered with slugs sticking in the tubes. While this may be due in part to the condition of the cooling water, it is known in at least one case that a sticking tube charge contained badly warped slugs. This, based on former experience, is a precursor of ruptures of the side failure type, especially in tubes of moderate to high tube power. From the foregoing, it is apparent that increases in tube power and level at the K Reactors should be approached cautiously if their current high productivity is to be maintained.

2. Tube Replacement

Tube replacement outages based on the plan of scheduling 60 tubes per week per reactor have been conducted during the month at B, D, F, and H Reactors. Performance on the whole has been extremely poor. Difficulties at B, D, and H due to stuck splitters and trouble inserting new tubes (at H) resulted in each of these outages exceeding the scheduled downtime causing an increase of 6% in downtime over that scheduled. The reasons for difficulty encountered are not known. One suspected difficulty was inadequate lubrication of the splitters due to insufficient zinc coating. Corrections to the zinc coating procedure were made in preparation for the F outage currently in progress, and improvements were also made in the pulling cable swivels. While it is not known for sure whether these changes are responsible 61 tubes were split at F in record time without a single stuck splitter. Tube removal, broaching and retubing also progressed in an equally satisfactory manner. This performance is very heartening and its continuance will brighten considerably the outlook on tube replacement. The largest remaining obstacle to routine scheduled replacement is the retubing difficulty encountered at H Reactor. As a result of this difficulty, some 45 channels are currently air channels, either empty or containing partially split tubes. Efforts towards development of tools and techniques for overcoming the tendency of tubes to stick when being replaced are being pushed, and a trial run is scheduled at 105-H early next week. No attempt will be made to schedule additional tubes for removal at H, taking out of service only those that actually fail, until methods have been perfected permitting retubing of the existing and accumulated empty channels.

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3 Other Operating Difficulties: (Continued)

a. A minimum outage was required at KW as a result of plugging of the panellit impulse line connection to the nozzle on 145 tubes. This difficulty was traced to poor water quality with accumulation of aluminum hydroxide and iron oxide in the small fitting opening causing the trouble. Unplugging the connectors and improvement in water quality evidently corrected the trouble since a recheck on panellit gauge response time at a subsequent outage revealed only one insensitive gauge. During the period between the initial trouble and the recheck, the temperature monitor was placed in the safety circuit for additional protection against plugging. It is noteworthy that this equipment is still not ready for inclusion in the safety circuit, since its use during this period resulted in several spurious scrams.

b. Use of the partially installed TV equipment at B Reactor to help locate a suspected slug on the rear face prior to the tube removal outage resulted in this piece of equipment falling into the basin. At the time of this writing, the camera has been recovered and is being dried out. The extent of damage is yet uncertain.

c. A recently completed rod calibration production test at 105-DR indicated that the newly installed rods at DR and the old reactors are 100% stronger than calculated especially when only a few rods are in the reactors. Use of this information should eventually result in improved reactor safety and better control. Along these same lines, a period trip has been installed in the 105-D proportional counter circuit, and is tied in to the annunciator circuit for testing prior to including in the No. 1 Safety Circuit.

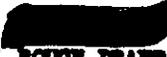
d. Although much improvement has been shown, KE and KW are still troubled with unsatisfactory performance of the vertical rod latching mechanisms causing failure to recover from scrams.

4 Ball 3X Systems

Recommendations made as a result of the Ball 3X failure at H Reactor last Fall have been carried out at all reactors with one exception. One recommendation consisted of provision of a device for providing an automatic mechanical lock on the ball hopper gates when rods were inserted in the reactor. No satisfactory method of accomplishing this has been found, but efforts to do so will continue. In addition to the above, work is continuing on recovery, cleaning and replacement of balls at both C and E Reactors, and all reactors routinely check condition of balls in the ball hoppers. Wet balls were discovered at DR and F Reactors (evidentially the supply of reactor atmospheric gas to the hoppers at F Reactor is not the answer to the problem) in a few hoppers, and were removed and dried. No further difficulty has been encountered with failure of balls to drop from hoppers. Work on the improvement of remote operability of 105-C ball 3X system is continuing, but progress is slow because of diversion of Maintenance forces to more urgent problems.

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C. NEW PLANTS AND FACILITIES

1. Project CG-558

A proposal advanced by Projects personnel for maintaining flow continuity to the reactors by means of a ten inch auxiliary riser, thus permitting simultaneous removal of existing old risers, during the 558 outages, has been studied. Adoption of this proposal supposedly has possibilities of cutting two weeks from the scheduled outage time. Study of this proposal was completed by Process and Operations personnel, resulting in a set of recommendations to Projects which would permit the safe accomplishment of the proposal. Agreement has been reached and the auxiliary riser will be used. In addition, a study was made of flushing requirements for newly installed (or to be installed) piping resulting in a procedure and recommendations which will save additional outage time without jeopardizing reactor operations. This will permit piping tie-ins during scheduled outages prior to the extended CG-558 outage, without excessive lost operating time for flushing following each tie-in.

The recent rupture increase has uncovered at 105-DR a difficulty with the CG-558 Poison Column Control equipment which has resulted in our inability to perform "quickies" on several occasions. It has been found that ball valves, and especially hydraulic lines and fittings to these valves interfere with placement of "quickie" equipment on tubes around the ball valves. All changes on the "quickie" equipment necessary to remove the conflict have been made, and our Contact Engineering people have been appraised of needed changes in the hydraulic lines and requested to take immediate action. Correction of these difficulties may prevent several minimum outages if present rupture rates at 105-DR continue.

2. Project CG-578

The gamma monitoring facility has now been installed at all the old reactors except 105-C. While the increased sensitivity of this equipment is a decided asset in rupture detection, the equipment itself has caused some difficulties and interference with normal operation. At 105-B difficulty has been sustained in maintaining uniform flows essential to proper operation of the equipment. It is planned to install different rotometer bobs and to regrade the sample lines to remove air traps. At 105-D difficulty was encountered with the equipment when several rotometers froze and broke during a tube removal outage when the reactor effluent was cold. This caused some expense and diversion of Maintenance personnel to make the necessary repairs. At F Reactor, some

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2. Project CG-578 (Continued)

outage time was scheduled this month to install the gamma monitoring equipment. At all reactors, but especially at 105-IR, the need for more sensitive confirmatory monitoring equipment has been demonstrated since on several occasions when the reactor was shut down following rupture indication, it was not possible to confirm the rupture by pigtail survey with existing portable monitoring equipment. This of course can result in nullifying the value of the gamma monitor, and could also result in unnecessary outage time.

3. CA-512

Word has been received from Project personnel that they do not intend to make any repairs or revisions to the effluent lines and outfalls from the 107 Basins on the basis that originally installed lines, as repaired, are adequate to handle all foreseeable eventualities within the original scope. A program for determining the extent of damage to the welds in the 107 KE and KW tanks has been agreed upon by Projects and Manufacturing personnel. The initial steps consisting of a statistical study of the need for repairs followed by an inspection of one of the tanks as indicated by the study will be carried out at Manufacturing expense. This is on the basis that we must first prove that conditions are bad enough to warrant extensive repair. If this is proven Project personnel will then proceed with negotiations to obtain the funds necessary to make repairs.

D. PERSONNEL, ORGANIZATION AND ADMINISTRATION1. Safety

Safety efforts of all units in the sub-section have been revitalized and expanded. Considerable personal effort is being expended by supervision at all levels, from the writer on down, to increase the awareness of weekly roll people in our sincere interest in safety and the fact that we truly consider it the most important phase of our job. These efforts include attendance at safety meetings on all shifts, unscheduled visits to the areas at night, increased emphasis on training and personal contact, selling of the idea of individual responsibility for safety, joint inspections of plant and equipment with Safety engineers, etc. Every effort is being expended to make safety a routine and integral part of every work day of every employee in the sub-section.


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2. Personnel and Organization

Preston Eddy has accepted a position as head of the 1706 TE and KER Semi-Works in the Pile Technology Section. His move will be effective between the 1st and 15th of April. Bill Koop has accepted an assignment as an engineer with the Radiological Engineering Section of Radiological Sciences and will be working on problems connected with 100 Area waste disposal. Jack Cline, a former Radiological Sciences man from the Radiobiology Unit has accepted an assignment with us and is currently training for a Supervisor 100 Operations II position. The moves previously mentioned, and others under consideration, are making it extremely difficult to make any gains in bringing our supervisory force up to its required strength. So far, little success has resulted from our efforts to obtain new blood through the Technical personnel office.

The organization studies made by Sterling Nelson early in the month were completed and results of his efforts were forwarded to you. It is sincerely hoped that the proposed or a suitable substitute area manager structure may soon become a reality. It is felt that only by adoption of such an organization will we realize to the fullest extent the potential within our grasp for providing safe, economical operation with high morale.

3. Test Program

Operators have completed the third in the series of tests designed to improve their knowledge of reactor safety and operations. The third test recently completed was designed purposely to cover the topic of safety. Results have not been tabulated yet. Also, a similar test devised for supervisory personnel has been completed by all supervisors. Preliminary examination of the results indicate that supervision generally is adequately informed on the theory and practice of reactor operations, although a few individuals can stand some brushing up to obtain a really comfortable position. It is planned to have unit superintendents incorporate any training needs indicated by these tests in the appraisal contact development plans for individuals where need is indicated.

E. LONG TERM ANALYSIS AND PLANNING

The demands on time resulting from ruptures, poor tube replacement performance and assorted minor problems has left little time this month for long range analysis and planning. However, one outstanding need has been analyzed, studied, and plans for improvement have been made. This effort has been devoted to overtime re-

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E. LONG TERM ANALYSIS AND PLANNING (Continued)

duction Steps are now underway to reduce each area to the essential number of people and to move all others to the Supplemental Crew to make them more readily available as a source of manpower to prevent need for overtime. It is hoped that a rather immediate result will be elimination of overtime for tube removal work. Studies have shown that a total of 15 people per shift are required for successful accomplishment of this work. An increase of three men on each of the eight supplemental crews will provide eight men in addition to the normal reactor crew for this work. Generally, this will provide a minimum of 14 men per shift, and it is hoped that with this number, and improved planning and time utilization, that overtime manpower may be avoided. Also, increase on the remaining supplemental crews will make some manpower available in case two other reactors are down beside the one scheduled for tube removal. It will take about two months to complete the transfers involved before maximum benefits may be expected. The situation will be reviewed again in about three months in order to prepare justifications for increase in manpower during the coming fiscal years if current efforts do not produce sufficient reduction in overtime requirements.

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January 23, 1956

R. S. Bell
 Manager
 REACTOR SECTION

MANAGEMENT REPORT - OPERATIONS SUB-SECTION

A. PRODUCTION

1. Operating Efficiency:

It is anticipated that the overall sub-section efficiency for the month will fall short of the goal 70%, primarily due to the large number of stack ruptures and some tube leaks. Unscheduled lost time for other reasons has been minimal.

2. Production:

Statistics are supplied under separate cover by D. L. DeNeal.

