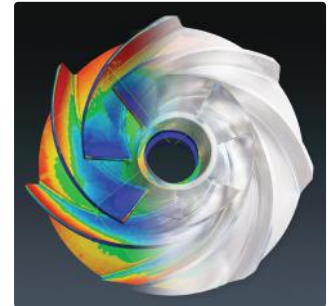
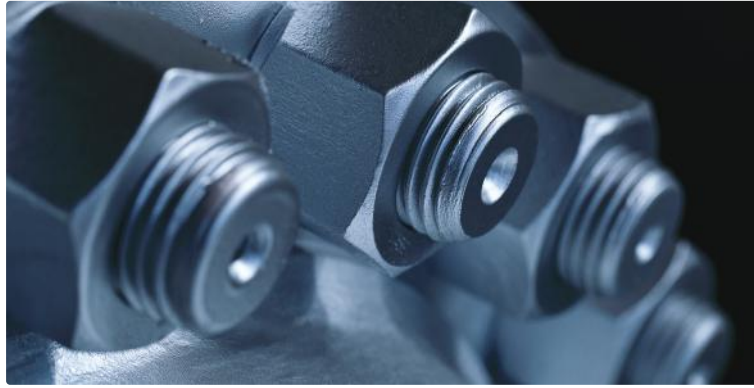


# POWERFUL CAPABILITIES FOR HIGH-CAPACITY VERTICAL PUMPS







## Large Pumps – Broad Capabilities

High-capacity vertical pumps require specialized capabilities. From lifting massive weights, to reverse engineering components with expansive surface areas, to troubleshooting vibration in machines susceptible to resonance problems, large vertical pumps have unique challenges. Fortunately, Hydro has cultivated unique capabilities to meet them.

Hydro's seasoned professionals have extensive experience in the pump industry and familiarity with a broad spectrum of manufacturers, designs, and applications. This talent and the knowledge gained from over 50 years of servicing the pump aftermarket has provided Hydro with the ability to not only repair your large pumps, but to improve them.

A newly manufactured pump component is only as successful as the expert engineering behind it. Hydro understands the importance of the engineering side of reverse engineering, especially when it comes to large pumps. That's because engineering expertise is the foundation of our business.

As an independent, unbiased source, Hydro's loyalty is to its customers and their pumps. That gives Hydro the freedom to provide an unbiased evaluation of designs that have potential flaws. The end result? A pump repaired or a part supplied by Hydro is often better than the original.



**Worldwide Service Centers**

**24/7 Emergency Services**

**Removal, Installation, and Start-up Support**

**Field Maintenance**

**On-Site Reverse Engineering**

**Large Part Manufacturing and Casting**

**Obsolete Design and Component Support**

**Engineering Review, Rerates, and Redesigns**

**Troubleshooting and Field Testing Services**

**50-Ton Crane Capacity**

**Wireless Condition Monitoring**

**Technical Training**



Hydro provides engineering expertise and essential support to pump users around the world for better performance and longer life.



A large industrial workshop with a high ceiling and a yellow crane. The crane is lifting a massive circular metal component, which is being lowered into a large circular opening in the floor. The component has a complex internal structure with several radial spokes. In the background, there are other industrial equipment, including a forklift and a ladder. The floor is made of concrete and has some yellow markings. The overall scene is one of heavy industrial work.

LET HYDRO  
DO THE **HEAVY**  
LIFTING  
FOR YOU.







## On-Site Reverse Engineering

Large pumps are expensive to ship off-site and often run without a spare. Being able to capture precision measurements of critical parts on-site reduces both cost and risk. Hydro's reverse engineering team is experienced in how to efficiently and accurately reverse engineer large components.

The field portion of the reverse engineering process for a large part can usually be accomplished in less than a day. After the measurements are taken, the pump can be returned to service while the model is completed and the part is manufactured.

Taking the initial component data is only the first step in Hydro's reverse engineering process. Using their experience in the failure modes and upgrades of large pump designs, the reverse engineering team will recommend component upgrades or improved metallurgy to extend the life of the part. Where appropriate, they will also identify methods of refurbishment that can return a large part to reliable service in place of supplying a new component.



## Troubleshooting & Engineering

The combination of long, cantilevered designs and sumps that rarely meet recommended standards can be a real headache for end users. Vertical pumps are often the most troublesome pieces of equipment in a plant.

Fortunately, Hydro has the engineering experience to diagnose and solve these problems. When additional information is needed, Hydro's pump improvement engineers can capture detailed field test data to support complex analysis.





