ORGANIZATION: BUFFALO PUMPS
NORTH TONAWANDA, NEW YORK

REPORT NO.: 99901114/90-01	INSPECTION DATES: 07/30-08/03/90	INSPECTION ON-SITE HOURS: 64

CORRESPONDANCE ADDRESS: Mr. Charles R. Kistner, President
Buffalo Pumps
An Ampco-Pittsburgh Company
874 Oliver Street
North Tonawanda, New York 14120-3298

ORGANZATIONAL CONTACT: Terry Kenny, Vice President
TELEPHONE NUMBER: (716) 693-1850

NUCLEAR INDUSTRY ACTIVITY: Manufacturer of commercial-grade pumps and military specification pumps. Manufacturer of pumps to Section III of the ASME Code prior to 1983.

ASSIGNED INSPECTOR: Lamon L. Cilimberg 9/24/90
R. L. Cilimberg, Reactive Inspection Section No. 1 (RIS 1) Date

OTHER INSPECTORS: L. L. Campbell, RIS 1

APPROVED BY: Uldis Potapovs 10-5-90
Uldis Potapovs, Chief, Reactive Inspection Section No. 1, Vendor Inspection Branch (VIB) Date

INSPECTION BASES AND SCOPE:

A. BASES: ASME Code Section III, NCA-4000; 10 CFR Part 50, Appendix B, and 10 CFR Part 21.

B. SCOPE: To follow-up an allegation that pumps which leak during hydrostatic testing are impregnated with sodium silicate to fill porosity and prevent leaking during a second hydrostatic test. To determine if the fabrication of pumps, spare parts, and refurbishment of pumps for the nuclear industry is in accordance with nuclear utility requirements.

PLANT SITE APPLICABILITY: All plants with Buffalo Pumps (BP) commercial-grade pumps.

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A. VIOLATIONS:

Not applicable

B. NONCONFORMANCES:

Not applicable

C. UNRESOLVED ITEM:

At the time of the inspection, BP had not notified their customers that commercial-grade pumps may have been waterglassed (impregnated with sodium silicate). In some cases and applications, BP customers need to evaluate the suitability of waterglassed pumps for application at commercial nuclear power plants. The NRC inspectors requested that BP advise the NRC concerning such notification relative to generic communications being considered by the NRC. (90-01-01)

D. STATUS OF PREVIOUS INSPECTION FINDINGS:

Inspection Report 99901114/88-01, dated September 8, 1988, referenced BP management statements that the ASME nuclear stamp was allowed to lapse in 1982, and BP had not supplied new nuclear pumps, refurbished nuclear pumps, or supplied nuclear pump parts to the nuclear industry since 1982. This inspection determined that the BP ASME nuclear stamp was allowed to lapse in 1983. Although no ASME Section III pumps were supplied during this period, the inspection determined that BP did supply commercial-grade pumps and pump parts to the nuclear industry after 1983. Additionally, the present inspection confirmed that BP had not supplied any pumps or pump parts to ASME Section III or other nuclear standards (10 CFR Part 21 or 10 CFR Part 50, Appendix B) to any nuclear power plants after 1983.

E. INSPECTION FINDINGS AND OTHER COMMENTS:

1. The NRC staff informed BP management of the scope of the inspection during the entrance meeting on July 30, 1990, and summarized the inspection findings during the exit meeting on August 3, 1990.

2. The NRC received allegations that BP waterglassed pumps to prevent leakage of the pumps during hydrostatic testing. The allegers considered this practice a problem because they believed the coating could fail in service and prevent safe operation of the system in which the waterglassed pumps were installed. The NRC inspectors substantiated that BP did impregnate with sodium silicate (waterglassing) the casings and casing covers of commercial-grade pumps which leaked during hydrostatic testing. Review of 422 shop orders issued after 1983 and related utility, Nuclear Steam Supply System (NSSS), Architect

Engineer (AE), and contractor POs selected by the inspectors indicated that no unique nuclear requirements (10 CFR Part 50, Appendix B, 10 CFR Part 21, or Section III of the ASME Code) were invoked by the purchaser. Seven orders were identified in which BP supplied pressure boundary parts (casing and casing cover) to Arizona Public Service, General Public Utility Nuclear, Niagara Mohawk, Union Electric, and Yankee Atomic.