B. PLANT OPERATION AND MAINTENANCE EXPERIENCE

1. Operating Experience:

- a. Ruptures: Rupture frequency continued along the trend established last month and present indications are that last month's record of 39 ruptures will be exceeded. There is nothing new or novel to report about the ruptures. The low concentration ruptures at 105-C continue to be a small per cent of the total, and are primarily of the hot spot, side blowout type. This type is also predominant at DR, and occurs to some extent at B, D, F, and H Reactors. It is characteristic of this type of rupture that it generally sticks in the tube, eliminating the possibility of a "quickie" and often making it necessary to replace both tube and pieces. Although a few cases of cap failure have been encountered, the other predominant type of failure continues to be the "between the ribs" type. This type is encountered predominantly at H Reactor, with lesser frequency at B and F. These ruptures generally can be removed with "quickie" equipment and techniques.

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1. Operating Experience:a. Ruptures: (Continued)

A recapitulation of ruptures for month to date is given below:

	<u>B</u>	<u>C</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>
Conc. < 100		3(2PT-1"C")				
100-200		1("C")				
200-300		2				
300-400						
400-500		1(PT)		2		
500-600		1(PT)	1	1		3
600-700	2			3	2	3
> -700	2				2(LPT)	

b. Tube Replacement:

The method mentioned last month of replacing tubes at the rate of 60 per reactor per week has now been in use for three weeks with good results. 193 tubes have been replaced so far with 60 currently being removed at H and a few more scheduled out at F prior to month end. While this is far short of goal performance, it is an encouraging increase in rate over the last three months of 1955. Performance during the last outage at D was better than 12 per day, with prospects for further improvement. Apparently scheduling a smaller number at one time with a break in between to recover exposure time and tool repair is a more logical approach to solving the problem. It is hoped that the number will be increased beyond 60 tubes per 5 day period as maintenance proficiency and availability of tools increases.

- c. Reactor Operation: A hot start-up was experienced at 105-D during the month with a high disaster potential, but with no immediate ill effects. A faulty start-up prediction curve for a secondary cold start-up resulted in start-up with a fast (4.5 second) period before control was established. Full control was established by the time the 500W level had been reached and no further difficulty was encountered. The Beckman flux monitors had not been reset to their most sensitive range for the cold start-up, in violation of Process Standards.

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1. Operating Experience:c. Reactor Operation: (Continued)

This incident points up once more the urgent need for improved control and trip instrumentation, particularly of the sub-critical monitoring and fast period trip types. Revisions to the Beckman circuitry are also in order to minimize the possibility of failure to reset, as in this case. Plans for these revisions are being made.

2. Maintenance Experience

- 1) Effluent Systems: Leaks in the LBY basins at both B and F Areas caused some concern, with the formation of lakes or pools outside the basins resulting from basin leakage. Water flow at 107-F was diverted to the crib before any apparent damage was done, and the leakage at 107-B was not great enough to be of immediate concern. Repairs to the No. 19 junction box in the new effluent line at B Area were completed, and repairs to the No. 1 junction box tie-in to the 105-C west line are well under way.
- 2) Temperature Monitors: The Brown temperature monitor at 105-C failed in service during the month causing readings up to 300° low, and this necessitated holding the reactor down for several hours until the difficulty could be cleared up. A satisfactory type of thermocouple insulation has been determined for use at B, D, F Reactors (C type polyethylene over nylon) and material is being ordered to permit installation at B Area during the CG-558 outage this Spring. Ordering for D and F will be withheld as long as possible in case a better insulation should be developed. Short and long range testing along these lines is under way.
- 3) Beckmans: Revisions to the Beckman flux monitors at KE and KW have been completed, greatly increasing the reliability of these instruments. Circuitry revisions have also been completed which make it necessary for two Beckmans at either reactor to either fail or indicate high trip in order to scram the other reactor via the Beckman intertie. This revision coupled with a more stable instrument power source, (BPA power with ample regulation has proven highly satisfactory) should eliminate many unnecessary outages at these reactors.
- 4) VSR Latches: The VSR system continues to be a source of unscheduled outage time at the K Reactors, but indications of improvement are in view. At a meeting early in the month, Design has accepted responsibility for producing a satisfactory re-design, and the project is paying for immediate temporary repairs. Work is under way on improvement of the latching mechanism, on the electrical tie-ins between rods and Ball XI system, and a distribution and control of the rod raising air supply system. It is anticipated that these temporary repairs will be well along within a couple of months. The overall re-design and replacement will more likely take a year for completion.

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C. NEW PLANTS AND FACILITIES

Work continued during the month in all old areas on CG-558 and CG-600 projects. A serious power condition has been noted at B-C Areas whenever one of the 4500 HP synchronous motors is started up at the 190-B Building. Voltage drops up to 12% have been experienced, and failure to correct this condition will probably result in failure of either one or both areas to recover from scrams in scram recovery time if both areas should be scrambled by a BPA power failure. No serious difficulty has resulted to date however from the start-up and testing of single motors.

A proposal from Minor Construction for cutting up to two weeks from the CG-558 outage schedule for old reactors by providing an auxiliary 10" riser to supply water to the reactor during removal of the old risers and installation of the new ones, has been studied. While there are serious potential hazards involved in this suggestion, it can be done safely. A letter covering Operations requirement for using this technique has been forwarded to Projects and Personnel Development personnel for their use in deciding whether or not Operations requirements for the safe conduct of this proposal can be met.

A meeting was held early in the month to review the status of CG-558 panellet gauge installation. Performance of gauges installed at H, DR, and D Reactors was reviewed. It was decided to withhold installation of any more gauges until certain tests and improvements had been made by the vendor, and project representatives have been informed of the action required to reactivate this portion of the program.

D. PERSONNEL, ORGANIZATION AND ADMINISTRATION

- 1) Appraisals: All sub-section appraisals have been completed, reviewed, and are being held for the go ahead signal for individual discussion. A slight improvement in overall appraisal level was noted, but this is indicative mostly of concerted efforts to either improve or remove those people with M appraisals last year.
- 2) Training Programs: The second set of process question has been answered by the operators, with about a 6% increase in number of satisfactory answers over that experienced in the first set of questions. It is the general opinion that initiation of these tests has increased the amount of study and self-improvement efforts on the part of the operators more than anything else that has happened in recent years. A third set of questions of the series of eight sets will be issued shortly. Test questions have also been issued to supervisors and chief operators and about 80% of these people have completed the tests at this time. Evaluation of results will be made next month.

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D. PERSONNEL, ORGANIZATION, AND ADMINISTRATION

- 3) Organization: S. L. Nelson has been placed on special assignment to work up details of a proposed "area manager" type organization to effectively increase the present organizational efficiency and to provide study data for other purposes. A new supervisory position description has been approved to permit acquisition of eight more supervisors to provide necessary back-up and assistance for Supervisor I during emergencies and to provide training opportunities for Supervisors I during emergencies and to provide training opportunities for Supervisors II to learn the next step up the line. It is expected that eventually this position will provide sufficient flexibility for training supervision at all levels.
- 4) Safety: Considerable emphasis has been placed on safety during the month on both a sub-section and individual unit basis. All units have reported special programs and efforts towards improvement of safety performance. An entire staff meeting, besides the regular monthly safety meeting, was devoted to discussion probing into the reasons for recent poor safety performance throughout the plant. Some rather basic reasons were uncovered, and will be documented separately in a letter to RS Bell this week.

E. LONG TERM ANALYSIS AND PLANNING

Despite the many pages that have been written on the subject, improvement of sub-section organizational structure and proper staffing is still the most fundamental problem to be solved. Only by a thorough understanding of the organizational problems involved and an effective resolution of them can we return to a basis of operation in a planned, efficient and business-like manner. The ever-increasing responsibilities of supervision with problems like tube replacement and rupture removal coming to the fore, higher and higher power levels being achieved, and increased need for control of property accountability, personnel exposure, overtime, etc. points up the need for a type of organization capable of meeting these challenges. In effect, we have made tremendous increases in production during the past ten years, but at the cost of an ever-increasing burden on the supervisor. This burden has reached the point that the job at times becomes quite frustrating, with no promise of relief in view. It is hoped that reorganization of the section along "area manager" lines for the present, with more fundamental and far reaching reorganization along similar lines in the future, may be the answer to solving our present difficulties.

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January 23, 1956

E. LONG TERM ANALYSIS AND PLANNING (Continued)

To this end, one unit superintendent is spending full time for a few weeks, working out details, discussing problems with other unit superintendents, and overall, endeavoring to come up with a well knit, effective, self-contained organization structure which will provide the streamlining we need to cope with today's problems, and to provide the framework for handling those still on the horizon. The results of this work should be available by month end and should provide sufficient basis for making a decision on changing to the proposed organization structure.

Operations Sub-Section
REACTOR SECTION

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December 23, 1955

R. S. Bell
Manager
REACTOR SECTION

MANAGEMENT REPORT - OPERATIONS SUB-SECTION
DECEMBER, 1955

A. PRODUCTION

1. Statistics:

Forwarded under separate cover to E. C. Smith by D. L. DeNeal.

2. Comments On Statistics:

New high power levels of 2010 MW and 2019 MW were achieved at KE and KW, respectively. This was achieved primarily as a result of improved flattening. Although we had set a goal of 75 per cent T.O.E. for December, it appears at this writing that the over-all efficiency for December will be slightly over 90 per cent. This is due primarily to a 23 day outage at D Area for tube replacement and project work coupled with outages caused by 29 ruptures at C, DR, F, and H Reactors. Forecasted input production goal for December will probably not be met as a result of power level limitations imposed on the K Reactors by the crocstie back-up water limitation and the low time operated efficiency quoted above.

B. PLANT OPERATION AND MAINTENANCE EXPERIENCE

1. Operating Experience:

a. Time Operated Efficiency: Time operated efficiency continued at a low ebb during the month due to slug ruptures, tube removal and project work as chief sources of lost time, with minor contributions due to leaking process water header at B, and electrical and Beckman troubles at the K's. These items will be discussed below.

b. Rupture Experience: The over-all rupture experience during December was worse than any previous month on record. At the time of writing this report, 29 ruptures have been experienced with a good probability of six or seven more by month end. The rupture picture has changed considerably

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1. Operating Experience:

b. Rupture Experience: (Continued)

from former months in regard to concentration of ruptures incurred. The formerly worrisome low (below 250) ruptures have come back to normal with only three at 105-C and one at 105-H. Considering the fact that higher tube powers and higher power levels have resulted this month from the cooler inlet water, this experience is encouraging. However, a new problem, first introduced last month, has raised its ugly head and is apparently going to be a source of considerable trouble. This refers to the occurrence of 25 ruptures at DR, F, and H Reactors in the concentration range of 400 to 600 MMD/Ton. This was anticipated to some extent at D and F Reactors, but the high rate at H (11 to date) and at DR (8) is difficult to explain. Most of these failures appear to be side blowouts, typical of corrosion failure from overheating resulting from decrease in the annular space below the slugs, between the ribs. The fact that the DR tubes are supposed to be in good condition with normal rib wear makes it necessary to seek some other reason for this low or rather intermediate exposure failure at that reactor. Some relief can be anticipated at D, F, and H Reactors as highly corroded tubes containing lowered ribs are replaced. Some evidence of this improvement has already been noted at 105-F. The only clue at DR Reactor is the occurrence of some of these ruptures in tubes near PCC tubes. While it is too early to say for sure, operation of this equipment may have a bearing on rupture rate. Another possibility is the increased efficiency of the gamma monitor rupture detection system may be picking up ruptures that previously went undetected, and which although leaking slightly, were discharged at goal concentration before a rupture detectable on the old Beta Monitor resulted. The increase in ruptures at both DR and H following this installation, coupled with difficulty in even locating the rupture tube by a normal pigtail survey, lends some credence to this idea. Further, confirmation will be forthcoming by comparing pre and post gamma monitor rupture experience at D and H Reactors as soon as this installation is completed at these reactors.

