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NO. 25 CROSSHEADER DAMAGE

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UNUSUAL INCIDENT REPORT
NO. 25 CROSSHEADER DAMAGE

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INTRODUCTION

The DR Reactor was shut down on July 10, 1963, for a scheduled charge-discharge outage. During the charge-discharge operation on July 11, 1963, the front work platform was being lowered to a new location for charging when the far side charging machine mounting rail came in contact with the 2 1/2 inch drain valve stem on front crossheader No. 25. Before the platform travel could be stopped, the drain valve and the related 2 1/2 inch piping was twisted down transmitting sufficient force to the crossheader to form a dimple in the header adjacent to the drain line-header weld junction.

SUMMARY

There was no nuclear safety nor personnel safety hazard involved in this incident.

Although there was no evidence of leaks at the deformed area of the crossheader, the damaged section was replaced when dye penetrant tests and x-rays showed superficial cracks and a shallow penetration at the weld which joins the 2 1/2 inch line with the No. 25 crossheader.

The cost of replacement was \$1,000.00 in labor and \$400.00 in material. The time for repair was 21 hours.

DISCUSSION

The DR Reactor was shut down at 12:18 a.m. on July 10, 1963, for a scheduled charge-discharge outage. At 3:20 p.m. on July 11, 1963, 39 hours after shutdown, the C Work Platform was being lowered to a new location for charging when the overhead mounting rail on the far charging machine came in contact with the 2 1/2 inch drain valve stem on front crossheader No. 25. Before the contact was recognized and the platform travel stopped, the drain valve was twisted down transmitting sufficient force to the crossheader to form a dimple in the header adjacent to the drain line-header weld junction.

Investigation showed that the charging machine mounting rail had crept forward about 2 1/2 inches and that the drain valve, which is a rising stem valve and normally closed, was in the open position. The valve, by necessity, is mounted on an angle such that opening the valve reduces the clearance to about 2 1/2 inches between the platform and valve. The combination of the rail extending beyond the normal position, the drain valve being in the open position and the charging machine being located in the vertical line of the drain valve stem, resulted in the contact between the mounting rail and valve stem.

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The charging machine mounting rail is fixed in position by a friction fit to two hangers mounted on a trolley for near-to-far travel. The friction fit had been recognized as a weak point. Consequently, the two hangers had been tack welded to the rail. The welds were found broken allowing the rail to move. There is some force transmitted to this rail each time the charging machine is moved forward to charge a tube. It is believed that this force, through repeated use, caused the welds to fail and forced the rail toward the reactor.

The 2 1/2 inch drain system on No. 25 crossheader was set up to measure the pressure gradient across the crossheader about one year ago. This test required that the valve be in an open position. The valve was not closed following the test due to an oversight; however, there was sufficient clearance had the overhead carriage equipment remained fixed. The C platform clearances were checked on April 26, 1963, and found adequate.

The far charging machine is normally stored to the far side of the drain valve location. Trouble had developed earlier in the shift with the far charging machine, so it was moved to this out-of-the-way location for maintenance adjustment. As a matter of interest, the alignment of the machine carriage had to be within $\pm 1/2$ inch in order for it to come in contact with the drain valve stem. The point at which the charging machine was located was purely happenstance.

Following a cursory survey of damage, the charging machine mounting rail was moved and tied back to its proper position, the drain valve stem was straightened and the valve was closed. This provided adequate clearance for the platform to be restored to an operating condition.

Engineering assistance was then requested for a detailed evaluation of the damage, and recommendations on further action. J. W. Hedges, G. E. Wade, J. M. Fox and P. F. Mercier constituted the inspection team. Dye penetrant tests and chalk tests were run on the damaged area, and x-rays were taken. The penetrant test showed superficial cracks in the weld which joins the 2 1/2 inch drain line to No. 25 crossheader. Chalk tests showed no leaks. The x-rays showed a shallow penetration of the drain line crossheader junction weld.

These findings were discussed in a meeting held on the morning of July 12, 1963. The meeting was attended by A. R. Maguire, E. J. Filip, J. W. Hedges, H. W. Heacock, R. W. Reid, R. R. Meyers, F. F. Vlacil, J. M. Fox, G. E. Wade, and P. F. Mercier. There was some doubt expressed in this meeting of the integrity of the damaged area of the crossheader. Since the crossheader is a critical component, it was decided to replace the damaged section.

In order to replace the damaged section of the crossheader it was necessary to isolate it from the process water supply system. There were 55 charges of irradiated metal in process tubes serviced by this header which either had to be cooled from an auxiliary water supply or discharged. Premature discharge of the metal would have resulted in a metal loss valued at \$15,000. Consequently, it was decided to establish auxiliary flow to these tubes. The remaining 33 tubes of active metal on this header were newly charged and did not require any special cooling. While establishing auxiliary flow is not in violation of Process Standards, it was considered prudent to use the PCA procedure to insure that all factors were considered in this unusual practice.

