August 30, 2004

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U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Monticello Nuclear Generating Plant
Docket 50-263
License No. DPR-22

Response To Request For Additional Information Related To Inservice Testing Program
Relief Request PR-07 (TAC No. MC1955)

References: 1) NMC Letter to NRC, "Inservice Testing Program Fourth Ten-Year Interval Relief Request PR-07," dated February 6, 2004

2) NRC Letter to NMC, "Monticello Nuclear Generating Plant – Request for Additional Information Related To Inservice Testing Program Relief Request PR-07 (TAC No. MC1955)," dated June 24, 2004

In Reference 1 the Nuclear Management Company, LLC (NMC) requested U.S. Nuclear Regulatory Commission (NRC) approval of the Monticello Nuclear Generating Plant Inservice Testing Program Fourth Ten-Year Interval relief request PR-07. In Reference 2 the NRC requested additional information concerning the requested relief.

Enclosures 1 - 6 of this letter provide the NMC response to the NRC request for additional information.

This letter makes no new commitments or changes to any existing commitments.

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If you have any questions regarding this submittal, please contact John Fields, Senior Licensing Engineer at (763) 295-1663.

Thomas J. Palmisano, Site Vice President
Monticello Nuclear Generating Plant
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Enclosures (6)

cc: Administrator, Region III, USNRC
Project Manager, Monticello, USNRC
Resident Inspector, Monticello, USNRC

ENCLOSURE 1

MONTICELLO NUCLEAR GENERATING STATION
RELIEF REQUEST NUMBER: PR-07

On February 6, 2004, the Nuclear Management Company, LLC (NMC) requested U.S. Nuclear Regulatory Commission approval of the Monticello Nuclear Generating Plant Inservice Testing (IST) Program Fourth Ten-Year Interval relief request PR-07. The NRC requested additional information (RAI) concerning this relief request via letter dated June 24, 2004. The questions from this RAI are provided in 'bold' text below with the NMC response provided in standard text immediately thereafter.

Question 1

Provide the originally specified design flow rate and total dynamic head (TDH) for EFT-ESW system pumps. Based on the design flow rate and TDH, describe briefly the criteria used for pump specifications and how the specific EFT-ESW pumps were finally selected. Also, provide the design documents of how the minimum flow requirement is determined for the affected system. It appears that the pump TDH is under-specified while the flow rate is over-specified.

Response

The original Control Room Emergency Filtration Train-Emergency Service Water (EFT-ESW) System pumps were rated at 200 gpm at 150 feet total head.

In the year 2000 the EFT-ESW pumps were replaced. The reason for the replacement was not because of inadequate size or EFT-ESW System performance problems, but recognition that the original EFT-ESW pump suction columns were too long, which resulted in the EFT-ESW pump suction bells sitting too close to the intake bay floor and the pumps taking in large quantities of silt and mud. This resulted in increased cleaning-related maintenance. Prior to installation of the present pumps, pump differential pressure typically decreased over the cycle to the point where maintenance had to be performed. Little or no wear was typically found on pump internals, but the bowl passages and suction bell were found to have a silt/mud deposit buildup that reduced flow areas and resulted in decreased EFT-ESW pump discharge pressures.

The present EFT-ESW pumps have shorter columns that reduce the potential for silt buildup by increasing the distance of the suction bell from the intake bay floor. The present EFT-ESW pumps were selected to produce the maximum discharge pressure possible without exceeding the design pressure of the EFT-ESW System or exceeding the motor horsepower rating of 15 HP. Due to present EFT-ESW pump design and efficiency, more flow is achievable with the same 15 HP motor. The current specified rating of the EFT-ESW pumps are rated at 200 gpm at 188 feet total head or 250 gpm at 174 feet total head.

ENCLOSURE 1

Relief Request PR-07 discussed, in-part, minimum system flow rate requirements. Documents discussing the cooling water requirements plus additional pump loads that the EFT-ESW pumps deliver are provided in Enclosure 2. These documents demonstrate the required loads on the EFT-ESW system based upon analysis and vendor recommendations. Table 1 below provides a summary of the loads and additional information concerning EFT-ESW pump flow requirements, including non-isolated loads that each EFT-ESW pump supplies.