- c. Tube Removal: Due to conflict of personnel required for project work and tube removal, both of which had to be completed at 105-B during the month, tube removal efforts were almost limited to 105-B, with a removal of 10 tubes at 105-H scheduled at month end. While there was improvement in some phases of the tube

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1. Operating Experience:

c. Tube Removal: (Continued)

removal job at D during the month, the over-all performance still falls far below that required to meet requirement of the forecasted tube corrosion during the coming year. The over-all replacement rate during this outage, including removal of a stack splitter, and replacement of eight previously abandoned problem tubes, was only eight per day (24 hours). This falls considerably short of the 12 per day minimum required to catch up and get in a current basis in one year at B, D, F, and H Reactors. Some interesting figures on tube removal scheduling are tabulated below. They are for the most recent forecast based on a 30 mil wall remaining at time of replacement.

	<u>B</u>	<u>C</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>	<u>All</u>
Due out now to catch up	98	0	305	2	353	222	980
Next three months	170	0	371	5	416	389	1351
Average*	60		125	2	140	130	450
Next six months	284	0	424	32	453	548	1741
Average	50		70	5	75	91	300
Next 12 months	528	0	500	155	526	790	2499
Average	44		42	16	44	66	210

* Indicates average number of tubes per month to remove to be caught up in the period indicated.

One encouraging development at the recent 105-D outage was a considerable reduction in exposure rate on handling tube removal tools as the result of a 20 tube test with a pre-removal purge using 20,000 ppm of Super-Gal, purging three tubes at a time. While this method was effective, as noted below, it adds approximately six minutes per tube to the removal time.

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1. Operating Experience:

c. Tube Removal:(Continued)

Purged Tubes

Maximum dose rate-cable 6 mrad per hour
Maximum dose rate-tube splitter 35 mrad per hour

Unpurged Tubes

Maximum dose rate-cable up to 150 mrad per hour
Maximum dose rate-tube splitter up to 3500 mrad per hour

d. Graphite Temperature Cycling - K Reactors: A major source of operating trouble resulting in decreased operating levels and forced shutdowns due to control difficulties at the K Reactors has been heat cycling in the graphite. This problem is under active study by the Process Physics group. The difficulty is apparently the result of graphite coring and the need for front to rear flattening. While front to rear flattening can be obtained by placement of poison pieces strategically in a certain percentage of the tube charges, a by-product of this flattening will be a peaking of slug powers in the most central portion of the tube with a resultant increase in rupture potential. Only experience will show whether or not this increased rupture potential is serious. It is quite obvious that ruptures must be avoided at the K Reactors even if power levels must be limited by limiting tube power, in order to maintain a high TOE and the resultant high input production even when these reactors operate at present moderate tube powers.

e. Miscellaneous Operating Problems:

- 1) The Beckman inter-tie at dual reactors continues to be a source of trouble and lost time, particularly at the K Reactors where new types of flux monitoring instrumentation and "still being explored" operating characteristics of control rods, result in a fairly high number of screws due to the flux monitors. A letter has been written to Technical by Process Sub-Section to inform them that we intend to remove this inter-tie from service unless it is included in Process Specifications. The current feeling is that the original justification for this inter-tie has now been shown to be unnecessary in light of accumulated operating experience. Elimination of this feature at the K Reactors

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DECLASSIFIED1. Operating Experience:a. Miscellaneous Operating Problems:

- 1) Continued
would result in a five to seven per cent increase in their TOE with a somewhat smaller improvement in the older dual areas because of the more stable and better understood flux monitoring instrumentation in the older areas.
- 2) Inspection, testing and maintenance work has been continued on Ball JK system balls and equipment components at all reactors as required during the month. As a result of ball replacement and other improvements at 105-C, it is felt safe to say at this time that all ball hoppers are operable. Follow-up inspection of the wet hoppers at 105-F to which reactor inlet gas has been introduced indicates that this approach is going to be successful as a means of drying out and keeping dry the wet hoppers at the rear of these reactors sustaining a high incidence of water leaks. In general, it is felt that this problem is under control, even though considerable maintenance is scheduled to obtain the desired state of perfection.

C. NEW PLANT AND FACILITIES

1. While work is progressing at various rates on the many projects currently under way in the reactor buildings, there is not too much to discuss from an operating viewpoint. Project work does have a considerable adverse effect on operating efficiency, and where convenient is rescheduled or put off unless some real gains in efficiency or production are to be realized rather immediately as a result of completion of the project work. One such item is the gamma monitor, Project CG-578, which has so greatly improved rupture detection at DR and H Reactors. The experience of impulse line freeze up mentioned last month in connection with CG-558 excavation has not been re-experienced. In general, this topic will be discussed much more thoroughly by Projects and Personnel Development Sub-Section.

D. PERSONNEL, ORGANIZATION AND ADMINISTRATION1. Safety

Safety performance in the sub-section has shown considerable improvement this month, with no Major or Sub-Major Injuries. However, four Near-Serious Injuries have been experienced, all of which are

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1. Safety (Continued)

attributable to maintenance of equipment or forces beyond ~~our~~ *operations* control.

- a. A portion of a limit switch stop fell off the transfer area crane cable at 105-C.
- b. A Maintenance employee removed a valve pin from a ~~water~~ check valve at 105-B with this riser under pressure.
- c. Maintenance tube removal personnel pulled the roof off the blue tool room at 105-D while using it as an anchor during tube removal.
- d. A portion of the concrete slab roof blew off the roof of 105-D, leaving an opening over the V&R benches, and dropping the slabs through the roofs of D Machinery Room and the Storage Area, and just outside the door of the monitoring room.

No one was injured in any of the above incidents.

2. Pile Operators' Testing Program:

The program testing the process knowledge of Pile Operators was continued during the month, despite some initial difficulties encountered from the Union. The first series of tests have been graded and returned to the various reactors. The passing grade was considered by the writer and a committee appointed for this purpose, to be 60 per cent on the first series of tests. ~~Seventy~~ *Seventy* per cent of the operators received this grade, or higher. We are currently studying what is required in the line of training to improve the ~~70~~ *70* per cent of the operators who fell below the passing mark. The second series of tests is currently being taken by the operators and should be completed by month end. There will be eight different examinations in all, covering all phases of reactor operation and equipment.

A similar set of tests has been devised by the Process Sub-Section to examine the members of supervision. These were recently delivered to the writer, and an attempt will be made to start this series also, prior to month end.

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3. Planning and Activities:

Planning and activities of plans for the improvement of the operating organization are continuing. Re-evaluation of the relief supervisor job from a level 6 to a level 8 has been completed and approved. This should greatly improve all phases of operation at the various reactors during the coming months. A new job description has been written and is being evaluated for a new job, Operations Analyst II. This job will be filled by men of current Operations Supervisor II experience (level 6), and will provide extra supervision for coverage of emergency situations, training, relief, and flexibility to permit movement of supervisory personnel in and out of the sub-section in line with Company manpower development goals. It is anticipated that this program will be approved and at least partially in effect by the end of next month. Additional weekly roll personnel have been acquired as permitted by recent manpower budget approvals to provide the work force necessary to cope with the various causes of inefficiency such as tube removal, increased amount of charge-discharge, etc. The over-all attempt in this respect is to reduce overtime to an economical level.

The biggest remaining problem is reorganization of the work load of the Sub-Section Superintendent. While the writer feels that the ultimate goal in this regard is the setting up of an area manager type of organization for each geographical area, it is currently a back breaking job to run efficiently an organization of this size with the existing organization structure. The writer is confident that the job could be handled with a high degree of efficiency by the inclusion of two additional staff experts of a high caliber, one an administrative analyst and another a maintenance and project work analyst, with the possible addition of a third, an operations or technical specialist. These three jobs may be regarded by some as "assistant jobs" and in a way they are. But, nevertheless, the problems constantly arising in the administration, planning, organizing, measuring, and maintaining and improving of eight reactors and roughly 400 people require the assistance of some experts to co-ordinate at sub-section level, the efforts of the supervision of the eight reactors, much as the present Manufacturing Staff of Administration, Process, Production and Projects Managers perform for the Manager of Manufacturing. The writer is not exactly a slow worker, and is quite experienced in problems and techniques of operating supervision, yet it is requiring from 16 to 24 hours per week of overtime to just keep the job from "bogging down," let alone setting aside time

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3. (Continued)

for planning, organizing, integrating and measuring. The main worry along these lines is not the time involved, but the fact that sooner or later some important detail may be overlooked. Movement in either one of the other of the directions noted should begin immediately. The easiest to achieve, of course, would be setting up the staff experts, but in the long run, if qualified people are available to fill the jobs, and the minor organizational problems can be ironed out, the area manager plan should be the ultimate goal.

E. LONG-TERM ANALYSIS AND PLANNING

The foregoing discussion on organization planning is the most urgent current problem facing the Operations Sub-Section. It is realized that problems concerning rupture rates, tube replacement, obsolescence and inadequacy of certain reactor components are big and serious problems, but most of these are under consideration from a process or technical standpoint already, and any additional benefits to be achieved by an operational analysis of a basic nature will require more time and effort than the writer currently has at his disposal. It is quite possible that expenditure of time along these lines could produce some really worthwhile results.

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A. R. Maguire
Superintendent
OPERATIONS SUB-SECTION

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November 22, 1955

R. S. Bell
Manager
REACTOR SECTION

OPERATIONS SUB-SECTION MANAGEMENT REPORT

A. Review of Previous Month's Activities

1. a) Statistics:

Submitted to H. C. Smith under separate cover.

b) Comments:

Several new production records were achieved during the period. New high levels have been achieved at DR - 1105 MW, H - 1205 MW, KE - 1800 MW, and KW - 1900 MW. These level improvements are the results of many factors. Lower inlet water temperature helped in all reactors. In addition, use of PCC equipment for flattening at DR and change in tube power limitations at KE and KW have been major factors. It is anticipated that by month end these high levels will result in new input production levels at some reactors. In general, ruptures, water leaks, and tube replacement continue to be a cause of low operating efficiency sub-section-wise, with additional effects being felt from Ball 3X difficulties at 105-C and the high pressure loop rupture at 105-H.

2. Significant Experience, Plant Equipment, Process Safety, Etc.

a) Major

1. Ball 3X Experience

Routine test drops of Ball 3X balls at 105-C Reactor have brought to light some undesirable conditions and have resulted in considerable lost time in correction of these conditions. Many components of the ball recovery system at 105-C have been found inadequate to perform their designed functions, resulting in excessive lost time during recovery, and in actually endangering the effectiveness of the system as a reactivity control device. Inadequacy of cleaning components of the system have permitted the return of dirty balls (graphite and rust covered) to the top of the unit resulting

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1. Ball 3X Experience (Continued)

in plugging up of the recovery system, and in several cases of failure to drop when the hoppers were tested. Of 27 scheduled test drops, 14 hoppers did not drop, and two were discovered to be empty. After freeing the 14 stuck hoppers and dropping a second time, all dropped as expected. Sufficient tests were run to indicate on a calculated basis, pending ability to drop and recover all hoppers in a reasonable time, that process specifications for operable hoppers were met. Work is currently underway to refill hoppers with new, clean 70% Boron - 30% steel mixture of balls, separating the dirty balls for subsequent recovery and cleaning for use as spare charges for the other reactors. In addition, a sizeable maintenance program is underway and is being followed very rigorously to assure early completion of all inadequate and defective items.

