



# Increasing MTBR Under Emergency Conditions



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By Faisal Salman, HydroAire.

## Faisal Salman

*Faisal Salman serves as director of nuclear services at HydroAire, a division of the Hydro Group of companies. Salman has been involved in aftermarket pump refurbishment and troubleshooting for over 30 years. He is a graduate of the University of Illinois with a Bachelor of Science degree in mechanical engineering.*



## Background

As the nuclear industry continues to adapt to new requirements under the Nuclear Promise, it is of key importance for utilities to strengthen existing safety protocols and execute efficiency improvements in day-to-day operations and maintenance to optimize overall costs.

One such nuclear plant found themselves struggling in regards to a planned outage of a vertical service water pump, providing cooling water to safety-related heat exchangers in the power generation process. In this case, the operating pump was actively exhibiting performance issues and was reaching the end of its lifecycle, requiring their reserve unit be placed into service under expedited conditions.

## The Importance of a Quality Inspection

The principal goal for the plant was to increase the Mean Time Between Repair (MTBR) of their pumping system to optimize efficiency and reduce costs. Unfortunately, upon initial review of the reserve unit, it was identified that it had

a history of poor performance issues under previous use. With this in mind, the nuclear plant chose to contact a trusted

aftermarket pump service organization for disassembly, inspection, and root cause analysis to ensure a successful transition.

A thorough inspection can help to identify issues that lead to recurring pump problems. Solutions can then be implemented to extend pump life and reduce long-term repair costs in future operation. Deep-rooted issues, if left unattended, often result in premature failure of components. An in-depth analysis can offer valuable insight for both the service organization and plant maintenance teams to discuss various options for not only repairing, but also optimizing the pump's performance and overall lifecycle.

By executing an engineering analysis, the service organization had isolated several critical issues which had contributed to the pump's poor performance. It was noted that long-term damage to internal components, column pipes, and weld joints had been caused by less than optimal water chemistry. If left unattended, the consequences of this damage would lead to a higher risk of catastrophic failure.

Routine wear had contributed to severe corrosion and erosion seen throughout the pump and its components. The edges of the impeller suction vanes were worn to a sharp, thin edge. The columns also experienced damage and were displaying thinned walls. Leakage from the pump's flange joints was also noted which can decrease pressure and flow, negatively affecting the throughput.



The operating pump was actively exhibiting performance issues and was reaching the end of its lifecycle, requiring their reserve unit be placed into service under expedited conditions.



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Faisal Salman serves as director of nuclear services at the headquarters of the Fluor Group of companies. Fluor has been awarded an after-market pump service contract and manufacturing for over 40 years. He is a graduate of the University of Illinois with a degree in mechanical engineering.

**The Importance of a Quality Inspection**  
The principal goal for the plant was to increase the Mean Time Between Failures (MTBF) of their pumping system to optimize efficiency and reduce costs. Unfortunately, upon initial review of the reserve unit, it was identified that it had a history of poor performance issues under previous use. With this in mind, the nuclear plant chose to engage a trained after-market pump service organization for disassembly, inspection, and test case studies to ensure a successful transition.

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As the nuclear industry continues to adapt to new requirements under the Nuclear Promise, it is of key importance for utilities to strengthen existing safety protocols and ensure efficiency improvements in day-to-day operations and maintenance to optimize overall costs.

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The principal goal for the plant was to increase the Mean Time Between Failures (MTBF) of their pumping system to optimize efficiency and reduce costs. Unfortunately, upon initial review of the reserve unit, it was identified that it had a history of poor performance issues under previous use. With this in mind, the nuclear plant chose to engage a trained after-market pump service organization for disassembly, inspection, and test case studies to ensure a successful transition.

A thorough inspection can help to identify issues that lead to recurring pump problems. Solutions can then be implemented to extend pump life and reduce long-term repair costs in future operations. Degraded issues, if left unattended, often result in premature failure of components. An in-depth analysis can offer valuable insight for both the service organization and plant maintenance teams to discuss various options for not only repairing, but also optimizing the pump's performance and overall lifespan.

By engaging an engineering analysis, the service organization had isolated several critical issues which had contributed to the pump's poor performance. It was noted that long-term damage to several components, including pipes, and weld joints had been caused by low flow optimal water diameter. It also mentioned the consequences of this damage would lead to a higher risk of catastrophic failure.

Reserve unit had contributed to various concerns and issues were throughout the pump and its components. The edges of the impeller section were seen to a sharp, fine edge. The turbine also experienced damage and was displacing fibrous matter. Leakage from the pump's change pieces was also noted which can discuss pressure and flow, negatively affecting the throughput.

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