Table 1

Pump	Cooling Water Requirement (gpm)	Cooling Water Requirement plus additional Pump Loads (gpm)
P-111C[1]	95	107[3,4]
P-111D[2]	91	103[3,4]

Note 1: Pump IST test flow rate = 143 gpm
Note 2: Pump IST test flow rate = 126 gpm
Note 3: 2 gpm to Core Spray Motor – additional non-required long-term ESW System minimum flow rate requirement
Note 4: 10 gpm to HPCI Room Cooler – additional non-required long-term ESW System flow requirement

The present EFT-ESW pumps have the capability for higher flow that adds additional margin, which reflects a common design philosophy (to allow for the potential addition of future loads and provide additional margin) for nuclear applications. Therefore, it is incorrect to conclude that the pump total head is under-specified while the flow rate is over-specified.

As can be seen from Table 1 above, the current test flow points of 143 gpm for P-111C and 126 gpm for P-111D have margin to the design basis accident conditions.

Question 2

Provide the test procedures for the EFT-ESW pumps (specifying the test loop) and acceptance criteria. It appears that the test loop is also the actual flow path for the EFT-ESW system under accident conditions. In order to achieve the highest flow rate, the system resistance cannot be varied during the test. If the system resistance cannot be varied during the test, ASME OM Code ISTB 5.2.3 (c), "Comprehensive Test," requires that the flow rate and pressure be determined and compared to their respective reference values. Discuss whether the requirements of ISTB 5.2.3(c) apply for the EFT-ESW pump test.

Response

The quarterly and comprehensive test procedures are provided in Enclosure 3. The test loop used in these procedures is the actual flow path for the EFT-ESW System under accident conditions, with the exception of a by-pass valve being opened around the EFT Cooler temperature control valve to provide higher flow rate for testing purposes. The procedures indicate that NMC does vary system resistance during testing; ISTB 5.2.3(c) does not apply to the EFT-ESW pumps, because the system is throttled to attain a repeatable testing flow rate. Therefore, ISTB 5.2.3(b) and ISTB 5.2.2(c) would apply to this code required testing.

Question 3(a)

Provide the system modification cost, including pump replacements, such that CPT can be performed at a flow ±20 percent of pump design flow, along with any difficulty in making the modifications.

Response

NMC has evaluated modification options available to meet the code required Comprehensive Pump Test (CPT) requirements. The costs associated with these modifications are provided in Table 2 below. Details of each option are provided below table 2.

Table 2

Option		Estimated NMC Cost
1	Replace present pumps with ones with higher pressure performance capability	$ 1,100,000
2	Install a separate isolable test loop to perform full flow testing of the present pumps	$ 220,000

Option 1: This modification would replace the present pumps with pumps of higher-pressure performance capability, selected such that the OM Code requirements for CPT would be met. This option is not feasible in the short-term due to the extensive modifications required, scheduling of resources, and a Refueling Outage required for implementation. The lead-time for ordering replacement pumps and for developing the design and modification packages precludes implementation of this option during the Spring 2005 Refueling Outage. Therefore this option is not available to be implemented until the Refueling outage in 2007.

Option 2: This modification would install a separate isolable test loop to perform full flow testing of the present pumps, P-111C and P-111D. This option would

be difficult to perform on line and would require extensive modifications. It is estimated that implementation of this modification would exceed the Technical Specification allowed outage time requirements and therefore a Refueling Outage would be required to complete installation. Further, development, fabrication and correlation testing of a separate isolable test loop, together with development of the design and modification packages, precludes implementation of this option during the Spring 2005 Refueling Outage. Therefore this option is also not available to be implemented until the Refueling outage in 2007.

Other options have been evaluated and discarded due the high risks associated with plant operation while performing testing (e.g., cross-connecting both trains of the EFT-ESW system together). As previously indicated, the identified available options would require extensive development and modification packages. The milestone for completion of a design change package for the Spring 2005 Refueling Outage was March 12, 2004. In accordance with the current code, the CPT is required to be performed for the EFT-ESW System pumps by June 1, 2005. Due to the lead-time for the manufacture or development and testing of critical components and the complexity and scheduling of the overall evolution, it would be a significant hardship to perform any of the available options by June 1, 2005. Therefore, relief from this Code requirement is necessary.