Besides the work at 105-C, action has progressed favorably at all reactors on recommendations to prevent inadvertent ball drops. Recommendations concerning locking of Ball 3X power controls and procedural recommendations are in effect at all reactors. Work on design of a safe, rod-operating replacement for the locking bars is in the discussion stage and appears feasible. Additional emphasis has uncovered another hazard in release latch-operating springs and these are being inspected on a routine basis. Job descriptions to make additional supervisory help available during hot and cold start-ups and other stress periods, are in preparation. Technical is working on development of improved methods of ball recovery at the older reactors.

2. Rupture Experience

The anticipated degree of improvement in decrease of high goal concentration ruptures following the decrease in variable goal exposure from 900 to 800 MWD is being realized. To date this month, only one high concentration rupture has been experienced and this was prior to goal reduction at F Reactor. However, the occurrence of low concentration ruptures is again becoming undeniably prominent. Ten such ruptures have occurred so far this month with four at 105-C, four at 105-H and two at 105-D. It is felt that to some extent at least, the same rib lowering that causes tube failures in the older reactors may be contributing to

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2. Rupture Experience (Continued)

increased slug failures at H and C Reactors. Since this is primarily a corrosion phenomenon, some immediate relief could be achieved by a decrease in outlet temperatures. A lowering in this manner at 105-C last May was followed by a subsequent reduction in rupture rate, and while it was thought that this was more likely due to an improvement in slug quality, the re-occurrence of low exposure ruptures at three reactors, two of which may well be plagued with excessive rib wear or corrosion, makes the desirability of an effluent temperature decrease, at least for a test period, more palatable.

3. Tube Replacement

There is nothing such that is new to report on this item. Considerable improvement, as previously noted, has been experienced in leak detection rates and manpower requirements. Actual tube removal work, however, has not kept pace with the progress that was expected, with a 15 per day rate still to be achieved, let alone 20. This subject has received considerable emphasis at all levels, and while no outstanding cooperative efforts have yet been noticed, it is thought that a better understanding of the problem at Department and Section levels, outside of Manufacturing, now exists. It has been demonstrated that internal corrosion calculation alone are not adequate to determine and eliminate potential leakers, since the existence of severe external corrosion, and accelerated internal corrosion between tube ribs, has thrown some serious unknowns into the predicting business. These factors have indicated that localized block tube removal planning may be in order, based on past experience.

b) Short Range Items

1. Radiation Incident

During removal of a stuck rupture from a zirconium tube (0961-H) in the technical high temperature-high pressure loop facility at 105-H, the ruptured slug ignited and caused considerable difficulty. While this incident has been reported informally, but at some length, by Operations and Radiation Monitoring, it is expected that Pile Technology will issue the formal report. For quick review however, the following items are cited as being significant in connection with this occurrence: 1) The burning of the uranium in the tube, 2) The stack emission which contaminated the fan cells

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FOODS

Operations Sub-Section
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November 22, 1955

1. Radiation Incident (Continued)

and surrounding area, 3) The extremely high levels of contamination spread over rear face surfaces, 4) The great difficulty still being experienced in removal of this contamination, 5) The extensive contamination of storage and retention basins, 6) The large amount of decontamination work remaining to be accomplished, and 7) The inconvenience to and hampering of general operations in the 100-H Area for several days following the incident. It is worthy of note that standard rupture removal procedures were followed throughout, and while this is far from the first known case of a slug burning, it is the first one that has resulted in this much contamination.

2. K Areas

Several problems of either a minor or a short range nature exist at these reactors which may be considered to be of a "growing pains" nature. The individual problems have a serious effect on production levels and operating efficiency, but they are not insolvable. Experience in improvement of poison patterns should improve flattening and reactor control. Start-up techniques and front to rear flattening will be required to improve existing graphite temperature cycles. Problems resulting from inadequate design still exist on the temperature monitor, panel lights, flux monitors, and the back-up water system. All of these are under investigation and are in some phase of solution. A recent report by Radiological Engineering and questions raised by Operations and Radiation Monitoring indicated a serious doubt of adequacy of repairs to the K Area effluent systems, and additional repairs or complete replacement seems to be in order.

3. Rear Face Thermocouples

This item is becoming increasingly important, with recent studies by Manufacturing Engineering pointing out that major thermocouple replacement will probably be due in a year. Further action is being requested on this item to make certain that we don't get caught short. should failure rate increase and make replacement essential sooner than currently planned.

3. Progress on New Plants and Facilities

- a. Staffing - nothing new.
- b. Getting ready for operation - nothing new.

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c. Other

1. Project Work

CG-550 project work continues at B, D, and ER Reactors on Phase I, and at F and H Reactors on Phase II. Much of this work, namely gamma monitor, panellits, and poison column control, has been delayed at some or all of the reactors to reduce interference with tube removal work. A new problem in connection with this project resulted from freezing of uncovered impulse lines to the front face risers due to excavation for new 190 Building annexes. This caused a screen and minimum outage at D Reactor, and nearly caused a ball drop due to the low pressure resulting in the front face piping. Attempts were made to repair leaks in Number 19 Junction box on the 105-B effluent line with only partial success. More work remains to be done to correct this condition and will probably involve costs up to \$25,000. Work on Project CG-593, Rear Face Television, was about 75% completed at 105-B. Completion and testing of this installation must be done before work is started at other reactors. Project C-512R Part V is now being initiated by Projects and Personnel Development personnel to accomplish: a) Replacement of vertical rod latch assemblies (an operating efficiency item) b) Additional charging magazine procurement. c) Satisfactory temperature monitor resistance bulb and connector. and d) Adequate shielding for 10 VSR spare holes.

4. Accomplishments

- a. The writer participated in several discussions with union and Union Relations personnel on problems connected with the operator testing program. To date, results of these discussions have been satisfactory.
- b. Test questions for operators have been issued and, currently, testing of operators on the first set of questions is underway. Following evaluation of results on this first test, questions will be issued to cover the seven remaining subjects concerned with reactor operation.

5. Action by Others Affecting Manufacturing or HAPD

- a. Other HAPD Departments. The decision by Radiological Engineering on adequacy of the K Area effluent lines and outfall lines may help to speed Engineering into making needed repairs.
- b. A.E.C. The shipping errors occurred during October which were discovered this month. These were called to our attention by the A.E.C., and, of course, gave us some undesirable publicity. The two errors have been reported separately, and necessary corrective action has been taken.

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B. Analysis of Trends

1. Production

Despite operation at overall reduced efficiency due to tube removal, the overall production trend is upward and will probably continue upward for the next several months. Contributing factors are seasonal decrease in inlet water temperatures, expansion of tube power limits at the K Reactors following front pigtail replacement, and benefits derived at the older reactors from some phases of the CG-558 program. Continued efforts toward improvement of tube removal techniques should ultimately result in increased operating efficiency with a further production gain.

2. Radiation Exposure

The establishment of the 3R annual exposure limit coincident with high exposure rates due to process tube replacement work, Ball 3X troubles, and high rupture frequency, imposes rather serious manpower and control problems on this sub-section. Currently, 20 Operations non-exempt employees have passed the 1800 mr exposure point, seven of whom are above 2500 mr and one is actually over the 3R limit, having accumulated 3010 mr as of November 18, 1955. The people concerned are primarily chief operators on the supplemental crews and at reactors involved in extensive tube removal. A policy has been started of rotating all chief operators through the high exposure jobs to minimize the effect this year and to prevent recurrence of this condition in the future.

3. Overtime

The overtime requirement for Operations personnel has been steadily increasing for the past several months. A rather sharp increase was noted with the beginning of the tube removal problem, but the production increases following the K Reactor start-ups, and the continuing upward trend as discussed above, has resulted in a fairly substantial (approximately 1200 hours per month) portion of the excessive overtime. Requisitions for procurement of 27 operators released by Separations, together with added flexibility permitted by the new ratio agreement with the union, and minor changes in internal organizational structure planned for the coming months, should result in a gradual decrease from 5000 hours per month for October, 1955 to approximately 2000 - 2500 hours per month by April of next year.

C. Analysis of Major Problems or Programs

The major problem of greatest significance facing us today is improvement of operating efficiency and its effect on the mode of reactor operation. This problem is being studied very thoroughly by the joint efforts of Manufacturing

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C. Analysis of Major Problems or Programs (Continued)

and Engineering Department. A "task force" composed of members from Technical Design, Process, and Operations has been appointed to dig out and define the problems involved, and to initiate necessary corrective action. The several meetings held so far on this subject have at least resulted in a clearer definition of the problem and of an increase in understanding of the problems involved at higher levels of management.

One of the fundamental problems concerns the effect of operating efficiency vs. production achieved. Data, graphs, and charts have been drawn up by both Technical and Process personnel to substantiate the stand that greater production can generally be obtained at the expense of operating efficiency. Of fundamental importance in this problem is the decision of whether or not it is better to shut down one reactor to undergo complete tube replacement rather than to continue replacement on a planned, on-the-run basis. A study of this problem is well underway, and results should be available and published by month end. Based on incomplete evaluation of results from the study, the greatest benefits economically and production wise, currently appear to favor continuation of the existing partial replacement method of tube replacement scheduling.

D. Planning to Meet Manufacturing Objectives

The main items of concern in this field have already been discussed in this report on control of overtime, radiation exposure, and operating efficiency. However, additional extensive efforts are being made to improve reactor safety by testing the process knowledge of both operators and supervisors by a series of comprehensive tests on reactor operation. These tests are currently in progress for operators, and are expected to start in the next few weeks for supervisors. Besides these tests, review and revision of all job hazard breakdowns is nearing completion, and new ones are being issued where needed. A study of effects and hazards of chemicals used either regularly or non-routinely in reactor operations is also underway.

E. Discussion of NAPO Objectives

A two-fold program is underway with regard to NAPO Objectives. First, all Operations Sub-Section supervisory personnel are being familiarized with the already published objectives of Mr. Johnson and Mr. MacGready, with emphasis upon making their inclusion as a part of our daily operating philosophy a fundamental part of the job. There is evidence to indicate that this is being done. The

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E. Discussion of NAPO Objectives (Continued)

case of action taken with regard to one of our suppliers of parts to recognize and reward his voluntary achievements in reduction of essential material costs, is an example. Secondly, emphasis is being placed on the necessity for all units in Operations to be setting up their own objectives with realistic goals and dates of achievement. It is expected that most of these will be applicable to individual reactor areas, but some of them will probably be of sufficient value to be forwarded upward for eventual inclusion in future NAPO objectives.