# Quality Shops & Experienced Teams

Working on large pumps requires a shop with the appropriate tooling and lifting capacity. It also requires a team dedicated to providing a higher standard of repair. Because vertical pumps are made of several stacked parts, keeping tight tolerances and best-in-class fit-ups is critical for reliable operation. Hydro's standards are more stringent than those required by any industry body. What does that mean for you? Longer life, better performance, and safer operation.









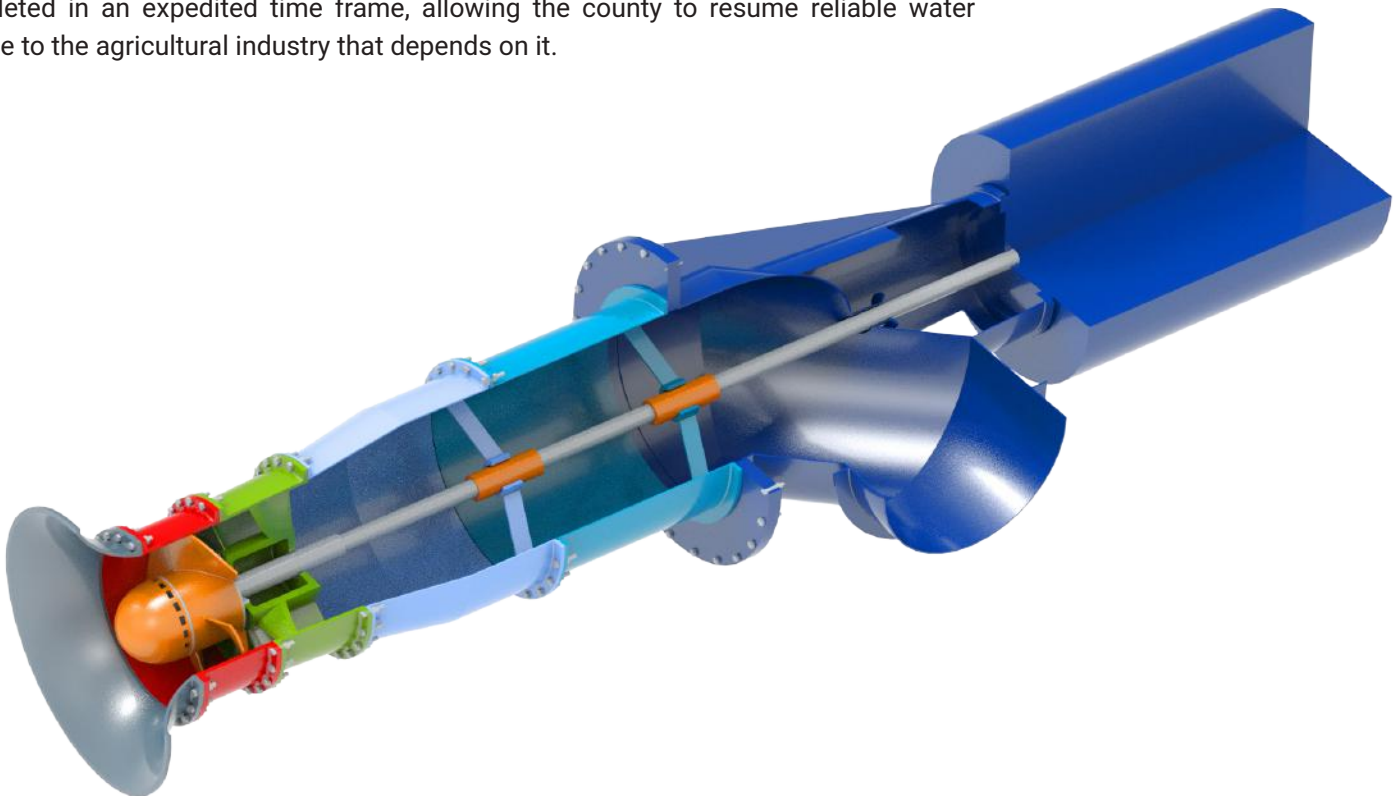
## Optimum Flow – Expert Solutions When It's Critical

A major county in California found itself in a crisis when its irrigation pumps could not produce the required performance, cutting off critical water supply to the reservoirs and aqueducts. These pumps suffered from high vibration and repeated failures characterized by extreme wear to the propellers, shafts, and bearings.

The OEM had extended their abilities as far as they could but were unable to resolve the problems. Hydro's engineering team was called on to provide a failure analysis and design an effective solution. Hydro found that deflection induced by high radial forces, excitation of the rotor critical speed at running speed, and faulty protection from sediment all contributed to the failures.

