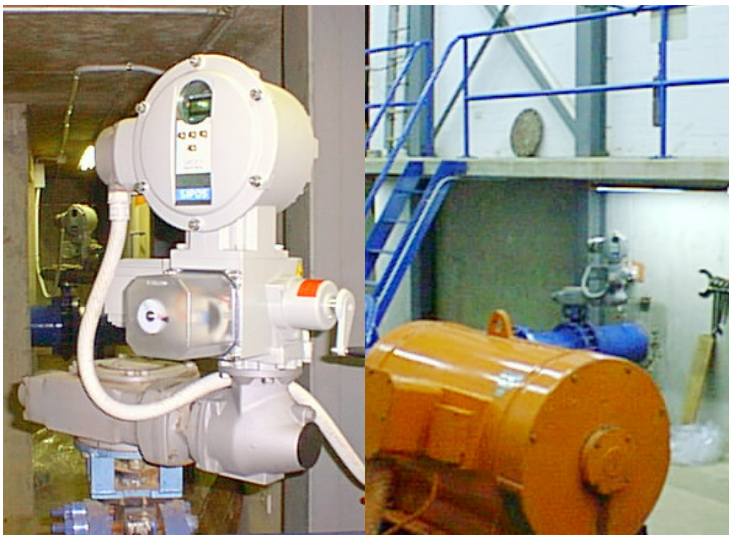
Water hammer and cavitation protection

Photograph shows a SIPOS 5 actuator mounted on a 12" butterfly valve at the Oura Pumping Station, Southwest of Cootamundra, Australia. The actuator's variable speed capability avoids problems associated with water hammer and cavitation during valve operation.



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Application

Water pumping from bore holes

In the area of Oura, 60km Southwest of Cootamundra, Australia, water is pumped from a number of bore holes into a collection tank and then onto a holding tank. Three pumps are each equipped with 12" butterfly valves to control the water flow.

Design Challenge

Water hammer and Cavitation

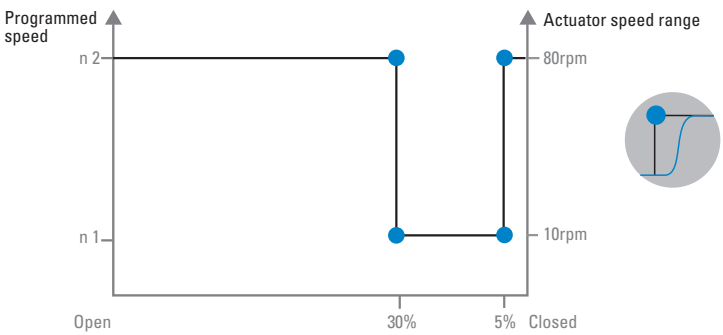
In order to protect the valve seats from damage caused by water cavitation, or the pumps from running dry in the event of water loss, the butterfly valves must be capable of rapid closure. Such operation creates huge hydraulic forces, known as water hammer. These forces are sufficient to cause significant pipework damage and must be avoided.

Solution

SIPOS 5 variable speed control

Fitting the valves with SIPOS 5 actuators allows different closure speeds to be set during valve operation. When closing from fully open to 30% open, a rapid closure rate is set. To avoid water hammer, during the 30% to 5% open phase, the actuator slows down to an eighth of its previous speed. Finally during the final 5% to complete closure the actuator speeds up again to reduce cavitation and consequent valve seat damage. Total valve operation time from open to close is around 3½ minutes.

Technical Data



Function Profile

The SIPOS 5 actuator has the unique capability to change output speed subject to its position of travel. This advanced flexibility can produce linearisation of valve characteristics, allowing simpler valve selection, or to significantly reduce water hammer when closing valves. The valve speed is defined by a maximum of 10 interpolation points which can be set in increments of 1% of the open position. Speeds can then be set in up to seven values (n1-n7) subject to the actuator type.

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