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 Manager
 REACTOR SECTION

OPERATIONS SUB-SECTION MANAGEMENT REPORT

A Review of Previous Month's Activities

1. a) Statistics:

Submitted to H. C. Smith under separate cover.

b) Comments:

New high levels of 1875 and 1650 were achieved at KE and KW Reactors respectively following the replacement of front face pigtaills, and 1030 MWD at DR following installation of new panellits and poison column control facility. Operating efficiency was considerably below normal because of water leaks, ruptures, tube replacement and an inadvertent Ball 3X drop at 105-H.

2. Significant Experience. Plant Equipment, Process Safety, Etc.

a) Major

1. Water Leaks and Tube Replacement

Process tube water leaks and resultant tube replacement, as well as the planned tube replacement program, continues to be a major source of cost and outage time. Leaks were experienced and repaired at D and H Reactors and a 100 tube replacement program was undertaken at F Reactor. Improvements in maintenance techniques, tools training, and organization have increased the replacement rate from an initial 8 tubes per day to 15 tubes per day during the recent F outage. Tube splitting, removal and replacement are now on a production basis. Considerable gains in time saving on this operation can still be made in nozzle removal and replacement, and in Van Stening new tubes. Work is actively under way on nozzle removal and replacement methods, and a new tool for Van Stening has been developed and should be available for the next large scale replacement program.

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1. Water Leaks and Tube Replacement (Continued)

A new method of leak detection is under development through joint efforts of Operations and Technical as the result of a suggestion by P. A. Cooke of Pile Technology. The method consists of application of vacuum to one crossheader at a time via the relief riser, with discharge of the vacuum pump exhaust gases to a helium leak detector. Sufficient vacuum is exerted to pull helium from the pile atmosphere into the leaking tube and thence to the crossheader, relief riser and leak detector. The method has been used successfully at D and H Reactors to isolate process tube leaks to individual crossheaders. The leaking tubes were then isolated and confirmed by conventional stinger type leak detecting equipment. Advantages of this method of detection are rapidity (8 to 10 hours for a full pile check vs. 36-48 hours for conventional methods), and savings in manpower. The entire job can be done by pile operators instead of Maintenance personnel, and since the only rear face work involved is valving headers to the drain, a minimum of exposure is involved. It was this factor which permitted successful leak test programs at D and H Reactors while Maintenance manpower was unavailable due to necessary and scheduled work at other reactors.

2. Ruptures

Slug ruptures also continue to be a major time consumer. Thirteen ruptures were experienced so far this month, with five of these being low concentration ruptures, four at C Reactor and one at D. The five low concentration ruptures represent a considerable decrease from the experienced during May and it is possible that the last of the questionable metal charged last Spring is now discharged from C Reactor. Some of this metal probably still remains in the older reactors due to the longer ripening period in these reactors. While some of these ruptures were discharged successfully with quickies, and others with minimum outages, at least one was much more serious. During removal of a stuck cored slug rupture at 105-D, forces of 10,000 psi were required to break the charge loose. For some reason, at present unknown, the gunbarrel pulled loose from the reactor, the nozzle broke loose from the gunbarrel, and the process tube broke in the reactor. As a result, several pieces of irradiated metal fell and lodged in the pigtails behind the sheet metal shield, making entrance to the rear face untenable. The nozzle, gunbarrel and piece of process tubing were finally pushed out of the


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2. Ruptures (Continued)

reactor into the pick-up chutes and, at the time of this writing, preparations are under way to remove material from the D elevator by using ropes from the D Machinery Room to permit use of the cab on the elevator. Readings of 150 r/hour on the 20 foot Beckman indicate that work by any means other than the cab is unlikely. The conclusion of this incident will be reported later.

3. Ball 3X Drop at H Reactor

During a recent start-up at H Reactor, following a leak test and repair outage, inadequate communications between the chief operator in the control room and the Supervisor 100 Operations I, on top of the unit resulted in action which permitted 29 channels of balls to drop into the reactor. No rules were broken but the circumstances which resulted in the drop involved inadequate thinking and poor judgement. As a result days of unnecessary exposure to radiation were involved. The supervisor was on top of the unit with a crew of men and another exempt employee to give instruction in the proper method of removing lock bars from the Ball 3X hoppers to make ready for the start-up. It was observed that no power was applied to the hoppers through the Ball 3X system, and the other exempt employee called the control room via the intercom system to request that power be applied to the system. This message was relayed to the chief operator by the pile operator who received the message on the intercom. The chief operator contacted Electrical Maintenance and requested that power be restored. This was done, but when power was restored, a light failed to come on indicating no power to one set of coil windings. The chief operator asked Electrical to determine the trouble and power was shut off again to do so. While this was going on in the control room the crew on top of the unit heard the click in the solenoids when power was restored, and, assuming that the system was normal, proceeded to remove lock bars without further contact with the control room. Twenty-nine lock bars had been removed when the power was cut off, permitting this number of hoppers to drop their balls into the VSR channels. During the ball removal considerable trouble was experienced with radiation from contaminated balls and from failure of equipment. Preventive steps include locking of Ball 3X power switches with provision that this switching be done only in the presence of the supervisor in charge of the building at the time, and provision that the supervisor in charge, or another supervisor specifically delegated by him, be in the control room at all times during completion of the start-up check list, to make certain that all items on the list are performed satisfactorily.

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b) Short Range or Minor Items

1. K Areas - Effluent System

The K Areas effluent lines were inspected by a diver during the month. No significant changes were noted since the repairs made last Spring. The effluent basins have also been restored to three basin cyclic operation without adverse effect on the river portion of the effluent lines so far.

2. Central Viewers - 105-DR

A section of herculite glass in the central viewer at 105-DR failed due to stresses in the glass during the month during operation. No overexposures resulted, and repairs were made during the pannelit outage. The protective screen was installed and this installation should also be completed soon at C and H Reactors.

3. B Area Effluent Line

A leak has appeared in an expansion joint in the newly installed CG-558 effluent line at 105-B which may eventually result in shut down of the reactor for repair of the line, if it becomes any worse prior to the next scheduled outage on November 7.

3. Progress on New Plants and Facilities

- a. Staffing - nothing to report.
- b. Getting ready for operation - nothing to report.
- c. Other - Project Work.

1. Project Work

Project CG-558 work, phase II, was initiated at F and H Reactors during the month. Installation of the new effluent line has begun at F and S and Z electrical outages required by the project resulted in 5 days of outage which were used for tube removal. Work on new 190 Building has begun at H Area. At 105-DR, the pannelit portion of CG-558 was completed, and the new gamma monitor (CG-578) and the poison column control facility portion of CG-558 were installed at the same time. No undue difficulty has been experienced with the

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2 Project Work (Continued)

new panellets, although many of the fringe zone gauges have had capillaries filled with oil to suppress excessive fluctuation. Use of the new PCC facility has resulted in some production gains.

The use of Unusual Maintenance forces to perform much of the project work has resulted in competition with the tube removal program for Maintenance manpower. As a result, some project work in future outages has been re-scheduled to permit the tube removal work to proceed at the maximum possible rate considering prior project commitments.

Work on completion of exceptions to Project CA-512 work during the month resulted in replacement of front face connectors at 105-KE Reactor, along with partial replacement of unsatisfactory thermocouples and installation of the fifth Beckman channel and new amplifier controllers for all channels. This work has resulted in new high operating levels at KE since completion of the outage.

4. Accomplishments

- a. The writer completed review of the non-exempt ratings and "Let's Talk It Over" interview results, and conducted a rating discussion and interview with one non-exempt employee. Several discussions were held with Union and Union Relations personnel on points in conjunction with the proposed pile operator - utility operator ratio plan.
- b. Several meetings were held in which members of Employee Relations discussed the new contract and other phases of union relations with supervisors and chief operators at the Friday Supervisors Meetings. All units completed annual non-exempt ratings and "Let's Talk It Over" interviews. Several proposals for improved sub-section organizational structure were considered by the writer and unit superintendents, but action will probably be withheld until after ratification of the new union contract.

5. Action by Others Affecting Manufacturing or MAPO

- a. Other MAPO Departments - Nothing.

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b. AEC

Word was received to decrease the scheduled low g/t production commitment considerably, resulting in switching H Reactor from low to high goal concentration production entirely, and in increasing the high concentration production at KW Reactor. This may eventually result in increased ruptures at these reactors, but conversely, efforts are being made to divert some of the uranium thus saved to all reactors. This will permit lowering of the high goal concentration from 900 to 800 MWD, and this should result in a decrease in the high concentration material rupture rate to 75-85% of the present rate.

B. Analysis of Trends

1. Operating Efficiency

Operating efficiency has continued on a downward trend during the past several months. Chief contributing factors have been amount of project work, water leaks and tube replacement, and rupture rate. While the amount of project work will remain relatively constant through January of 1956, and will increase later on in 1956, it is expected that recent improvements in tube removal and leak detection techniques will result in considerable improvement from that standpoint. It is also expected that rupture rate will decrease if present efforts to lower goal concentration of high concentration material are realized. Also, the effect of iron impurities resulting from a canning process change last Spring, should be past in the near future, and some improvement in low concentration rupture rate should result. It is predicted that overall operating efficiency will improve several percent in the next few months and will probably approach 75-80% shortly after the first of next year.

C. Analysis of Major Problems or Programs

Nothing new to report. Tube replacement due to corrosion continues to be our major problem, and this was covered in detail last month. New information concerning the problem has been included under appropriate headings in the foregoing paragraphs.

D. Planning to Meet Manufacturing Objectives

1. Improvement in morale, safety, and operating efficiency as a result of better trained operators is being approached from several angles. The existing operator training program has been reorganized and rigorous specific goals have been outlined for supervision to follow in this regard. Discussions have been held

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D. Planning to Meet Manufacturing Objectives (Continued)

with Union representatives, and they are quite in accord with the program. This will guarantee a thorough orientation and indoctrination of new employees during the first 3 months of their employment, and will provide a basis and means for weeding out undesirable or incompetent employees during the probationary period. Secondly, a committee has been formed and is working on improvement of training aids and techniques including audio visual methods, charts, etc. in the form of training kits, to assist the supervisor in the job of re-training all operators. Finally, a series of questions has been drawn up for presentation to operators, chief operators and supervisors to test the extent of their present process knowledge, and to determine where further educational efforts are needed.

E. Discussion of HAPO Objectives

Nothing special to report. Work on development of chief operators and lower echelons of supervision via organized programs such as the Friday Supervisors Meeting, continues. Consideration is being given to ways and means of indoctrinating unit superintendents in the duties and requirements of the sub-section superintendent's job. This will not only assist their development efforts, but will more rapidly point out to the writer where guidance is needed, and will also provide him with more time for planning and development work by permitting periodic assignment of much of the sub-section routine to the unit heads in this manner.

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R. S. Bell
Manager
REACTOR SECTION

OPERATIONS SUB-SECTION MANAGEMENT REPORT

A. Review of Previous Month's Activities

1. a) Statistics:

Submitted to H. C. Smith under separate cover.

2. Significant Experiences, Plant Equipment, Process Safety, Etc.

a) Major

1. Reactor Safety Considerations

a. Ball 3X Systems

During a recent ball drop at 105-C Reactor, balls in three hoppers failed to drop. Difficulties encountered in the ball recovery operation indicated that the failure may have resulted from the formation of clusters in the balls due to dirt picked up on the trip through the system. Following this observation, all balls at 105-C were inspected and it is felt that they are in a satisfactory condition. Balls at KE and KW are known to be OK, both by virtue of newness, routine tests, and the ball drop at 105-KW resulting from the 165 KW power failure.

