

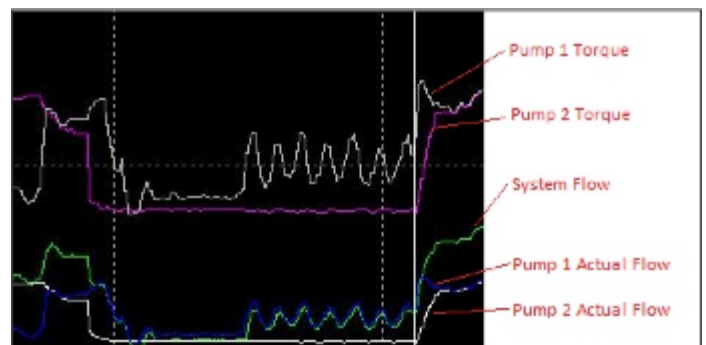
## ITT PumpSmart® control solutions Application: Process Water – Dust Suppression

**Ore exporter sharply reduces maintenance costs 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, water hammering and dead-heading. The pressure-sustaining valves were unreliable and very high maintenance. What's more, the pumps' mechanical seals were failing on an almost weekly basis and the company was spending approximately \$350,000 AUD annually on maintenance. Clearly, an upgrade to the system was needed.

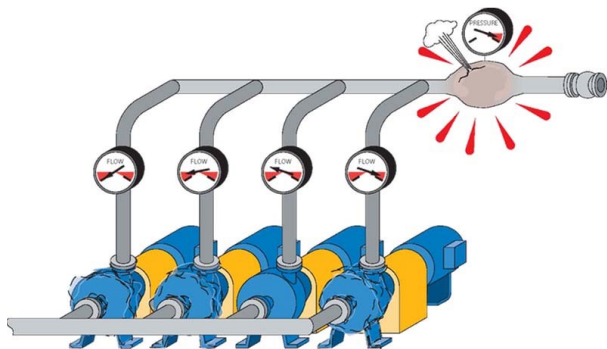
A detailed analysis of the system trends enabled ITT to understand and correct the issues associated with the mechanical seal failures. The data trend in Figure 1 shows that although the pumps were operating at exactly the same speed, the actual flow of each pump was not the same. Small variations in the hydraulic system and manufacturing tolerances within the pumps meant that one pump would outperform the other at exactly the same rotational speed. The periods of dead-heading the weaker pump were short, in the region of 3-4min, but with close to 40kW of wasted energy being imparted into the process fluid, the temperature in the seal chamber would rapidly rise, causing a seal failure that presented as dry-run, despite sufficient suction pressure.



*Figure 1 Synchronous speed operation resulting in seal failure*

## Benefits

Managing multiple pumps with a standard variable speed drive is a very 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.



*Figure 2. Originally the pump flows could not be synchronized at fixed speed*

## Solution

The upgrade consisted of removing the control valves and installing three PumpSmart units connected to a single downstream pressure transmitter. The external flow meter had been on the common discharge header, so when two pumps were operating, it was erroneously assumed that each pump was providing half of the flow. Now the SmartFlow feature is used to calculate the actual flow. Onboard logic determines the number of pumps that need to be running at any given time and torque-based algorithms separately calibrate the speeds of each pump to ensure equal flow. The pumps now work together in the process system, eliminating pressure swings, water hammering and dead-heading. This in turn ensures that each pump has sufficient flow for the cooling of the fluid in the seal chamber.

In fact, since the new PumpSmart-enabled system became operational in January, 2015, there hasn't been a single mechanical seal failure on any of the pumps. Over that period of time, maintenance costs have dropped virtually to zero. And because fewer pumps are now operating to deliver comparable flow rates, overall energy consumption has been reduced, saving the company even more.