Question 3(b)

Provide the records and history of maintenance and repair work performed on the EFT-ESW pumps from the time NMC installed them in January 2000. Also, explain (including providing the records and history of maintenance and repair work performed on the pumps) why the original EFT-ESW pumps need to be replaced.

Prior to 2000:

As described in the response to Question 1, NMC experienced increased cleaning-related maintenance due to the close proximity of the EFT-ESW pump suction bells to the intake bay floor. During the cleaning-related maintenance of the pumps, minor maintenance, gaskets, O-rings and wear rings were replaced. Maintenance observations indicated that the pumps were degraded due to accumulation of silt and dirt in bowl passages, not due to failure of pump components.

Post 2000:

EFT-ESW pumps, P-111C and P-111D, were replaced under the direction of Modification 99Q050, "ESW Flow Improvement". After the pump replacement, the only significant maintenance has been associated with routine motor bearing lubrication. See Enclosure 4 for the associated work order.

Question 4

As shown in the pump performance curves provided by Johnston Pump Company in NMC's submittal of February 6, 2004, the pump design flow is 250 gpm at 174 TDH. In accordance with ASME OM Code ISTB 4.3(e)(1), "Reference Values," reference values must be established within ±20 percent of pump design flow rate for the comprehensive flow test. Explain why NMC uses ISTB 4.3(e)(2) for Group A or B tests to determine an IST design flow rate for CPT. It appears that NMC will continue the existing pump test of 50 percent to 57 percent of the design flow rate. However, by introducing an IST design flow of 200 gpm, the proposed reduced-flow test looks more like a flow test of 63 percent to 72 percent. Because the pump is expected to operate at a significantly lower design flow rate, can the pump be run reliably for an extended period of time following the accident?

Response

Yes, the pumps can be run reliably for an extended period of time following an accident.

Prior to entering the fourth ten-year IST Interval, in anticipation of meeting the ISTB 4.3(e)(1) and ISTB 4.3(e)(2); NMC performed testing to attain the highest repeatable flow rate that could be achieved consistently, which is the requirement of ISTB 4.3(e)(2) for Quarterly testing. Specifically, NMC performed testing of the present Monticello EFT-ESW pumps to determine whether a repeatable test flow rate of 160 gpm or greater could be sustained (160 gpm is within 20 percent of IST pump design flow rate of 200 gpm).

The highest repeatable flow rates attained during the test were:

P-111C Pump: 156 gpm
P-111D Pump: 137 gpm

NMC reviewed the data from this test against past data from the time the present pumps were installed (January of 2000). From this review, NMC selected the current flow reference points for the two EFT-ESW pumps, based on being able to meet these flow rates reliably and consistently over a course of time which would include seasonal and normal systematic variability's (system resistance changes prior to cooler cleaning, etc.). Since the criteria of ISTB 4.3(e)(1) cannot be attained based on earlier testing, Relief Request PR-07 was submitted to the NRC.

During the project development phase to replace the subject pumps in the late 1990s, NMC procured the pumps with a specified minimum design flow of 200 gpm. The pumps provided by the vendor have the capability of higher flow that adds additional margin, as previously described. The vendor pump curve specifies the pump design capacity as 250 gpm (see Relief Request PR-07, Figure A and Figure B).

Per the vendor, these particular pumps could have been selected for the EFT-ESW service within a wide range of service. The vendor has subsequently determined that continuous pump service is supported within a design flow range of ≈ 138 to 330 gpm.

Given this design range, NMC determined that any one point within that range can be considered a design point, or design flow, for a particular application. Therefore, the final design point, or NMC designated flow for the EFT-ESW pumps was therefore not critical to the vendor and ultimately the final selection point for these pumps, since the vendor design flow range was met for continuous service.

NMC has specified the IST design flow requirement for the two EFT-ESW pumps as 200 gpm. In assigning this IST design flow value NMC has achieved both consistency with the requirements of the Code and the stated vendor design capability of the pump. The current flow test points that can be achieved have margin to the design basis accident condition, as previously discussed in the response to Question 1.