At the other reactors, routine inspections and functional tests have indicated that the Ball 3X equipment, including the balls, is in good condition and is reliable. However, a recent visual inspection at F Reactor showed signs of moisture in the back hoppers and immediate tests are scheduled to determine the exact condition of the balls.



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2. Reliability Of Back-Up Water Supply At K Reactors

While this problem is essentially the responsibility of the Power Sub-Section, it is mentioned here since electrical fault tests to determine the degree of reliability of electrical back-up for the water plants were scheduled during the month in conjunction with the KW pigtail outage.

3. Miscellaneous

Work is progressing on the replacement of the original PC (proportional counter) equipment at all old reactors with more reliable and sensitive equipment. Also, a project proposal is being prepared for the installation of tight wire guards and photocells on the C elevators to prevent the elevator from damaging front face nozzles or pigtails during reactor operation, thus preventing loss of water to process tubes.

A program has been worked out and documented for the increase in power level from the 500 KW tube limit (currently imposed by faulty pigtails) to the anticipated high levels following pigtail replacement. The program was worked up jointly by Operations and Process personnel, and approved by Pipe Technology personnel. It is felt that the stated program gives a conservative approach to power level increases.

b) Short Range Items

1. Ruptures

The occurrence of low concentration ruptures has decreased to two (at C Reactor) during September and removes the immediate urgency from this problem. However, high concentration ruptures, eight at the older reactors, indicates the need for re-examination of the decision to raise the high variable goal concentrations to 1000 MW. This concentration was decided upon as an expedient to counteract the current metal shortage. More data will be required to permit a decision to lower the concentration since the ruptures could be the result of other factors than high concentration. The occurrence of two ruptures in special high quality slugs being tested at K Reactor at 1386 and 1474 concentrations resulted in termination of this test.


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2. Water Leaks

Leaks were experienced at D, ER, F, and I Reactors during the month, resulting in considerable outage time. This may indicate that tube corrosion rates, previous discussed, may be more serious than existing data indicate.

3. Process Tube Thermocouples

The failure rate of process tube thermocouples has increased at several reactors, and examination of the problem by Manufacturing Engineering personnel indicates that thermocouple insulation deterioration may make a full scale replacement program necessary in the near future at all older reactors (except IE and KW).

4. Oscillating Panellit Gauges

It has been determined that excessive oscillation of the new CG-558 panellit gauges can be damped sufficiently to minimize screens from this source, without adversely effecting the sensitivity or response time, by injecting oil into the gauge capillary. As a result, scheduling of CG-558 panellit outages will be resumed starting with ER on September 29th.

3. Progress On New Plants and Facilities

a. Nothing to report.

b. " " "

c. The outage to replace defective front face pigtails at KW has been completed and the IE outage is scheduled for next month. The KAPL 120 loop at 105-H is operating on in-pile recirculation without fuel elements. It is planned to change fuel elements at the end of September.

4. Accomplishments

a. A few appraisals and development plan reviews were conducted by the writer.

b. The sub-section has completed concept ratings and Nine-Point contacts, and is nearly complete on mid-year review of concept appraisals and development programs.



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5. Action By Others Affecting Manufacturing Or MA²O

- a. Nothing to report.
- b. A recent requirement by the IOC and the ABC regarding the labelling of special shipping casks may result in some expense to establish accurate tare weights for the identification tags on some of these containers. This problem is still under consideration and discussion with GE - SE Accountability.
- c. Nothing to report.

B. Analysis Of Trends

The recent rash of sub-major injuries in the sub-section indicates the need for concerted effort by supervision an improvement of safety performance. Plans are being made to obtain this improvement by a more active safety program with the non-exempt employees as well as with supervision. Efforts will be made to observe and correct safety weakness of all employees before accidents occur, and to take disciplinary action if necessary, to correct any serious repetitive faults uncovered in individual cases. This, of course, is in addition to a rigorous review of JES's and safety rules, plus increased use of other safety aids. Also, each superintendent is making extensive efforts to get across to his supervision their responsibility for safety.

C. Analysis Of Major Problems

1. Tube Replacement Program

Recently completed technical studies on internal tube corrosion rates have resulted in the postulation of a method for the prediction of probable failure rates of process tubes at various effluent temperatures. The initial data was processed on the TOR computer to obtain the current status of tube wall thickness. Considering the limits of accuracy of the assumptions, data, and calculations involved, it has been decided that a safe and economical figure at which to begin tube replacement, to prevent a snowballing leak problem, is 25 mils of tube wall remaining. This initial data, together with tube temperature history and current effluent limits, has permitted the calculation of a tube replacement schedule on the 604 computer, by our Production Scheduling people. The tentative figures quoted last month have now been firmed up and result in the following picture of this problem.



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1. Tube Replacement Program (Continued)

Reactor	No. Tubes Now in Area of Loss	Time of Replacement	Notes
100-B	0	November 1955	0
100-D	90	Nov	10
100-DR	0	June 1956	20
100-F	70	Nov	20*
100-H	0	November 1955	40
100-C, KE, and KW - no problem for about two years.			

*This figure is based solely on internal corrosion. Other known factors, such as cracked or pitted Van Stone flange, and areas where previous history has indicated severe loss, raises this figure for immediate replacement to about 100 tubes. Parenthesis indicate removal rates necessary to cope with combined internal and external corrosion.

Tube removal equipment and techniques are being developed which should ultimately result in a tube removal rate of about 20 tubes per day for the next six months with an anticipated 40 per day thereafter. The best maintained rates to date have been 8-10 tubes per day.

While initial calculations indicated a complete pile retubing every four years, based on 105°C outlet temperature, recent refinements in equations and data place this more nearly at three years. While it was originally figured to be economical to run at 105° effluent temperature with four year tube life, this philosophy may have to be revised downward unless actual tube replacement time can be speeded up to offset the production losses entailed by the more rapid pile retubing requirements.

While current tube replacement costs have averaged about \$600 per tube, it is anticipated that refinements in tools and techniques will ultimately result in a cost of about \$300 per tube. This, of course, indicates a cost of 1.5 to 2 million dollars per year per reactor for tube replacement alone. This staggering figure certainly presents a good case for increased efforts on the development of zirconium or other corrosion resistant tubes as early replacements for the existing aluminum tubes.

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D. Planning To Meet Manufacturing Objectives

Present and forecasted work loads due to increased power levels, the tube replacement program and the normal amount of emergency work accompanying the operation of eight reactors, points out that we are in a very poor position manpower wise. As a result of this poor position, we have been requiring on an average of 3500 to 4000 overtime manhours per month. Some of this time is required because of burnout, some because of lack of flexibility in our non-exempt organizational structure.

Plans for alleviation of this condition are being actively pursued. At the present time, a plan has been proposed to the union via Union Relations to make a one classification job for all operators. It is anticipated that acceptance of the plan would result in a saving of at least 2% of our present manpower requirements. Beyond this, three separate organizational structure changes involving non-exempt employee distribution have been proposed and are being studied. It is planned to come to a decision on the best way to obtain increased flexibility and job coverage, as a result of these studies, by the end of next month. It is almost certain that any of these plans, or any plan which accomplishes these results, will require an increase in the work force of up to 80 weekly full people and possibly 8 supervisors. However, it is believed that the added safety, improved efficiency, improved morale, and decrease in overtime will more than offset the additional costs. For instance, current overtime hours alone average equivalent to 85 to 100 men per month.

E. Discussion Of NAPO Objectives

In line with objectives concerning exposure to radiation, plans are underway to remove from positions of exposure those Supplemental Crew chief operators whose current exposure is approaching the annual tolerance dose. An interview for one of these employees by another sub-section on a job requiring relatively little exposure to radiation, has been arranged. Efforts are continuing to do the same for the other two Chiefs who are approaching the annual tolerance limit. Over and above this, studies are being conducted of ways and means, such as rotation of assignments, to equalize this exposure potential as much as possible among all non-exempt personnel.

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August 23, 1955

R. S. Bell
Manager
REACTOR SECTION

OPERATIONS SUB-SECTION MANAGEMENT REPORT

A. Review of Previous Month's Activities

1. a) Statistics:

Submitted to H. C. Smith under separate cover.

b) Comments

Production at KE Reactor was approximately 11% greater than in any previous month. Operating efficiency continued at a low ebb, due mainly to water leak and tube removal problems and operating difficulties in the K Area water plants.

2. Significant Experience, Plant Equipment, Process Safety, Etc.

a) Major

1. Tube replacement

Additional corrosion data from B, D, F, and H Reactors during July permitted Technical to firm their recommendations on the tube replacement program. Currently, it appears that 1000 tubes must be replaced during the coming 12 month period, because of internal corrosion alone. An additional 400 tubes may have to be removed at F Reactor because of external corrosion, and 200 because of stuck gunbarrels.

In general, the tube replacement program lines up as follows:

Reactor	Bulk Outlet Temp.	Tubes replaced during next year	Start Replacement	Replacement Rate
100-E	90	130	10 months	50 tubes/min.
100-D	80	350	Nov	30
100-F	85	400	4 months*	50
100-H	85	150	10 months	55
100-B	90	0	--	--

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*Replacement because of external corrosion is currently in process at 105-F.

There is no immediate problem at DR, C, KE or KW.

Progress on tube removal and replacement techniques has been satisfactory, but is still below goal. Goal rates are 20 tubes in 24 hours at a cost of \$300 per tube. It is hoped that this goal may be achieved by October.

2. Ruptures

There were 14 regular metal ruptures in 12 tubes, and one J metal and one C metal rupture during the month. The most significant change in the rupture picture is the decrease in the rate of low concentration ruptures at C Reactor, with only one such failure during August and no low concentration ruptures at other reactors. The majority of the ruptures (four each) occurred at D and F Reactors, those at D being all over 900 MWD concentration. Those at F were somewhat lower and no doubt reflect to some extent the many ups and downs of this reactor. On the basis of the improved performance at C Reactor, it is believed that the metal causing the rise of low concentration ruptures during May, June and July is now almost completely discharged, and it is planned to reinstall the 105°C effluent temperature limit at this reactor.

3. Power Failure - KW Area

The most significant single event during the month from the standpoint of reactor safety and production efficiency, was the total failure of power supply at KW Reactor and water plant on August 21. At this time, the KW Reactor scrammed due to power failure and simultaneous low water pressure. Both reactor and water plant were plunged into darkness for a considerable period, with the exception of a few battery operated emergency lights. Fortunately, the cross-tie from KE Reactor operated as planned, and although its operation scrammed that reactor also, it provided the shutdown of flow requirements necessary to take care of initial decay and subsequent gamma heating effects. All 165 KW equipment failed, both normal and emergency, except the high lift pumps. These took care of the initial period following the power failure


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but had to be shut down almost immediately because of effect of cavitation on the impellers. (It was established that the cross-tie was providing adequate flow before the high lifts were shut down).

This power failure resulted in approximately three days downtime at each reactor before electrical faults were discovered and corrected, and other failures resulting from the scram, were corrected. (The scram caused balls to drop at KW and the skip hoist cable broke during recovery of the first 25 hoppers.) KE of course, had to remain down until all electrical tests were complete since there was no guaranteed backup via the cross-tie line so long as these tests were in progress.

