

ITT PumpSmart® control solutions Application: Offshore Seawater Pumping

Controlling flow in a variable head seawater pumping system.

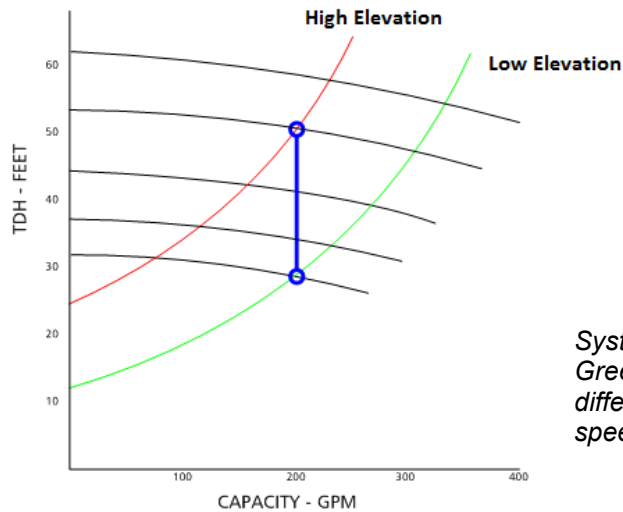
Problem

A company uses a custom-built offshore platform for the installation of wind turbines. Once in position, the platform is raised until it is 45 meters above the sea's surface. During the raising process, and thereafter, it is imperative that seawater be pumped via two submersible pumps into onboard storage tanks to supply water for engine cooling. This means that the pumps need to deliver the design flow rate with a constantly changing head. High swells can also impact flow. What's more, the demand for water often fluctuates.



Before and after photos of the platform show the 45 meter air gap.

For all of these reasons, it was extremely challenging to keep the flow within the allowable operating limits of the pumps. Although a variable speed drive had been used, it wasn't able to solve the problem. With simple speed control, the user is unable to identify how much flow the pump is actually delivering and where this is in relation to the performance curve. What's more, when both pumps were in operation, there was a risk that if one pump had become weaker from internal wear or other factors, the stronger pump could dead-end it and cause early failure.



System curve changes (Red and Green Line) from elevation differences overlaid with a variable speed pump curves (grey lines)

Benefits

ITT PumpSmart® provides the next level in intelligent pumping by using a standard variable frequency drive with directly-embedded algorithms. This onboard logic delivers sophisticated control that keeps pumps within their reliable region under even the most dynamically changing conditions. To help accomplish this, it utilizes SmartFlow™ sensorless flow measurement, which can derive the flow of the pump within $\pm 5\%$ of the rated pump flow without the need for an external meter.

Solution

Two PumpSmart controllers were added to the system. The units are able to provide the actual flow of each pump via their SmartFlow feature and are ranged to provide the minimum to maximum required design flow rate—regardless of static elevation or changing sea levels. Taking a signal from the onboard DCS for the tank level control, the system simply asks for “more” or “less” flow into the tanks.

Special pump protection features provide an even wider margin of safety. The pumps are protected against dry run conditions and will fault if they are accidentally started out of the water. And because PumpSmart is able to calculate the flow, minimum flow fault protection also reduces the risk to the pump and motor from overheating due to insufficient cooling.

In summary, all operational and reliability issues were resolved through the added control that PumpSmart brought to the system. This, in turn, has helped the company accrue significant savings from lower maintenance costs.