Further, the pump design meets the intended service conditions for EFT-ESW. The design incorporates special cavitation resistant stainless steel material and bearings suited for increased loads to exceed the post-LOCA accident mission time of 30 days. This allows the pump to be operated reliably at 70 gpm for at least 100 days.

Question 5

Give the details (e.g. temporary modifications of piping) of any EFT-ESW pump full-flow testing performed during pre-service or during service since the start of commercial operation. Also, provide any other full-flow data of pump shop testing provided by the manufacturer.

Response

Modifications had been made previously to increase the testing flow capability of the EFT-ESW system. On the previously installed pump selected pump impeller stages were increased in size to increase flow margin. Flow indication gauges were installed to facilitate IST. Various valves in the system were either completely removed, the internal components removed, or replaced with valves that resulted in less system resistance and thus an increase pump testing system flow. Installation of a bypass around the EFT Cooler temperature control valve(s) allowed higher flow testing of the subject pumps. For modifications that were prior to the installation of the present pumps, documentation has not been included, only discussed within this response. No modifications have been performed on the EFT-ESW system piping since the present pump installation in January 2000.

Prior to MNGP entering the fourth ten-year IST interval, the testing requirements of the code were met without this type of comprehensive pump testing.

ENCLOSURE 1

The pre-operational testing procedures used for acceptance of the two pumps are provided in Enclosure 5. The full-flow data of pump shop testing provided by the vendor is provided in Enclosure 6. Figure 1 and Figure 2 below show the data from the pre-op acceptance test plotted against the vendor pump curves. NMC in-situ pump testing demonstrated the pumps were capable of meeting the required minimum flow requirements for their intended service in design basis accident conditions.