Hydro redesigned the bearing span to counteract the deflection and critical speed issues. The pump-out vanes were also redesigned to provide better lubricating flow to the guide bearings. Finally, the protection rings were redesigned to keep sediment from the propeller and provide better overall dynamic balance.

The solution provided by Hydro significantly increased the life of the pump. Not only were the changes effective, but they were executed efficiently. The modifications were completed in an expedited time frame, allowing the county to resume reliable water service to the agricultural industry that depends on it.







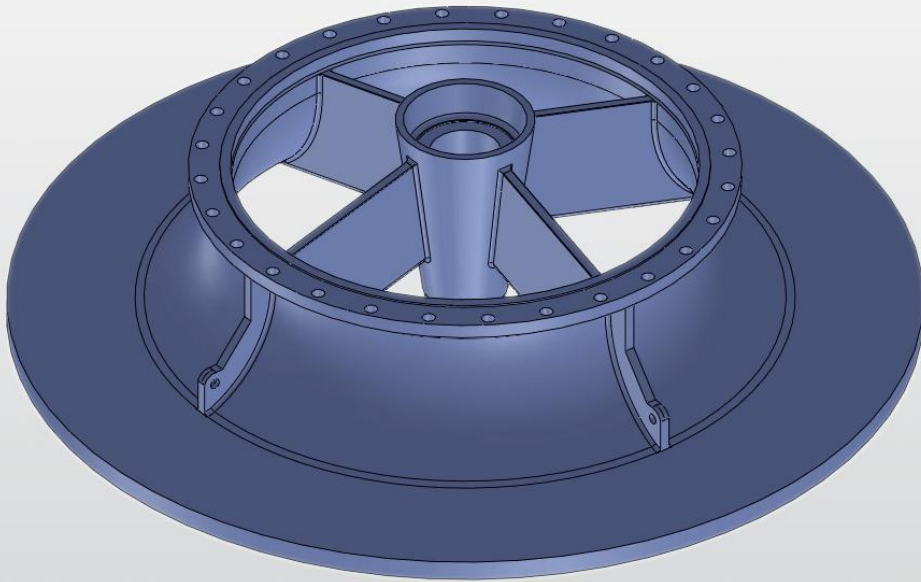


## Fully Equipped & On the Move

Hydro was called on to reverse engineer a large circulating water pump in the Caribbean to supply parts for refurbishment. The lead times for receiving parts from the original equipment manufacturer (OEM) were excessive. More concerning, the suction bell provided by the OEM had failed during service. All internal ribs were lost, and the bearing holder was found loose within the assembly.

When Hydro reviewed the design of the suction bell, it was clear that low manufacturing cost was prioritized over reliability. Instead of providing a cast component, the suction bell was fabricated and had an excessively thin wall thickness.

Hydro reverse engineered the suction bell and created a model for a cast component, establishing the rib design and bearing holder location based on design experience. Exterior ribs were added to strengthen the bell and the wall thickness at the suction bell skirt was increased from 3/8" to 2". The part was scanned on-site within 1 day, with the engineering analysis, modified casting design, and quote for manufacture being completed within about 3 weeks.





