MAINTENANCE AND REPAIR EXPERIENCE OF THE N.S. "SAVANNAH"

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ABSTRACT

The N.S. SAVANNAH has been in operation over ten years. During this time a substantial amount of maintenance and repair has been performed on the nuclear plant and associated systems.

Maintenance and repairs can be broken down into two major categories which are inspection, calibration and repairs performed routinely as a preventative maintenance program and those repairs necessary because of equipment failure.

The preventative maintenance program is primarily associated with the U.S. Coast Guard annual inspection. A major preventative maintenance program was performed on the electro-hydraulic-mechanical control rod drive system during the first refueling in 1968. The program included a complete electrical and mechanical overhaul of each control rod drive mechanism.

There have been two major equipment failures during operation of the N.S. SAVANNAH. The first, in June 1965, was a failure of the primary canned rotor pumps. The pump failures were caused by a leak in the electrical terminal bushings which admitted air from the containment to the pump stator cavity during a 60 psig containment leak rate test. The four pumps were replaced with spares and subsequently repaired including installation of new cans. The second, in 1969, was a failure of several of the buffer seals. The seals were installed in 1961 and had lost their resilience. In addition, the operation of a seal return flow stop valve may have caused higher than normal pressure and several tests performed prior to the failure may have subjected the seals to excessive pressure. The buffer seal capsules were removed from the reactor head, disassembled and the seals were replaced.

Maintenance experience with the SAVANNAH has been very good with only two major equipment failures in 10 years.

The Nuclear Ship SAVANNAH, a joint project of the U. S. Atomic Energy Commission and the Maritime Administration of the U. S. Department of Commerce, was constructed to demonstrate to the world (1) the intent of the United States to employ the power of the atom for peaceful productive purposes and (2) the feasibility of using nuclear energy to power merchant ships. The building of a nuclear powered merchant vessel was first proposed in April 1955. Construction was authorized by Congress in July 1956, fabrication of the nuclear plant commenced in 1956, the keel was laid in May 1958 and the vessel was launched on July 21, 1959. The nuclear fuel was installed in November of 1961 and the reactor was brought critical for the first time on December 21, 1961.

The ship sailed to Yorktown, Virginia in 1962, had her initial sea trials in March and was delivered for operation on May 1, 1962. An operating authorization was issued in August, 1962 and an initial tour of 11 domestic ports was then undertaken. The SAVANNAH has since sailed a total of 454,675 miles.

Since maintenance is performed on ships on a daily basis, it would be impossible to document all of the individual instances when maintenance was performed; therefore, this paper will be limited to (1) a description of the special maintenance facilities for the ship located at Todd Ship-

yards Corporation, Galveston, Texas, (2) items which were replaced because of frequent malfunction, (3) major preventative maintenance performed, and (4) major maintenance required because of equipment failure.

Special Nuclear Facilities

The Nuclear Facilities are located in the extreme eastern end of Todd Shipyards Corporation, Galveston Division Shipyard. Located in this nuclear exclusion area is a nuclear facilities building, a high raised structure approximately 67 ft wide, 122 ft long, and 67 ft high with a steel I-beam frame structure, a corrugated asbestos cement roof and corrugated asbestos cement walls. An illustration of the facilities is shown in Figure 1, "Special Nuclear Facilities".

The building is equipped with an overhead bridge crane capable of lifting 75 tons, a spent fuel storage pit, various grappling and handling tools, a reactor mock-up pit, a decontamination room, a demineralized water system, a radiation monitoring system, an emergency power supply and a fuel storage area.

The east end of the building has three levels: the main floor houses the steam heating equipment and a low bay work and storage area; the second and third floor areas measuring approximately 66 x 20 ft contain offices and a chemistry laboratory.

In the immediate vicinity is the instrument electrical work shop which is air-conditioned with all incoming air being filtered. The shop is equipped with pneumatic, electrical and electronic calibration equipment. The primary standards for the electronic calibration equipment are manufactured and calibrated to reference standards certified by the U. S. Bureau of Standards.

The pier used for berthing the ship is approximately 674 ft long, 40 ft wide, and 12.4 ft above mean low water. The pier contains all service outlets including compressed air, fresh water, oxygen, acetylene, salt water, steam, demineralized water, and liquid radioactive waste transfer lines. The bearing deck of the pier is reinforced concrete and has four rail tracks running its entire length. The two center tracks are 90 lb rail, spaced 4 ft 11 inches apart for standard rail service. The two outer tracks are 175 lb rail for gantry crane service and are spaced 25 ft apart. The pier is designed to support 100 tons per crane wheel loading.