ENCLOSURE 1

Pump P-111C

Page 8 of 14

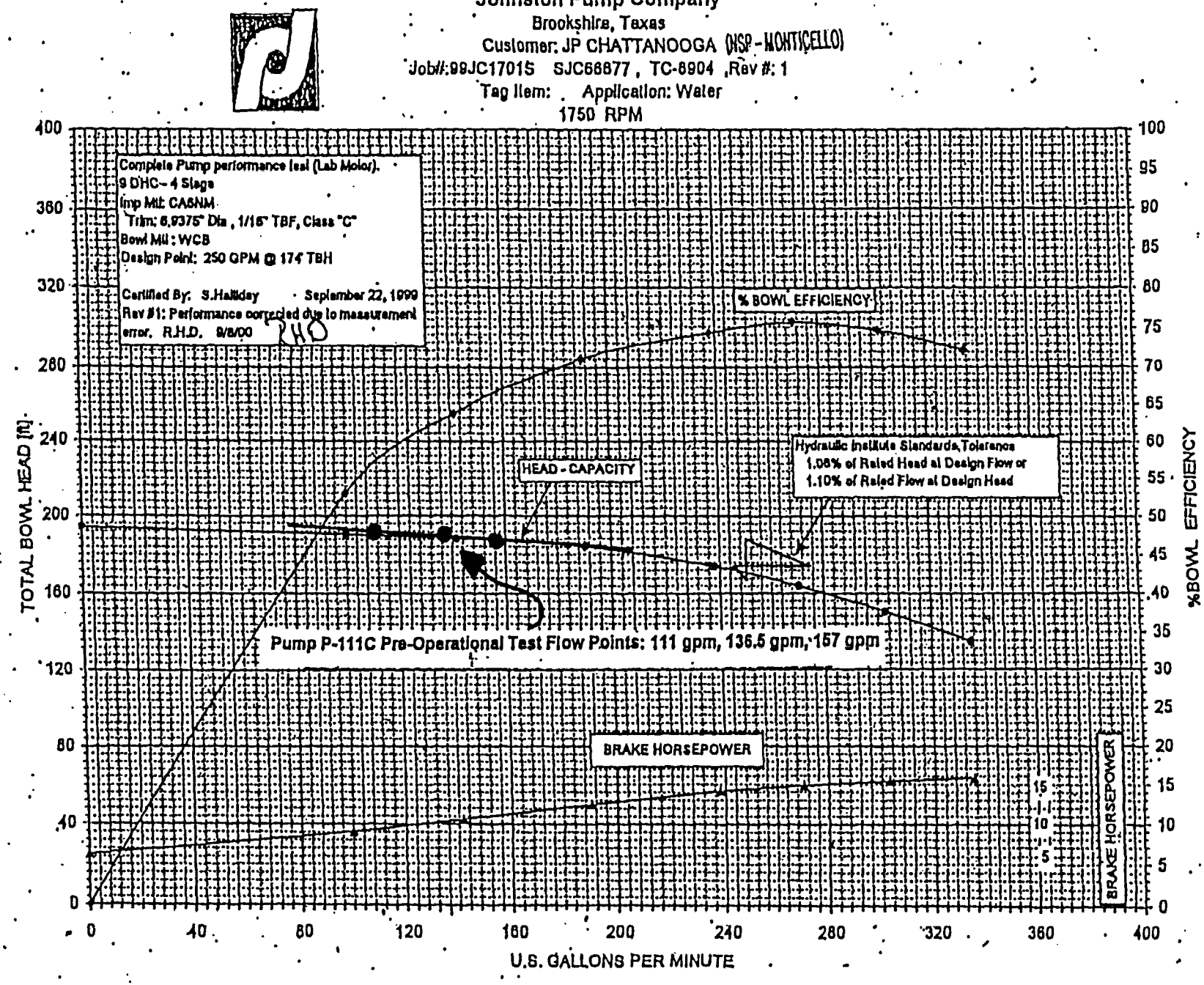


Figure 1

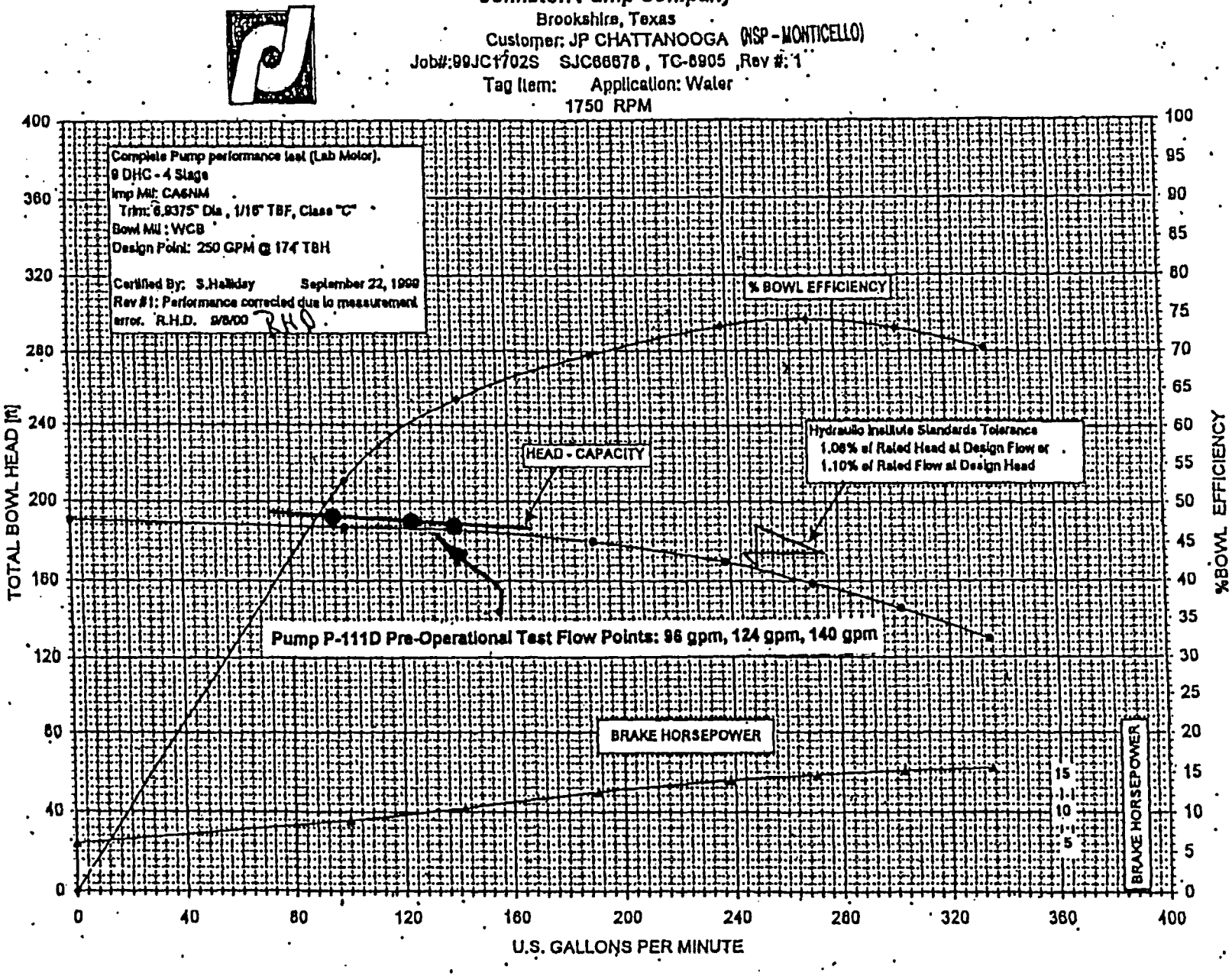

Johnston Pump Company
Brookshire, Texas
Customer: JP CHATTANOOGA (NSP - MONTICELLO)
Job#:99JC1702S SJC66676 , TC-6905 ,Rev #: 1
Tag Item: Application: Water
1750 RPM
Complete Pump performance test (Lab Motor).
9 DHC - 4 Stage
Imp Mtl: CA6NM
Trim: 6.9375" Dia , 1/16" TBF, Class "C"
Bowl Mtl : WCB
Design Point: 250 GPM @ 174' TBH
Certified By: S.Halliday September 22, 1999
Rev #1: Performance corrected due to measurement error. R.H.D. 9/8/00 RHD
% BOWL EFFICIENCY
HEAD - CAPACITY
Hydraulic Institute Standards Tolerance
1.06% of Rated Head at Design Flow or
1.10% of Rated Flow at Design Head
Pump P-111D Pre-Operational Test Flow Points: 96 gpm, 124 gpm, 140 gpm
BRAKE HORSEPOWER
TOTAL BOWL HEAD [ft]
%BOWL EFFICIENCY
BRAKE HORSEPOWER
U.S. GALLONS PER MINUTE
0
40
80
120
160
200
240
280
320
360
400
5
10
15
20
25
30
35
45
50
55
60
65
70
75
80
85
90
95
100

Figure 2

Question 6

The acceptance criteria of Table ISTB 5.2.3-1, "Comprehensive Test Hydraulic Acceptance Criteria," of the ASME OM Code specifies the acceptable, alert, and required action ranges required for CPT at the pump design flow. Justify the acceptability of using these acceptance criteria for pump tests at a lower flow rate. Alternatively, justify how operation at the lower flow confirms the capability of the pump to perform as required under design flow conditions or how it meets the intent of the CPT.

Response

The design basis accident condition is discussed in Table 1 under the response to Question 1. Margin exists between the design basis flow condition capability required from the pumps and the current flow testing points for the two pumps (P-111C: 126 gpm and P-111D: 143 gpm). Testing at these points confirms the ability of the EFT-ESW pumps to perform their safety function. The testing flow paths used for both the EFT-ESW pumps are the same as would be used for the accident condition, with the only exception being an open bypass valve around EFT Cooler temperature control valves to verify flow capability through the coolers. As seen in Figure 1 and Figure 2, NMC pre-operational testing of the two EFT-ESW pumps confirmed the in-situ capability of the pumps to perform their safety function above the design basis accident flow and demonstrated pump performance and characteristics were near the vendor's results in the range NMC could test at.

As is discussed in the response to Question 4, these particular pumps could have been selected for the EFT-ESW service within a wide range of service. Since the vendor supports the design range previously mentioned, any one point in that range can be considered a design point, or design flow, for a particular application. The final design point, or NMC designated flow of the EFT-ESW pump was not critical to the vendor and ultimately the final selection point of this pump, since the vendor design flow range was met for continuous service.

