

ITT PumpSmart® control solutions Application: Process Water Supply

Ore exporter improves pressure stability and safety of multi-pump system.

Problem

Rio Tinto is major iron ore exporter that stores incoming ore in large stacks before it is loaded onto ships. The dust that this operation generates was suppressed using water cannons driven by three fixed-speed pumps in a system controlled by flow-triggered start/stop limits and pressure-sustaining valves. Because operators were unaware of the actual flow being produced by each pump, incorrect pump sequencing resulted in large pressure swings and water hammering. Dead-heading caused mechanical seals to fail weekly, so maintenance costs were unacceptably high. Importantly, the swings in pressure also created serious safety issues for personnel using hoses to perform manual washdown.



As the flow would decrease (A), the pressure in the system would increase (B). Then as dust suppression cannons would come online (C), the flow demand would sharply increase and the pressure would drop to unacceptable lows. As the cannons switched on and off, the flow and pressure would fluctuate accordingly (D & E).

Benefits

Managing multiple pumps with a standard variable speed drive is a challenging task given the breadth of process variables, speed, flow and pressure. In contrast, the ITT PumpSmart® variable speed drive system features embedded logic that manages the entire process: from balancing flow between pumps, to rotating pump operation for even wear, to providing automatic fault backup. It also features SmartFlow sensorless flow measurement, which can derive the flow of the pump within $\pm 5\%$ of the rated pump flow. In fact, with only four pieces of pump performance data, PumpSmart can calculate flow by comparing the pump power and flow performance curves.



ITT PumpSmart® variable speed drive units have effectively eliminated pressure swings from the system.

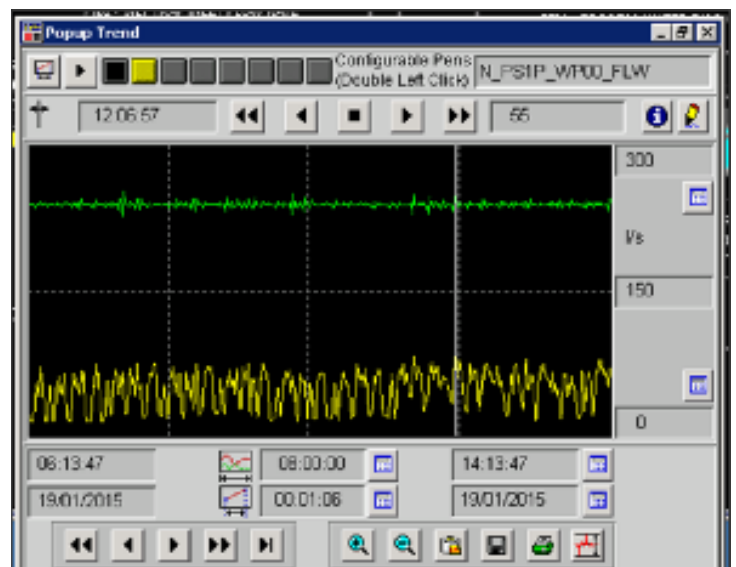
Solution

The upgrade consisted of removing the control valves and installing three PumpSmart units connected to a downstream pressure transmitter. The units are able to gauge the actual flow of each pump via the SmartFlow feature. Onboard logic determines the number of pumps that need to be running at any given time and torque-based algorithms calibrate the speeds of each pump. Each pump now generates equal flow at all times and works together in the process system, eliminating pressure swings, water hammering and dead-heading.

Since the new PumpSmart system became operational in January, 2015, there hasn't been a single pump failure. Most importantly, worker safety due to pressure stability has greatly improved.

"The control systems are working unbelievable well. Even when the demand for flow rate is changing all over the place, the pressure stays constant."

—Rio Tinto Project Delivery Engineer



The trend over an 8 hour period shows a dramatic improvement compared to the pressure spikes of >700kPa in the original system.