The Whirley Crane, mounted on the pier, has service access over the entire length of the Pier and sufficient shore travel to easily perform any heavy lift operation. The crane has a lifting capacity of 75 tons at 75 ft from the pivot point of the crane mount and has capabilities for a full 360° horizontal swing.

An additional facility is a barge called the N.S.V. ATOMIC SERVANT, designed to provide a mobile servicing

facility for the N.S. SAVANNAH for storage of irradiated fuel elements and for acceptance, processing and storage of liquid waste. The ATOMIC SERVANT also contains facilities and equipment for decontamination and contaminated repair work and a complete contaminated laundry facility.

Major Equipment Replaced

The first piece of equipment to be replaced because of frequent malfunction was the radiation monitoring system. The original system had 16 channels and 33 detector units. There was never a period after the original installation that all the original 16 channels were operational at any one time. Maintaining the system required more than 75% of the time of one technician for repair and trouble shooting the system. The equipment malfunctions not only disrupted normal instrument maintenance, but caused a greater workload on the part of the health physics monitor checking each alarm for confirmation of false alarms prior to notifying the technician in order for him to perform the necessary repairs. During the time that replacement was being considered, a review was conducted of operational requirements and health physics procedures. The conclusion was reached that the original radiation monitoring system was overdesigned with respect to the number of channels, particularly since all the locations or functions related to safety or plant operation were duplicated by routine measurements which would normally be performed by health physics personnel. The new system that was installed was a modern solid-state electronic system consisting of 13 channels. It occupied only two of five radiation monitoring cabinets in the control room and included readouts, recording functions, alarms and reset functions for all channels.

The second major replacement was the containment vessel electrical penetrations. Each time a containment vessel leak rate was performed many hours were expended in tightening the penetrations to reduce leakage. The new penetrations were of a fused-glass zero leakage design which were individually helium leak checked at 286 lbf/in². A comparison of the old and new penetrations is shown in Figure 2, "NS Savannah Electrical Penetrations". The new penetrations reduced the containment vessel leak rate from about 1.3% to less than 0.7% per day at 60 lbf/in².

The last major piece of equipment to be replaced was the main feed pumps. The original pumps required a significant amount of maintenance because of failure of bearings, packing glands, and gland seals. Also they could not be started remotely. The new pumps were installed to be started remotely with the control system designed such that there are status lights to inform the operator when a pump is correctly lined up for remote starting.

Major Preventative Maintenance

A great deal of preventative maintenance is performed

annually on the N.S. SAVANNAH. The preventative maintenance program is primarily associated with the U. S. Coast Guard annual inspection. The inspection consists of checking and calibrating approximately 115 nuclear and auxiliary plant instruments. Included are replacing of booster filters, checking all tubes and electronic components and replacing any worn linkage or damaged parts in the instruments. Also during the annual inspection relief valves are tested and the primary and auxiliary reactor systems are hydrostatically tested at which time valves and pumps are repacked and adjusted as necessary to prevent malfunction.

A complete overhaul of the Control Rod Drive system has been the largest single preventative maintenance program undertaken on the ship. It was accomplished concurrently with the first fuel shuffle.

There are 21 electromechanical hydraulic control rod drives located on the upper head of the reactor vessel. Each drive is connected to a control rod assembly by a vertical shaft located in a nozzle in the reactor vessel head. A buffer seal assembly prevents the primary coolant from leaking through the nozzle into the containment. The control rod is moved by the hydraulic and mechanical forces acting on the control rod and drive assembly. Each of the 21 drives is independent with respect to scram action. The electromechanical and hydraulic portions are independent of each other. No action of the electro-mechanical portion can affect the hydraulic scram capabilities. Figure 3 shows the complete "Control Rod Drive Assembly".

After the Control Rod Drive System, attached to the reactor head, arrived in the Facilities Building for maintenance the covers were removed and the head was placed on the head stand. The Control Rod Drive System maintenance structure was assembled around the unit. Figure 4 shows the "Control Rod Drive Maintenance Area". Service systems, including demineralized water for the buffer seal inlet header and a hydraulic test unit were connected to the structure. The Control Rod Drive System framework was not removed from the reactor head, but maintenance was performed on the component parts while they were disconnected. Before the components were removed from the control rod drive structure, the mechanism shafts were lowered and disconnected from the buffer seal shafts.