Interviews with BP personnel indicated that these parts could have been waterglassed. Non-pressure retaining parts are not waterglassed because the hydrostatic test does not affect these parts. Pumps and parts ordered to nuclear requirements until 1983 were not waterglassed. Documentation could not be found which indicated when commercial pressure boundary parts were waterglassed to prevent leaking which was detected during the initial hydrostatic testing. Waterglassed parts can not be detected by visual examination. The allegations were substantiated on the basis of statements made by BP employees to the extent that if during the performance of a hydrostatic test a commercial-grade pump casing or cover exhibited through wall leakage, waterglassing may have been used to prevent the through wall leakage.

3. Waterglassing

Waterglassing is a term used in the pump manufacturing industry which means the impregnation of metal castings with sodium silicate to seal porosity and tight cracks to prevent leakage during a hydrostatic test. BP used waterglassing on commercial-grade pump casings from 1957 to 1987. The waterglassing procedure most recently used by BP was Procedure CP 12-10, "Impregnation of Porous Metal Castings," Revision A, dated December 14, 1978. BP did not waterglass commercial pump casings unless the casings leaked during the hydrostatic test. If a pump casing leaked during hydrostatic testing, a decision was made by the tester or the foreman to waterglass or scrap the casing. Sodium silicate (40 degree Baume') is mixed with water in a ratio of 1 to 7 to form waterglass. Waterglass was poured into the casing until full, and 50 psig above the hydrostatic pressure was applied until the waterglass was observed to seep through the pores of the casing. The waterglass was then drained from the casing with the excess being washed away with water. Visual examination of the casing could not detect that waterglass was present after washing because the waterglass was below the surface of the metal. The casing was then heated to a temperature of 200°F for 2 hours to cure the waterglass. After cooling, the casing was hydrostatically tested. If the waterglassed casing passed the hydrostatic test, it was assembled into a completed commercial-grade pump and shipped to the customer. Commercial-grade pumps supplied to the nuclear industry

would have been waterglassed if the casings had leaked during the initial hydrostatic test. Pumps ordered to Section III of the ASME Code were not waterglassed because waterglassing was unacceptable to the ASME Code for repair of casings which leaked during hydrostatic testing. The Authorized Nuclear Inspector (ANI) signed the shop travellers at BP and waterglassing of ASME pumps would not have been permitted by the ANI.

A concern which could be postulated is the cracking of the waterglass in the system. A second concern is the potential for deterioration of the waterglass by the fluid being pumped which could result in fluid leaks through the casing. As of the writing of this report, the inspectors are not aware of any incidents that have been reported to the NRC or to BP which involved operating problems which resulted from the use of waterglassing to prevent fluid leaking through BP casings.

4. Discussions With BP Personnel

(a) The inspectors met jointly with Mr. Charles Kistner, President of BP and Mr. Terry Kinney, Vice President of BP. Mr. Kistner and Mr. Kinney started working at BP in March 1987 and January 1986, respectively. Both stated that BP employees told them that waterglassing pump pressure boundary parts such as the casing and casing cover was a common practice. Both indicated that waterglassing had been performed on commercial pumps and pumps supplied to the Navy. They indicated that there is reason to believe that any pump casing or casing cover produced by BP could have been waterglassed except pumps and parts ordered to the requirements of Section III of the ASME Code.

Messrs. Kistner and Kinney stated that POs received from nuclear utilities after 1983 which imposed ASME Section III, 10 CFR Part 50, Appendix B, or 10 CFR Part 21 requirements have not been accepted unless the utility deleted these requirements and agreed to accept the pump or pump part as a commercial-grade component. The reason stated for this practice was that BP's ASME nuclear stamp expired in 1983.

Mr. Kinney stated that BP has received no reports of operating problems related to pumps or parts which had been or could have been waterglassed.

(b) The inspectors also discussed the BP waterglassing activities with Mr. Marvin Werth, a BP Machinist and Mr. Rodney Hassely, the Shop Steward at BP. Mr. Werth indicated that waterglassing had been performed since he started working for BP in 1950 and

was stopped in 1985. He indicated that he was foreman in the assembly area where waterglassing and hydrostatic testing was performed for only one year, 1968.