A detailed explanation of the electrical equipment failure at 165-KW will not be given here. However, the troubles found and corrected included a failed frequency relay, two failed CT over-voltage relays, a failed voltage sensitive relay on #2 generator, and field generation difficulties on #1 generator because of dirty commutator and brushes.

b) Minor Items

1. Horizontal Rod Replacements

Horizontal safety rod replacement was completed on schedule at B and H Reactors. DR replacement is scheduled early in September.

2. Effluent Systems

The cushion chamber trouble experienced at D Reactor has been corrected by removal of nearly all timbers from the cushion chamber. Remaining timbers on the floor will be removed at a subsequent outage.

Tests of the KE effluent system were completed during the month and are currently being evaluated by the Engineering Department. Until these results are evaluated, and additional tests are made on the condition of the portion of the outfall lines in the river, KE and KW continue to operate their 107 basins on a continuous rather than the designed batch basis.

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Management Report

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3. Temperature Monitor

Thermok bulbs continue to fail at the rate of 2-3 per day at KW with a lesser rate at KE. Replacement of these bulbs is scheduled as time permits during the scheduled extended outage for pigtail replacement.

4. Pressure Monitor

Considerable difficulty has been experienced at H Reactor with fluctuations of new CG 558 type panellit gauges following their installation during the month. Engineering has the problem under active consideration. Elbows to the panellit gauges at the older reactors show increased evidence of plugging due to corrosion product build up and result in making the gauges insensitive. These are being corrected as rapidly as outage time permits.

3. Progress On New Plants and Facilities

- a. Difficulty is being experienced in obtaining funds from Engineering on project CA-412-R to pay for the new charging magazines required at KE and KW to complete their charging equipment needs. Lack of these funds (\$45,000) may well result in low charging rates until the new magazines are obtained.

4. Accomplishments

- a. Action has been instigated on bringing the Operations Sub-Section exempt personnel requirements up to organization chart strength and to further this to the extent of maintaining a few extra people in training positions. So far, two candidates from Process Sub-Section have accepted positions in Operations, one new supervisor-in-training has been hired from outside, and several other candidates are being reviewed for potential value to the Sub-Section before interviews are scheduled.
- b. The program of reviewing appraisals and the status of development methods with exempt personnel is well underway. It has been completed by some Unit Superintendents.

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5. Action By Others Affecting Manufacturing or MAPO

a. No comment.

B. Analysis of Trends

1. Action taken in June towards reduction of Special Hazards incidents is evidently bearing fruit. The high of five incidents in May was reduced to two in June, 0 in July, and 0 in August. Emphasis will be maintained to keep the trend in this direction.
2. It begins to be apparent that the major gains in production to be obtained by revisions to standards and limits have already been realized. Until more radical improvements are made, it may be expected that future gains in level will be minor. The most fruitful field for continued improvement in production is in increased efficiency through better planning, scheduling, and radically improved maintenance methods and application.

C. Analysis of Major Problems

Limitations imposed by the present functional type of organization in the Reactor Section appears to be the major problem confronting us. This is especially true in coordinating the efforts of Operations, Maintenance and Radiation Monitoring in the various areas. The division of responsibility (in many cases hazily defined) could be made more specific, and the over-all result of effort applied by all groups in an area could be more productive if a single head were in charge of each area. Under the present system, the many groups have different interests in the performance of their jobs, and in many instances, these short view interests act to the detriment of the fundamental purpose of obtaining the greatest amount of production safely and cheaply. An over-all head for all units in an area could remain in closer contact with the problems and people involved, and could coordinate their efforts to a far greater extent than the functional Sub-Section heads now operating under the difficulties of distance and lack of intimate association with the problems of others outside their own Sub-Section.

It is suggested that the ideal organization would be a cross between a purely functional and a purely plant type organization. Each geographical area should have its own head and be self-sufficient in most things, be it a double or a single area. The present functional Sub-Sections such as Process, Radiation

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Monitoring, and portions of Project and Personnel Development, Maintenance (i.e., Unusual Maintenance, Planning and Scheduling) and Operations, (i.e., Production Planning and Scheduling and Supplemental Crews), should be re-organized into more effective units, but continue on a functional basis to service all the operating areas as required.

There is no question but the problems brought up by this type of organization, such as need for supplemental work forces for both Operations and Maintenance for outage work, and other similar problems, could be overcome. It is predicted that adoption of this type of organization will result in greater production, increased efficiency, lowered costs, and in the long run, a reduction in the number of personnel required to do the job.

D. Planning To Meet Manufacturing Objectives

Continued emphasis is being placed on efforts to increase the morale of chief operators and to make them feel closer to management. Along with their attendance at weekly supervisory meetings, plans are now in effect to make their next annual ratings in September on the old exempt roll Form B appraisal sheet, and efforts will be continued to write up job descriptions to make it possible to use a regular appraisal form next year. This is not only beneficial morale wise, but helps to meet more power development objectives with these men, who are to a large extent, our reservoirs of talent for future supervisory personnel. It has been cleared with Personnel Practices that use of Form B will be satisfactory for chief operator ratings this year.

E. Discussion of NAPO Objectives

No Comment.

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July 22, 1955

W. K. MacCreedy
Manager
REACTOR SECTION

OPERATIONS SUB-SECTION MANAGEMENT REPORT

A. Review of Previous Month's Activities

1. a) Statistics:

Statistics have been submitted to H. C. Smith under separate cover.

2. Significant Experiences, Plant Equipment, Process Safety, Etc.

a) Major or Long Range

1. Tube Replacement

Data from recent Technical tube inspection studies indicates a considerable increase in tube corrosion failure rate. On the basis of tubes (two) recently removed from the D Reactor, there is a possibility that over 1,500 tubes in B, D, F ER, and H Reactors will have to be replaced in the coming twelve month period. This estimate is based on preliminary data at existing operating conditions for removal of tubes when they reach 25 mil wall thickness. This data will be supplemented by additional data from the examination of ten suspect tubes from B Reactor, to be removed during the current red outage, and thirteen tubes from D to be removed at the first opportunity.

Firm estimates of anticipated tube removal rates will be forthcoming from Technical about the middle of next month. At this time, the current metal picture and probable tube removal and replacement rates will be crunched into the picture to determine whether or not it will be necessary to reduce outlet water temperature limits.

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2. Ruptures

The low concentration rupture problem has been limited to C Area this month, with four low concentration ruptures. No new information has been advanced to explain them. It is also noteworthy that one tube containing cored material (twelve tubes being run to about 900 concentration at 105-C to pilot this material for K Area use) ruptured at a concentration of 50% MWD.

The 100°C outlet water temperature at 105-C will be continued for at least another month in an attempt to determine the effect of this temperature on rupture rate in low concentration slugs.

3. High Rear Face Radiation Levels

The exposure rates from emanation of radiation from rear face piping is reaching the point where annual exposures come critically near the annual permissible rate for both Operations and Maintenance personnel. It is planned to run a test on a one header basis during the next month to determine whether or not a chromic acid purge will successfully reduce this radiation level. If successful, plans will be made to extend this purge to a full reactor basis.

b) Minor1. Horizontal Rod Replacements

Replacement of horizontal safety rods at D Area was completed and replacement at E Area is nearly complete. H Area replacement will start as scheduled following completion of the B Area outage.

2. Effluent System

Considerable outage time was spent at 105-D removing timbers from the cushion chamber. All of the timbers were removed from the sides and roof, with floor timbers remaining to be removed during the next outage.

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July 22, 1955

2. Effluent Systems (Continued)

All of the Omega joints in the F Area effluent lines have been replaced with Dressler couplings. The three (3) 72" couplings leak if backfilled, but hold if left uncovered.

Old area retention basins continue to leak at a high rate, 2,000 gallons per minute at 107-F. Although repairs to these basins are scheduled on Project CG-558, replacement with new basins may be more economical in the long run.

3. Chute Liners

Chute liners have been repaired at 105-B during the HCR outage with recovery of six pieces of metal. It is anticipated that similar repairs at 105-D and 105-F in November will simplify operations and clear up some basin accountability problems.

3. New Plants and Processesa) Venturi Calibrations

It has been determined that venturi calibrations at EN vary as much as 6% due to failure to make procurement specifications tight enough. This may mean a corresponding decrease in power level when the reactor goes on trip before instability limits. This situation is being investigated with Process personnel.

b) Charging Magazine Shortage

Considerable operational overtime is required at both KE and EN Reactors due to an insufficient number of charge magazines for a normal change discharge. A purchase requisition has been prepared for procurement of 390 additional magazines for each reactor at a cost of \$45,000. The possibility of receiving these funds from Project CA-512-R is being investigated.

4. Accomplishmentsa) Attitude Survey

The recent attitude survey for Operations Sub-Section has been reviewed and a letter outlining plans for improvement of below standard conditions has been written.

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5. Action By Others Affecting Manufacturing Of MAPO

a) No comment.

B. Analysis Of Trends

a) No comment.

C. Analysis Of Major Problems

Adequate staffing of supervisory personnel may well become a major problem in view of probable demands on trained reactor exempt personnel for power reactor programs. Consideration must be given to maintaining a proper ratio of technically trained people to upgraded operators in preparing for this demand. This, in turn, indicates the need for rapid procurement of technically trained personnel both from the Technical Graduate rotational program and from promising candidates elsewhere in the MAPO and outside sources both in and outside the Company. The procurement of these people early enough to provide adequate training before the actual need arises will prevent our being forced to upgrade operators or fill vacancies with people from other sub-sections who have sufficient experience, but are lacking in potential.

Requisitions for both exempt and non-exempt people to help fill this gap have been issued.

D. Planning To Meet Manufacturing Objectives

a) Manpower Development

The program mentioned last month of holding a series of meetings with first and second rank supervisors on the Island Manpower Development topic is well underway and has been received with considerable interest. Reports from three of these sessions have been received and the comments on them indicate the direction for additional emphasis on manpower development.

E. Discussion Of MAPO Objectives

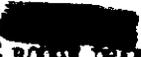
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REACTOR SECTION

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June 22, 1955

W. K. MacCreedy
Manager
REACTOR SECTION

OPERATIONS SUB-SECTION MANAGEMENT REPORT

A. Review of Previous Month's Activities

1. a) Statistics:

Submitted to H. C. Smith under separate cover.

2. Significant Experience, Plant Equipment, Process Safety, Etc.

a) Long Range

1. Tube Leaks

The activities which were discussed in last month's report concerning the development of improved tube removal techniques are well underway. Preliminary tests of several devices were tested on reactor tubes during the F Area outage of June 10. These tests demonstrated that a completely different action may be expected on irradiated tubes than that experienced on new tubes. Some of the cutters which were tested showed promise of ultimate success. The Design Section is working on several devices which would provide better and faster pulling forces for the cutters.

Additional testing of these devices is planned for the July outage.

2. Ruptures

The low concentration ruptures are continuing to be of major concern. During the current month there have been eight of these distributed between C, F, and H Reactors - 4, 3, and 1 respectively. This distribution further emphasizes the likelihood that tube powers are not the major factor. Except for the iron deposition theory advanced by the Metal Preparation Section this month, nothing new has been developed to explain the problem which causes these ruptures.