Twenty-one scram clamps were installed on the scram solenoids. The control rod drive electrical test units were connected to the structure junction box. The rod locking pins were removed and demineralized water was applied to the buffer seal shafts. Each shaft was lowered, disconnected from the mechanism, then raised and pinned in its full-up position of 70 inches.

All control rod drive components were tagged with system numbers before removal and photographs were taken of the control rod drive components for reference. As the components were removed from the structure, they were placed in storage racks and the cylinder ports and supply lines were capped. All Waterman flow control valves, accumulator liquid level switches, oil pressure switches, and gas pressure switches were removed. All electrical cables were removed, including the upper junction box to the scram and isolation solenoids. Once the control rod drive components had been disassembled, detailed maintenance was performed as follows:

1. New "O" rings were installed on lead screw upper flanges.
2. Hydrostatic testing was performed on the hydraulic cylinder to 4100 lbf/in².
3. Detailed inspection was made of drain tubing for oil leakage from the control rod drive motor gearbox seals, drive shaft spur gear and anti-backlash gear, and drive shaft bushing and bushing clamps. All were in good condition.
4. The drive chains were inspected and tightened.
5. The drive nuts, lead screws, rod locking pins, detent bearings and round head nylon screws in the drive carriage were inspected. All were in good condition.
6. One angle assembly spring was replaced; all other angle assemblies and latch assemblies operated properly.
7. The oil storage wick on each lead screw was inspected and all wicks were lubricated.
8. New felt was installed on each coupling piece.
9. The shroud anchors were inspected and tightened.
10. All lead screw seals and bearing grease supplies were checked and several bearings were greased.
11. Each control rod drive motor gear box oil level was checked and oil was added where needed.
12. All twenty-one hydraulic accumulators were disassembled, cleaned with alcohol and inspected. All had one or two small rust spots on the cylinder gas side walls. After cleaning, new "O" rings and back-up rings were installed in each accumulator.
13. The twenty-one Waterman flow control valves were overhauled. Each flow control valve was disassembled, cleaned, inspected, and reassembled with new "O" rings. The valves were found to be

clean and in good condition with the exception of two which were replaced.

14. New "O" rings were installed on all control rod drive hydraulic cylinder vent and drain plugs, upper and lower hydraulic panel hoses, scram valve solenoids and all panel valves.
15. Several valve mounting cap screws had to be removed by drilling the heads off, removing the valve and then removing the bolt.
16. The control rod drive motor gear box units were replaced.
17. The buffer seal bolts were removed, inspected and X-rayed. New buffer seal bolts were installed as necessary.
18. Scram solenoids were all replaced as a preventative maintenance measure.
19. One torque transmitter was replaced.
20. The scram time test circuitry was modified to allow the test to be performed from a common terminal board.
21. New cables between the upper junction boxes, control rod drive mechanisms and level detector switches were prefabricated.

After control rod drive maintenance was completed, the system was reassembled and many new parts were installed. New accumulator gas pressure switches with new tubing to the accumulators were installed. Installing the twenty-one accumulators and flow control valves was difficult. To alleviate an alignment problem installing these two systems, the opening in the control rod drive structure near the gas cap and the accumulator resting pads had to be enlarged. Also, a hydraulic hose with swivel adaptors was installed between the flow control valves and hydraulic panel. The buffer seals were installed. All twenty-one thimble platforms and a prefabricated oil drip sheet were installed. New electrical junction boxes were installed, including new cabling between the upper junction boxes and the level detection switches. The torque position transmitter and control transformer electrical connectors were connected after each mechanism was lowered into place. The armored cables were then connected to the upper junction boxes. With the equipment installed, the control rod drive mechanism was ready for testing.

The control rod hydraulic testing unit was connected to the system and the unit was started and pressure applied. Several small leaks were found and repaired. With the Control Rod Drive Hydraulic System in a zero lift mode, each mechanism shaft was lowered, connected to the buffer seal shaft, raised, and pinned in its full-out position. This completed connection to the buffer seal shaft.