Mr. Werth indicated that non-ferrous pump casings were waterglassed at the direction of the foreman when the casing leaked during the hydrostatic test. He said that cast iron was waterglassed but he was not sure about stainless steel.

Mr. Werth explained that the three types of pumps manufactured at BP were nuclear ASME Section III, Navy, and commercial. Messrs. Werth and Hassely indicated that the controls on nuclear pumps required color coded travellers, tool control, inspection hold points, and segregation of items. Personnel received training on what was permitted on nuclear pump manufacture and waterglassing was not permitted on nuclear pumps. Mr. Werth noted that nuclear pump casings were easily recognized because they were thicker and heavier than commercial casings, the parts were routed in cages, and every item was marked with green paint. Messrs. Werth and Hassely stated that they were not aware of a nuclear pump being waterglassed. Mr. Werth said that pumps were hydrostatically tested after assembly. A common practice on leaking commercial pumps was to waterglass the casing and repeat the hydrostatic test to confirm that the waterglassed pump did not leak. He repeated the statement that nuclear pumps were not waterglassed. He added that commercial pumps were not waterglassed if the casing did not leak during hydrostatic testing.

(c) The inspectors also met with Mr. Marty Kraft, Regional Sales Manager/Navy Division who was the QA Manager at BP from 1986 through January 1990 and was a QC Inspector prior to 1986. He stated that waterglassing was done when the hydrostatic test failed, and the hydrostatic tester performed waterglassing on his own authority or by the direction of the foreman. He indicated that the shop traveller for a commercial-grade pump or part shows only that a hydrostatic test was passed and not whether waterglassing was performed to prevent leaking during the initial hydrostatic test. He maintained that waterglassing could have been performed on any type commercial pump material, but the QC technician, the ANI, and controls in place prior to 1983 prevented waterglassing of nuclear pumps.

Mr. Kraft explained that the waterglassing process involved filling the pump casing with sodium silicate, pressurizing the casing until the liquid is in the porosity and small cracks,

depressurizing the casing, draining and washing off excess sodium silicate, baking the casing in an oven, cooling the casing, and then repeating the hydrostatic test to ensure that waterglassing had plugged the leaks. He stated that some commercial pump casings which leaked during the hydrostatic test could have been repaired by welding and then waterglassed after the weld repair if they leaked during the hydrostatic test which was always performed after weld repair. Mr. Kraft indicated that no waterglassing had been performed by BP since 1987.

5. Document Review

The NRC inspectors reviewed 422 shop orders issued in 1984, 1985, and 1986 for POs from BP customers who are known to do business with commercial nuclear power plants, but the inspectors could not, for every order, determine if the orders were intended for application in a commercial nuclear power plant. The review encompassed the population of orders which could have been intended for nuclear application. Of the 422 orders, 197 were for non-pressure boundary items such as bushings, bearings, gaskets, seals, rings, and pump repair kits. Of the remaining 225 orders associated with pump pressure boundary items, 70 were not sent to commercial nuclear facilities, and 155 orders were purchased by utilities or organizations associated with commercial nuclear power.

Of the 155 orders that could have been sent to commercial nuclear power plants, 7 orders were on POs from 5 nuclear utilities, and 148 were purchased by organizations known to have supplied items to utilities for use at nuclear power plants. None of the orders reviewed imposed requirements unique to nuclear procurement such as 10 CFR Part 50, Appendix B, 10 CFR Part 21, ASME Section III, or any nuclear specification or regulatory requirement.

The end use of 154 orders is unknown. One order (Shop Order 84440638 and customer PO 026262) indicated that Part 21 was not applicable. The order was placed in 1985 for a casing cover by GPU Nuclear Corporation for the Oyster Creek Nuclear Station. The GPU PO indicated that the cover was to be used in the off gas closed cooling water system and required a certified material test report for chemical composition and a certificate of compliance for the casing material. The GPU PO indicated that the part was important-to-safety but was ordered commercial-grade and no requirements unique to nuclear procurement were imposed.

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F. PERSONS CONTACTED:

J. Amico, Jr. - Sales Engineer
L. Bernis, - Sales Clerk
R. Hassely - Shop Steward
T. Kinney - Vice President
*C. Kistner - President
M. Kraft - Regional Sales Manager
J. Roman - Chief Order Processor
M. Werth - Machinist

*Attended exit meeting