Table 3a and Table 3b provides a comparison of the change in pump head and pressure performance between the flow reference point band which can be achieved for pump P-111C (test band of 141 – 145 gpm), P-111D (test band of 124 -128 gpm) and a hypothetical 200 gpm point (test band of 200 – 204 gpm)*. For the Table 3a/b comparison, the vendor pump curves were used, which are representative of pump performance and characteristics per NMC testing.

* 200 gpm is selected based on –20% of 250 gpm (the NRC indicated design point) which would meet Code requirements for testing.

Table 3a

P-111C CPT Flow (gpm)	Code Allowed CPT Flow (gpm)	Change in Pump Head in Tolerance Band (ft)	Equivalent Gauge Pressure Change (psi)
143	--	0.28	0.12
--	200[1]	0.67	0.30

Table 3b

P-111D CPT Flow (gpm)	Code Allowed CPT Flow (gpm	Change in Pump Head in Tolerance Band (ft)	Equivalent Gauge Pressure Change (psi)
126	--	0.25	0.10
---	200[1]	0.75	0.33

Table 3a, 3b Notes

1: Nominal Value for test band of 200–204 gpm (200 gpm is the lower CPT limit for an assumed design flow of 250 gpm).

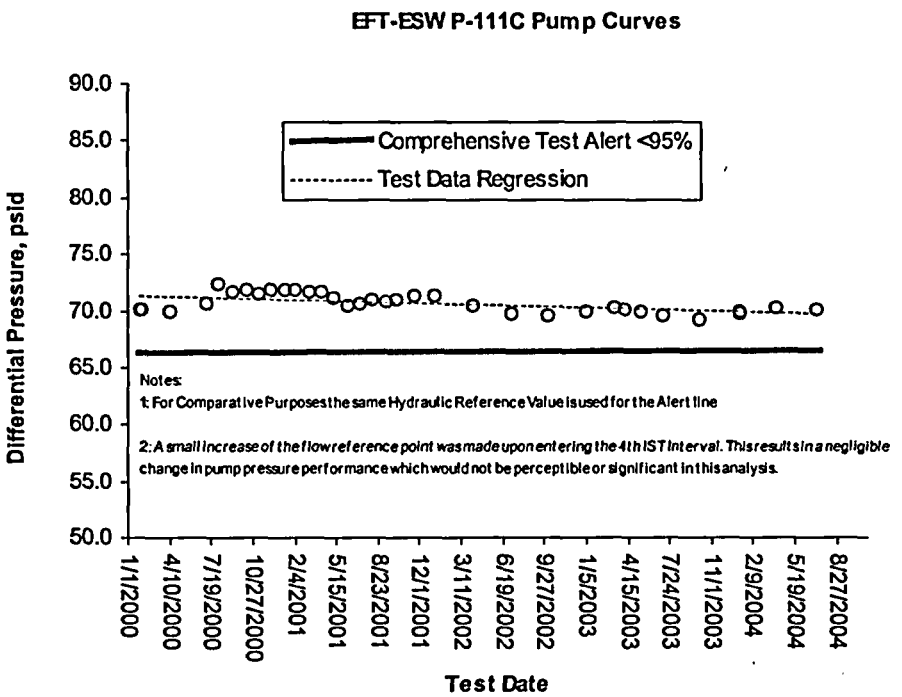
The discharge pressure analog instrument accuracy for the CPT is +/- 0.5% full scale. Using a 0 – 100 psig pressure gauge as an example, this equates to +/- 0.5 psi. A 0 - 100 psig gauge with 1 psig graduations can be read to 0.5 psig. For the Pump P-111C, the difference in the equivalent gauge pressure reading between the current test point which can be repeatably achieved and 200 gpm is 0.18 psig. For the Pump P-111D, the difference in the equivalent gauge pressure reading between the current test point which can be repeatably achieved and 200 gpm is 0.23 psig. Neither difference can be read on the example pressure gauge meeting the ISTB 4.7.1 accuracy requirements for CPT.

Since the small changes are within the Code acceptable instrument accuracy and readability, the detection of the change in pump pressure performance between the current test points and 200 gpm is statistically insignificant.