Electrical testing was made in conjunction with the hydraulic test. The control rod drive was driven to its upper and lower limits and tests were made on the drive motor current, torque transmitter null voltages, position indicators, tachometer voltages, and limit switch settings. Both upper and lower limit switches required some adjustment. At the completion of these tests the armored cables were connected and tested, including the blower motor direction of rotation and scram time test continuity. The total time required for the over-haul was 14 days.

Major Equipment Failure

The first major equipment failure was the N.S. SAVANNAH's Main Coolant Pumps. The SAVANNAH's pressurized water reactor consists of two loops. Each loop has two primary coolant pumps mounted on the steam generator outlet plenums. The pumps discharge into a common header for each loop.

The Main Coolant Pumps are vertical, single-stage centrifugal pump units driven by an integral electric induction motor. The motor is of the "canned" type, that is, the rotor and stator are hermetically sealed by means of liners or cans in the magnetic gap. These cans are suitably backed to withstand the full system pressure. The main impeller is located at the lower end of the motor shaft. The motor rotor operates immersed in the pumped fluid. The bearings are of the carbon graphitar type. The above combination makes possible a unit that is hermetically sealed and the need for mechanical shaft seals and external lubrication is eliminated.

After four trouble-free years of operation, two of the four canned rotor primary coolant pumps unexpectedly failed and the condition of the other two pumps was suspect because of intermittent high current drain. This failure occurred during the start-up phase of a work outage; therefore, the outage was extended to allow for replacement of all four primary pumps. The pump failures were caused by a leak in the electrical terminal bushings which admitted air from the containment to the pump stator cavity during a 60 lbf/in² containment leak rate test.

Replacement of the pumps created an involved number of steps for removal and replacement in the containment vessel. The major steps involved in removing one of the pumps (PS-P2) are presented below to illustrate the complexity of the task:

1. Removal of the reactor hatch cover over the containment vessel.
2. Removal of the grating forward of the containment vessel cupola in the upper reactor compartment.
3. Removal of the equipment hatch forward of the cupola on the containment vessel.

4. Removal of the grating under the equipment hatch.
5. Removal of the railing and ventilation ducting on the starboard side of the control rod drive structure.
6. Removal of ventilation ducting and gratings over and adjacent to the PS-P2 volute.
7. Removal of one cooling water line adjacent to PS-P2.
8. Establishment of a radiation control area around the pump and protection of the surrounding areas from contamination.
9. Isolation of the loop by closing the gate valves and subsequent draining to the waste system.

The physical removal of PS-P2 involved the following significant steps:

1. The motor was disconnected electrically at the terminal box.
2. Cooling water lines were removed.
3. Welded vent and pump flush lines were cut. These lines were treated as contaminated.
4. Sixteen flange bolts were heated and removed from the periphery of the pump flange.

The pump was raised vertically out of the loop, rotated 45° out of vertical, moved athwartship 5 ft, raised 10 ft and rotated to the horizontal position after passing under the aft ring of the cupola. The top was raised until the pump was at a 45° angle to pass the starboard reactor vessel sway brace and then was rotated 90° beyond the horizontal position to pass the forward rim of the cupola. The pump end was lowered until the unit was aligned vertically under the equipment hatch. The unit was raised half-way through the hatch and tilted aft while being raised. It was raised diagonally through the hatch and was passed to the pier crane for transfer to the shore facility for repair. This movement of the pump is illustrated in Figure 5, "Pump Movement Out of Containment Vessel".

After the pumps were replaced with spares, it was decided to repair them at the Todd Facility rather than send them to the vendor for repair. Primary steps in repairing the pumps included drying of the stator windings. This was done because two of the failed pumps had stator windings which had been saturated with primary water and had to be dried out to bring the insulation resistance up to specification. The stators were dried by internally and externally heating.

A high vacuum system was applied to the stator cavity which contained a cold trap allowing sampling of the condensable vapors to determine if moisture was still being removed from the stator windings. The drying procedure was continued until no moisture was detected in the cold trap. At this point, the drying was secured and the stator windings maintained their insulation resistance when cooled to ambient temperature.