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It may be well to point out at this time that the reactor had been down long enough that if water was lost to an individual tube for an indefinite period the fuel surface temperature would not have risen above 350° C, which is well below the temperature at which any fuel jacket melting would occur.

To provide cooling to the irradiated metal tubes, the through reactor decontamination manifolds were modified to provide 55 outlets. These manifolds were connected to the main process water supply riser through the individual tube flushing riser. The 55 outlets were then connected to the irradiated metal tubes. There were only 30 "stingers" available, so 30 of the tubes were put on the manifold supply by inserting a stinger in the nozzle. The remaining 25 connections were made by adapting a piece of hose to fit the pigtail opening on the tube nozzle. A manometer was installed in one tube on each manifold to aid in monitoring the flow. The flow was controlled by a valve which regulated flow to a pair of tubes. The caps were removed from the rear of the irradiated metal tubes, and the flow was transferred from the main supply to the auxiliary supply, two tubes at a time. The two tubes were always a pair supplied by a common flow regulating valve. The first pair of tubes set up from each manifold included the tube with the manometer attached. Following a setting of flow corresponding to 20-25 inches, as measured by the manometer, the flow rate emanating from the rear of the tube was observed from the central viewer. As the flow to each tube was transferred to the auxiliary supply, the flow rate was adjusted to correspond with the flow coming from the tube equipped with a manometer. Flows were continuously monitored on front and rear during the entire period the tubes were cooled from the auxiliary supply. Also, continuous tube temperature monitoring was in effect during this period even though it was questionable that the temperature monitor was effective with the rear caps off. No personnel were permitted in the discharge area from the time the caps were removed prior to establishing auxiliary flow until the flow was restored from the repaired header.

The crossheader was isolated from the risers by closing the two header valves. It was stripped of all hardware between the spool pieces at each end of the header. The crossheader was disconnected at the spool pieces and was saved about 15 inches to the left of the 2 1/2 inch drain pipe junction. The far section of the crossheader was removed to the DR Maintenance Shop where a 30-inch section, which included the damaged area, was removed, and a new 30-inch prefabricated section was welded in. The section of header was then taken to the front face and welded in place on the header.

The header was then blanked at the spool piece location at each end of the header and was pressure tested at 920 psi. The crossheader was reconnected to the near riser and flushed for five minutes to flush out any foreign material which may have resulted from the welding. Following the flush the header was restored to normal.

The welding operation was observed by J. W. Scoggin, Inspector, who accepted the three welds. X-rays taken of the new welds also showed them to be acceptable.

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Normal water supply was restored to the process tubes by maintaining a 40-inch differential pressure on the repaired crossheader while the tube flow was transferred, two tubes at a time, from the auxiliary supply to the normal crossheader supply. Continuity of flow checks were run on each of the tubes as they were returned to the crossheader.

Panellit continuity checks were performed on each tube by valving the Panellit line closed at the tube location then opening the valve and observing the response to pressure change on the respective Panellit gauge. This completed the repairs and test on No. 25 crossheader. The damaged section of the crossheader will be examined, and a report on the findings will follow the examination.

COST INVOLVED IN THE INCIDENT

1. Repair costs totaled \$1,400.00.
2. The time used in evaluating and repairing the damage amounted to 21 hours.

CAUSE AND RECOMMENDATIONS

The investigation, conducted on July 16, 1963, was reported in document Serious Accident IPD 63-9. In this investigation it was determined that the cause of the incident was an inadequate method of securing the charge machine mounting rail.

The incident points out the need for a detailed periodic inspection and review of platform clearances and equipment repair status. A periodic audit of front face equipment by Applied Reactor Engineering may help in disclosing an oversight in the PM program, and thereby prevent any additional incidents of this nature.

Consideration should be given to developing procedures and equipment needed to cope with a similar problem.

Recommendations resulting from the Serious Accident Investigation are as follows:

Specific

1. Carriages should be inspected and modified as necessary to insure that rails and hangers are in proper position and securely fixed in position.
2. All other installations on the work platform, which receive thrust, should be checked to make sure they are secured in place by an approved design.

General

1. All plants should make a detailed inspection of equipment mounted overhead to insure that adequate clearance exists between the mountings and all front face hardware. Equipment which receives forward thrust and is in a fixed position, should be properly secured using an approved design.

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2. Applied Reactor Engineering should study the possibility of using protective devices in the sections of the work platform not covered by the "broomstick."

A. R. Maguire

Manager
D-DR Reactor Operation

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