As can be seen in Table 1, the current IST testing flow points are above the design basis accident flow condition. The flow path used for testing is very similar to the flow path required for the design basis condition. The pre-operational testing performed

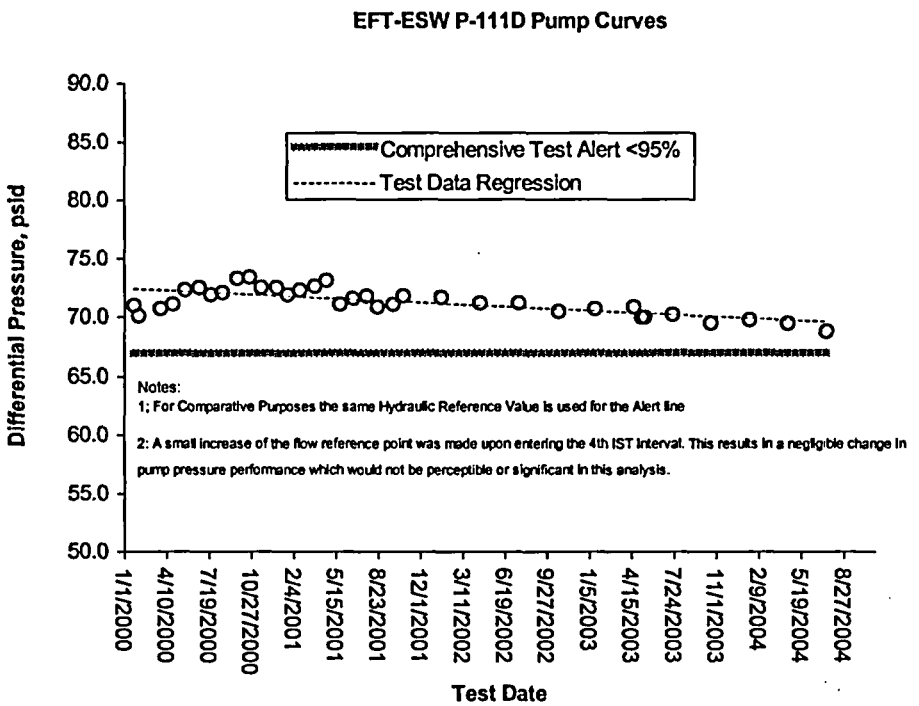
when the pumps were installed (Figure 1 and Figure 2) show the pump curves closely correlate to the vendor curves in the area of operation by NMC. Figure 3 and Figure 4 provide a trend history of the pumps since installation in year 2000. Linear regression through the trend data for both pumps show the present ability to monitor the pumps for degradation during Quarterly testing, which is satisfactory. Since these pumps are not in continuous operation, a gradual, decline in pump performance is evident, as would be expected from intermittent operation. Testing at the current flow points confirms the capability of the pump to perform as required under the design basis condition for the system, as detailed in Table 1.

Figure 3



ENCLOSURE 1

Figure 4



In summary, the following points are made:

1. There is an insignificant difference in the ability to trend and monitor pump degradation between the existing test flow points for P-111C and P-111D and a hypothetical 200 gpm, which would have been allowed by the Code if the IST design flow rate of 250 gpm.

2. Incremental pump performance change can readily be detected and trended in a satisfactory manner at the current flow test points to ensure the design basis accident condition flow requirements are always met. Comparing the NMC pre-operational testing results with the vendor performance curves shows good correlation in the flow areas where NMC performed testing. The intent of the Code is met and there is assurance the pump can meet its safety function.

3. The current flow test points are above the design basis accident condition for the system, and degradation can be trended, detected and acted upon before the pump could degrade to the point where its safety function performance is challenged. The flow path used for IST testing is similar to the flow path required for the design basis condition – the exception being a by-pass valve is opened

around the EFT Cooler temperature control valve to provide higher flow rate for testing purposes.

The current flow test points will allow NMC to perform technically sound evaluations and reliable assessments of the pump operational readiness and performance characteristics as compared to the design-basis accident flow requirement. Based upon the above discussion, NMC believes the intent of the CPT will be met for the subject pumps when performing the CPT at the two-year frequency at the current flow test points. Satisfactory trending and degradation monitoring can be achieved at the current test flow rate.