The next step was replacement of the stator and rotor cans. During replacement of the stator and rotor cans, sample cans and mock-up pressure caps were fabricated and the welder and weld procedures were qualified using these mock-ups. The installation of these cans have an extremely critical fit as the .0185 in. thick inconel can is fusion welded to the 304 stainless steel upper and lower pressure caps and (0) zero tolerance is the specification. Upon completion of the can welds, a liquid dye penetrant inspection was made and the stator and rotor units were subjected to a 3000 lb hydrostatic test. This test formed the cans to the rotor and to the stator lamination bars. On completion of the testing and pressure forming, the dye penetrant test was repeated and then the welds were helium leak tested.

After repairs were completed, it was found that the repair operation had changed the dynamic balance of the rotors. Each rotor was successfully balanced to the manufacturer's specification of .20 oz-in. for the shaft assembly, including all rotating parts.

On completion of balancing and reassembly, each of the four pumps were tested by installing them in a spare volute without an impeller. The volute had been sealed on both the inlet and discharge side and suitable pressurizing piping had been installed. Each pump was run for 24 hours; 12 hours at half speed operation and 12 hours at full speed operation. In addition, each pump underwent approximately five start-and-stop cycles.

Since the repair, two of the pumps have been reinstalled into the loop and have performed satisfactorily. It is believed that this is the first time canned motor pumps of this size have been repaired outside of a pump manufacturer's plant.

The second and last major equipment failure was a portion of the buffer seals. The buffer seal assemblies in the SAVANNAH reactor plant function as a buffer between the primary water within the reactor and the containment vessel atmosphere at the control rod drive penetrations. The buffer seals are multiple bushing-type pressure break-down devices consisting of stellite floating rings.

These buffer seals, installed in the SAVANNAH in 1961, had seen continuous trouble-free service and undergone routine inspections until the time of the 1969 outage, although recommended in-service life was known to be three to five years. Changing the seal packing was considered during the 1968 core shuffle; it was

decided unnecessary as the seal assemblies had maintained excellent performance during the extended period and periodic tests indicated neither excessive wear nor failure of any buffer seal component.

Faulty packing was discovered on March 14, 1969 during base-load operation. To replace the atmospheric and backup seal packing on all twenty-one buffer seal capsule assemblies, the entire assemblies would have to be removed from their installed position on the reactor head. Preliminary plant preparations were required prior to the operation, including installation of the instrumentation for monitoring reactor vessel water level during lower-than-normal water level conditions, modification of radiation monitoring channels to sense radiation in the immediate work area, and installation of an audible neutron instrument to monitor and alert personnel of abnormal core neutron multiplication. Detailed procedures were prepared to perform the work.

In lieu of taking the ship to the Galveston Facility it was decided to perform the work in the New York area at Todd Shipyards Corporation's Brooklyn Division. Since all the work was to be aboard ship, special work areas were required. The ship's attitude indicator was installed so the ship could be trimmed if necessary to place the rod drives in true vertical position.

Following preparation of detailed procedures and work areas, the actual outage was divided into five phases, commencing with Phase I, rod disconnect and mechanism storage.

This operation prepared the reactor head area for removal of the capsules from the reactor and involved the disconnection, removal and storage of the control rod drive mechanisms. A safety review of the operation assured there would not be control rod ejection or accidental withdrawal of a control rod.

Phase II involved removal of the capsule assembly from the reactor and preparation of the assemblies for overhaul, including separation of the buffer seal shafts and extension shafts and removal of the thermal sleeves.

This operation was somewhat simplified as the X capsule, removed and replaced with a spare during the 1968 core shuffle, was available for observation. This capsule was disassembled, inspected and reassembled to determine if any problems might be encountered with the 21 capsules in the reactor. Upon disassembly, two problem areas were revealed: high radiation and contamination levels would be encountered and difficulty would be involved in removal of the thermal sleeve. Some tools had to be specially fabricated. A clean room was constructed to prevent the spread of contamination during removal and installation of the thermal sleeves.

Phase III involved the overhaul of capsules, which was originally limited to the removal of the capsule clamp to permit atmospheric packing renewal. During disassembly of the original X capsule, two factors were revealed which increased the scope of the operation to include complete disassembly of all capsules.

The first factor was incorrect assembly of the capsule. The inlet water supply side of the buffer seal capsule had its packing rings and lantern rings incorrectly installed. The second factor was the considerable erosion evident on all inside surfaces of the rings.

