CELEROS™ FLOW TECHNOLOGY

CASE STUDY

SMART ENGINEERING MINIMIZES NUCLEAR OUTAGE

CLYDEUNION® PUMPS

- Lead times minimized through smart manufacturing
- Outages minimized through retention of existing pumps
- Increased flow rate of 600 gallons/min achieved

Industry:	**Power – nuclear**
Region:	**Europe**
Territory:	**France**
Category:	**Hydraulic re-rate**
API Type:	**BB1**

CHALLENGE

A nuclear power plant in Western Europe required an increase in the pump flow rate of their reactor water cooling pumps.

Strict conditions due to the safety-critical nature of the application meant that removal of the pumps from site was not an option, so factory testing of the engineering solution was not possible. Any potential outage had to be minimized.

SOLUTION

Contractual duty guarantees were put in place in accordance with ISO 9906 Grade 2 and a pre-contract acceptance site test was performed to establish a baseline performance. The required re-rate consisted of a less than 5% increase in head.

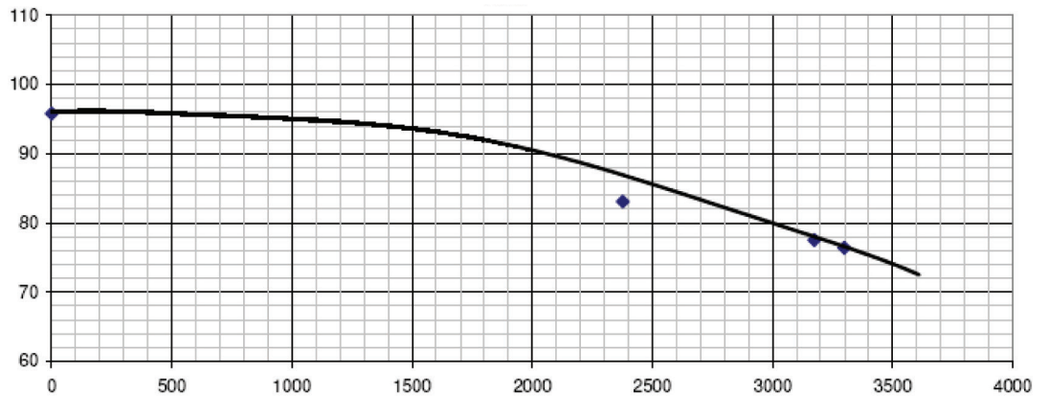
To meet the fine adjustment necessary under the restrictive operating conditions, ClydeUnion Pumps, a Celeros Flow Technology brand, determined that the best solution would be to retain the existing casing in-situ and manufacture a new impeller off-site that would deliver the required increase in flow rate.

To reduce lead times, minimize risk and improve geometrical accuracy, we used rapid pattern manufacture techniques. This included 5-Axis machining of pattern equipment directly from the 3D CAD model of the modified hydraulics.

Thermodynamic testing conducted by an independent third party was used to prove the pump performance characteristics were within the positive tolerance band of the contractual duty.

	NORMAL OPERATION	SHUTDOWN	LOCA
	Guaranteed Values	Expected Values	Guaranteed Values
Flow Rate - USgpm	14,057	14,601	10,593
New Impeller TDH (kg/cm)	7.65	7.52	8.38
Required Power (kW)	770	785	679
Present TDH (kg/cm)	7.42	7.22	7.88
CPL Committed TDH after evaluation	7.71	7.57	8.21
Percentage Head Rise from current TDH	3.96%	4.78%	4.16%

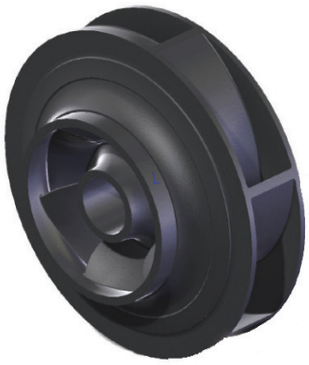
PREDICTED PERFORMANCE CHART



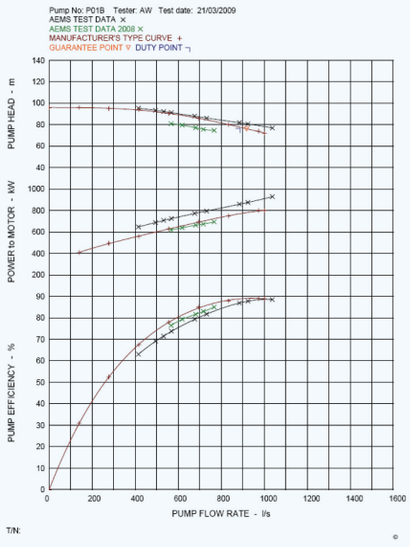
OUTCOMES

We were able to deliver an improvement in flow rate of 600 gallons/minute without removing the pumps from site. Our ability to design and engineer a new impeller using smart manufacturing techniques meant that the solution for this safety-critical cooling system could be made to the highest levels of accuracy and delivered in the shortest possible time.

Our long experience of the nuclear industry meant we had a full understanding of the particular constraints it places on operations and maintenance routines. We were able to devise a solution that meant we could meet all the customer's requirements and affect the pump re-rate with the minimum of disruption.



SITE TEST DATA



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| SPEED | EXCELLENCE | PARTNERSHIP

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