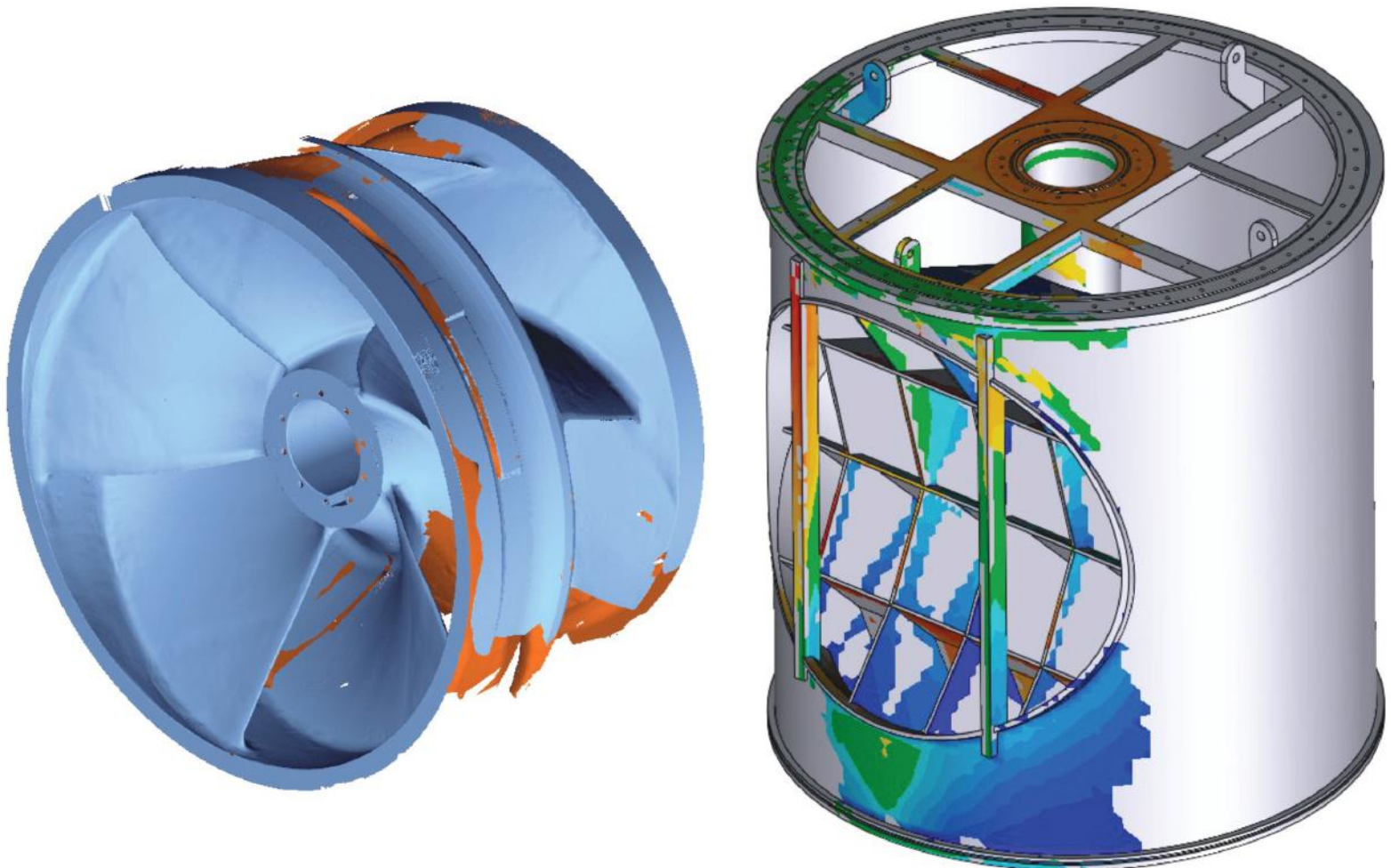




## Reverse Engineering – An End to Obsolescence

A nuclear utility had a large circulating water pump with severe vibration issues that required refurbishment in an emergency time frame. Hydro's Aston, PA service center, which has a 50-ton crane and a history of providing quality repair for nuclear non-safety related equipment, was chosen for this work. Despite the unique challenges in machining and maneuverability presented by large pumps, the DCI and refurbishment were performed in under 2 weeks.

This pump model is an obsolete design with very few existing installations. During the refurbishment process, Hydro's reverse engineering team captured the data necessary to create a verified model of the pump components. Developing a reverse engineered model was a crucial step in establishing a reliable source to manufacture these large components. With the verified model and Hydro's casting and machining capabilities, the plant can plan ahead to ensure all critical components are available for future refurbishments.





# Quality Systems & Processes



**As-Found Inspection Documentation** – Providing high-quality information and assets in regard to the unit's problem areas, breakage, signs of degradation, and other issues examined upon receiving.



**Customer Data Management and Processes** – All aspects of the work scope are processed through Hydro's ERP systems. This enhances transparency, quality assurance, accountability, traceability, consistency, and 2-way communication during the repair process.



**As-Built Documentation** – When a unit leaves the shop, customers are provided with a full spectrum of documentation post-repair, highlighting all aspects of the servicing, engineering support, and forensics, as well as documentation on further improvements, optimized operation suggestions, and support services.

At Hydro, it's about more than quality, it's about our commitment to consistent quality and ensuring that our customers are provided with a superior product, and optimized mean time between repair for years to come.





24/7 FIELD & EMERGENCY SERVICES



RELIABILITY SERVICES



QUALITY REPAIR & ENGINEERING SERVICES



CRITICAL PARTS SOLUTIONS



CERTIFIED PERFORMANCE TESTING



CONDITION MONITORING



EDUCATION & TRAINING





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