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Operations Sub-Section
Management Report

W. A. MacCreedy

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June 22, 1955

2. Ruptures (Continued)

We are continuing the 1000C outlet water temperature limit at C Reactor, pending further developments concerning this problem.

3. IX Recovery Equipment

The recovery of the IX balls at 105-F reactor during the month further emphasized the need for more adequate recovery equipment. The present equipment is cumbersome and difficult to handle. The recovery rate is far too slow, averaging only two columns per shift. Burnout rates for personnel were not too severe, but only because a waiting period of three days was allowed before starting the recovery operation. We intend to request the Design Section to study our needs in the light of this recent experience and provide a more adequate system.

b) Minor

1. Horizontal Rod Replacements

The replacement of the D Area horizontal rods is firmly scheduled to begin on June 27, with B Area scheduled for July 11 and F Area August 8. There does not appear to be any reason for further delay in completing the installation of all new horizontal rods.

2. F Area Effluent Line

Considerable trouble has been experienced with the underground portion of the F Area effluent line. The welds at the expansion joints were failing from fatigue as a result of the greater expansion of the line with higher outlet temperatures. These welded type joints have been replaced with Dressler couplings and have been entirely satisfactory on the 60" section of the line. Some difficulty has been experienced on the 72" section. It is expected that the leakage problems will be eliminated as a result of the installation of these couplings.



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W. K. McCready

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June 22, 1955

3. New Plants and Processes

a) Pigtail Replacements

Operation of both K Reactors continues to be limited by 500 kW/tube power limit imposed as a safety measure until more reliable pigtailed are procured and installed. It is expected that the new Teflon-braided stainless steel pigtailed will be available by mid-August for one reactor and by early September for the other. These will be installed immediately by Minor Construction and it is expected that the levels will be increased to tube powers comparable with those at 100-C for KW and 100-H for KE. This would give power levels of about 2600 for KW and about 2200 for KE.

b) Metal Discharges

The discharging of low concentration metal began at 100-KW June 25. Discharges of 80 tons, each one scheduled for June 25, July 1, 11, and 28 for a total of 320 tons during this short period. The preparation of metal and handling of the discharged metal will require some overtime for Operations since the Supplemental Crew will be tied up with the SSR outages.

4. Accomplishments

- b) The Operations Sub-Section has completed rewriting the evacuation procedures and training sessions are now in progress. It is expected that the sub-section will be prepared to put this new procedure into effect by July 1.

5. Action By Others

Plans are well underway to start shipments of "H" slugs to Savannah River Works. Savannah has indicated that they will be prepared to receive these slugs in about a month and a half. The removal of these slugs from our basin will be helpful in relieving the storage problem which is expected to develop in the coming months.

6. Analysis Of Trends

1. Radiation Problems

The alarming increase of radiation incidents during the past two months has prompted the following program in the Operations Sub-Section, in an effort to curb this trend:

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June 22, 1955

1. Radiation Problems (Continued)

- a. Insure that all individuals have incident investigations reviewed with them within one week after issuance.
- b. Place more emphasis on radiation hazards in Safety meetings.
- c. Insure that all supervision in the Section carefully follow all regulations and enforce them very strictly.
- d. Instruct all people involved in radiation work in the use of radiation instruments.

C. Major Problems

Nothing new.

D. Planning To Meet Manufacturing Objectives

1. Psychological Tests

There has been very little progress made toward getting the contract signed for obtaining the tests which are to be used. In view of this fact and because the Union negotiations are rapidly drawing near it seems prudent to postpone the scheduling of this work until after the negotiations have been completed.

2. Production vs. Bogey

The fiscal year production bogey for Pu was 1996.8 K MWD. It is estimated that we will produce 1,634.6 K MWD during the fiscal year or 81.9% of the Bogey. The failure to meet this bogey resulted from the failure to start the two K Reactors as soon as planned and the inability to reach the forecasted level because of the pigtail problem.

The six old reactors exceeded the bogey by 2.6% primarily as the result of postponing several extended outages into the next fiscal year.

Six old area forecast	1429.3	
" " " made	1466.5	102.6% of forecast
K Area forecast	535.4	
K Area made	158.6	29.6% of forecast

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W. K. MacCreedy

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June 22, 1955

2. Production vs. Budget (Continued)

Total forecast	1996.8	
Made old area	1466.5	
Made K (1.06)	<u>168.1</u>	
	1634.6	81.9% of forecast

3. Unit Cost vs. Fiscal Budget

The unit cost budget for the fiscal year was \$10.39. It is estimated that the fiscal year unit cost will be \$11.17 or 7.5% over. This results from failure to realize the production scheduled for the K Reactors. The unit cost budget for the six old reactors was \$12.05 and the year's unit cost will be \$11.34 or 6.0% under the budget. This under run results primarily from postponing several extended outages to the next fiscal year.

E. Discussion Of EAPO Objectives

1. Manpower Development

The Operations Sub-Section is planning to hold a series of eight meetings using the techniques demonstrated at the Island Camp. These meetings will be held on Friday mornings and will be attended by these supervisors and chief operators on shift. Unit Superintendents will act as group leaders. It is felt that this program will provide a stimulus for these supervisors and chief operators in the field of self development.

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April 21, 1955

W. K. MacCreedy
Manager
REACTOR SECTION

OPERATIONS SUB-SECTION MANAGEMENT REPORT

A. Review of Previous Month's Activities

1. a) Statistics:

Submitted to H. C. Smith under separate cover

2. Significant Experience, Plant Equipment, Process Safety, Etc.

a) Long Range

1. Tube Leaks

The tube leak problem at F Area continues to be serious. Collection rates during the month reached the lowest level in the past four months and stayed at 5-7 gallons per day for ~two weeks. The collection rate increased to 60-80 gallons per day about the 15th. The reactor was shut down on the 18th for pressure testing and three tubes were found with small leaks. In addition there were ~20 tubes which had minor Van Stone flange leaks and loose nuts. It would appear that the newly installed "O" ring gaskets are fulfilling the requirement of preventing leaking Van Stone flanges from putting water into the graphite.

Present plans call for the replacement of ~200 tubes in this reactor on the basis of ~40 per month. It is expected that this will cost ~\$8,000 per month and two days outage time.

2. Run to Rupture Tests

The current philosophy for testing new types of metal requires that a given number (small 2-3) of tubes be allowed to remain in the reactors until they rupture.

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2. Run to Rupture Tests (Continued)

While this program has many advantages from an experimental standpoint, it should be pointed out that it is quite costly in production. A recent review of the status at 105-C indicated that, for the four month period ending in April, there has been in excess of 20,000 MWD's lost as a result of removing these ruptures. In addition to this lost production time, costs ranging from \$1,000 - \$4,000 are required to remove and replace tubes when the rupture is stuck. Other disadvantages involve the extra risks present for "quickie" discharge attempts and the additional start-ups required. It is not proposed that this program be eliminated entirely, but it is our intent to be somewhat more critical of the material charged and to endeavor to keep the number of tubes involved to an absolute minimum.

3. Warped Slugs

One tube of "B" type metal - lead dipped - gave trouble during the month at 105-D. The concentration was .865 and the tube was reluctant to push, but did move with charging machine forces. A close watch is being kept on this metal's behavior since approximately 50% of the current production is of this type metal.

4. Graphite Distortion

There have been no new developments this month, but it is now clear that we will have to use some 4" metal in the top 3 rows at 105-F in the near future.

b) Short Range

1. Safety Rod Problem

Replacement of all remaining old type rods at IR was completed during the month by Miner Construction. Current schedules call for D Reactor replacements to commence on May 2, B on May 16, and H, probably, on June 6.

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Operations Sub-Section
Management Report

W. K. MacCreedy

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April 21, 1955

1. Safety Rod Problems (Continued)

New rods installed in February at F Area have been very satisfactory and have operated without difficulty.

2. Downcomer Chambers

Both B and D Areas experienced difficulty with loosening of boards in the downcomer chamber. The repairs mentioned last month have been some help, but in spite of the retaining devices installed to hold the boards in place, several boards have broken away at the edge of the holding frame. Process Sub-Section is studying the problem, but it looks very much as if it will be necessary to remove all boards and rely on the concrete to last until the CG-558 downcomers are installed.

3. Effluent Basins

The leakage rate of the retention basins in the three old areas is high. F Area is leaking at approximately 1,200 gpm per side. The Radiological Sciences Department is aware of this, but has not given us an answer as to its effect on the river. I rather suspect that they prefer not to go on record with any statement now. I'm inclined to wait, since their answer, if forced at this time, might require basin repairs.

Summary and Progress

Submitted by R. O. Mahann.

4. Accomplishments

a)

b) Sterling Nelson has been working with Maintenance on a tube removal device which operates on the principle of loosening the tube by twisting it radially in the channel. The torque is applied through several stainless steel funnels inserted into the tube. Two stack tubes were removed and replaced in four hours without difficulty. Further testing will be done next month.

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Management Report

W. K. MacCreedy

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April 21, 1955

5. Action by Others Affecting Manufacturing or H&PO

No comments.

B. Analysis of Trends

1. Minor injuries in the Operations Sub-Section have taken a definite downward trend. There were only seven minor injuries reported through the 20th compared to 22 for March. This represents about a 50% reduction. Continued emphasis on supervisory responsibility for safety will assist in maintaining this gain.
2. Production levels will start dropping off as the water temperatures increase. We expect an approximate 8-10% reduction in level at all reactors which are now at 107°C outlet. DR will, of course, gain ~250 MW as the result of increased water flows and higher outlet water temperatures after the venturi outage.
3. A further study of manpower requirements indicates that, instead of 15 operators, it will be necessary to add 30 and at least 10 additional supervisors in order to provide the minimum coverage needed. Particular emphasis is being placed on the need for reduction in overtime and all Superintendents are being cautioned regularly to be certain that any overtime used is easily justified.

C. Analysis of Major Problems or Programs

1. Reactor Safety

This problem is still receiving major emphasis and I believe we have things well under control. Our main interest now is to acquire additional equipment on the reactors. The low level flux monitor device has been tested at ER and appears to be satisfactory. Engineering is preparing a report which will be the basis for a project to install these on all reactors. In addition, we will be installing the new panellet gauges on E Reactor in June. Gauges for the other four reactors will start arriving in August at the rate of 2000 per month.

2. Brine Concentration

No changes have been made in goal concentrations this month. D is discharging at goal plus 400 and the other high producers are discharging at essentially goal plus 300. It would appear wise to hold B at its present concentration level for an additional month, before taking the additional 100 step.

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Operations Sub-Section
Management Report

W. K. MacCreedy

-5-

April 21, 1955

D. Planning to Meet Manufacturing Objectives

1. Psychological Tests for Operators

Several discussions have been held with Medical and Labor Relations relative to making tests to insure the mental stability of our operators. At the present time, Dr. Fuqua has prepared and submitted a contract to the AEC which would provide the service we require from the University of California. The AEC has had the contract for 30 days, but has not as yet approved it. Dr. Fuqua does not believe that there will be any difficulty in getting it approved and will continue to follow up on this. In the meantime, we expect to have our plans completed by the end of May for discussing this with the Union and expect to start the tests by July 1.

E. Discussion of HAPO Objectives

No comment

Operations Sub-Section
REACTOR SECTION

JH Warren: jeb

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