It was decided to completely disassemble, clean, and inspect each part of all assemblies to determine wear and re-usability. Each part was cleaned, inspected and photographs were taken of the stellite rings. Assembly of the 100 parts making up one capsule were checked off piece by piece and individually examined for defects. Each part was then inserted in the capsule barrel, positioned and seal clamped with a 0.06 in. to 0.09 in. clearance between the clamp flange and capsule face, permitting easier installation of the capsule seal clamps.

During capsule overhaul the buffer seal shafts were cleaned, inspected, measured and inserted into the overhauled capsule assembly. The seal clamp was tightened after the buffer seal shaft was installed. During this phase, many unanticipated time-consuming difficulties were encountered due to the varied combinations of possible problem areas. Seven hundred and seventy seven measurements had to be taken and 2100 parts were cleaned. To disassemble all the capsules, 525 socket head cap screws were removed and then replaced.

Phase IV involved receiving the overhauled capsule from the clean room, installing the thermal sleeve and then installing the capsule in the reactor. The thermal sleeve was oriented by lining up the matching marks made during thermal sleeve removal. Newly fabricated set screws were installed and tack welded. The assemblies were transported to and placed in the maintenance stand where the buffer seal extension shafts were connected, the collector ring handling tool removed and the buffer seal shaft handling tool installed.

The fifth and final phase of the outage involved installation of CRD mechanisms and rod connect. Thimble platforms, collector rings and the dripshield were installed; mechanisms were installed and connected hydraulically and electrically and extension shafts were connected to the control rods. The control rod drive hydraulic system was lined up for "Zero lift" operation, a precritical valve and electric check was performed and each control rod was mechanically connected. A visual inspection between control rod drive mechanisms was performed to detect oil leaks during CRD system startup; only minor oil leakage was observed. Operation of the buffer seals since the overhaul has been satisfactory.

Operation of the N.S. SAVANNAH since criticality in 1961 has been very successful. The reactor has been operated 21,225 effective full power hours and plant operation at sea has been excellent with the reactor available for power 99% of the time.

The maintenance reported above covers all of the major items encountered during the nine and one-half year operation of the ship. It is felt the SAVANNAH has demonstrated that a nuclear merchant ship can operate safely and reliably in regularly scheduled service.

(1) Position Indicator	(14) Hydraulic Cylinder
(2) Load Screw Drive Shaft	(15) Ogee-Pat
(3) Hydraulic Piston Shaft	(16) Lower Mechanism Alignment Plate Flange
(4) Control Rod Sprocket Drive Assembly	(17) Drive Nut
(5) Load Screw	(18) Carriage
(6) Coupling Flange	(19) Drive (actuator) Pin
(7) Buffer Seal Shaft	(20) Latch Arm
(8) Buffer Seal Extension Shaft	(21) Tie Rod
(9) Reactor Vessel Head	(22) Inletic Platform
(10) Handling Arm	(23) Buffer Seal
(11) Rod Drive Motor	(24) Control Rod Nozzle
(12) Reduction Gear	(25) Control Rod
(13) Upper Mechanism Flange	

FIGURE 3
CONTROL ROD DRIVE ASSEMBLY

FIGURE 4
CONTROL ROD DRIVE MAINTENANCE AREA

FIGURE 5
PUMP MOVEMENT OUT OF CONTAINMENT VESSEL

D I S C U S S I O N

A.S. de BUSTAMANTO: I would like some comments on the necessity and/or convenience of such an expensive facility as the special nuclear facility in Galveston. It seems from the paper that this type of repair and maintenance work can be also done in a normal shipyard.

R. ALLEN: I agree that with one ship I think it is right that it is fairly expensive but such a facility could probably service ten to twelve ships per year, and therefore the cost would be cut down considerably on a pro rata basis, and thus you could serve more ships with very little additional equipment or personnel.

J. EDWARDS: Following on that last question, can you say if your special repair facility is going to be kept in service and if so, for how long? This is a slightly leading question, and is really asking how many more nuclear ships do you envisage in using it?

R. ALLEN: As long as we have nuclear ships to service, we will keep it open.

W. VINCK: Mr. Allen mentioned the deterioration of the leak rate of the containment vessel and the repairs which will be made. I was wondering whether this deterioration of the leak rate was especially due to sea-going conditions or whether they would have been encountered in a land-based vessel in the same way?

R. ALLEN: I think in this particular instance it would have been the same in a land-based plant because there was preliminary a design problem, the original design of the penetrations was not adequate.