DrX Application Note

DrX DrKnock and DrFlow

Subject Independent flow verification for actuated valves

Note Ref. **AN270.03**

Valve verification

An essential element of modern process plant operation is automatic flow control using solenoid or motor driven valves. Feedback from such valves is often unavailable, and in other cases, where there is measurement, the feedback is indirect.

For example the monitoring of the actuating motor's current indicates that it is drawing power, not that the valve has seated properly. The ultimate measurement in most cases is the presence of flow, or not, in the downstream pipe, which conventionally is very costly to implement and therefore is ignored until a failure occurs.

Increasing environmental awareness and process accountability also call for increased monitoring, and additionally there is growing demand for independent measurement to verify plant operation.

This application note presents some easy, low cost solutions using various DrX modules based on experiences in the UK steel industry.

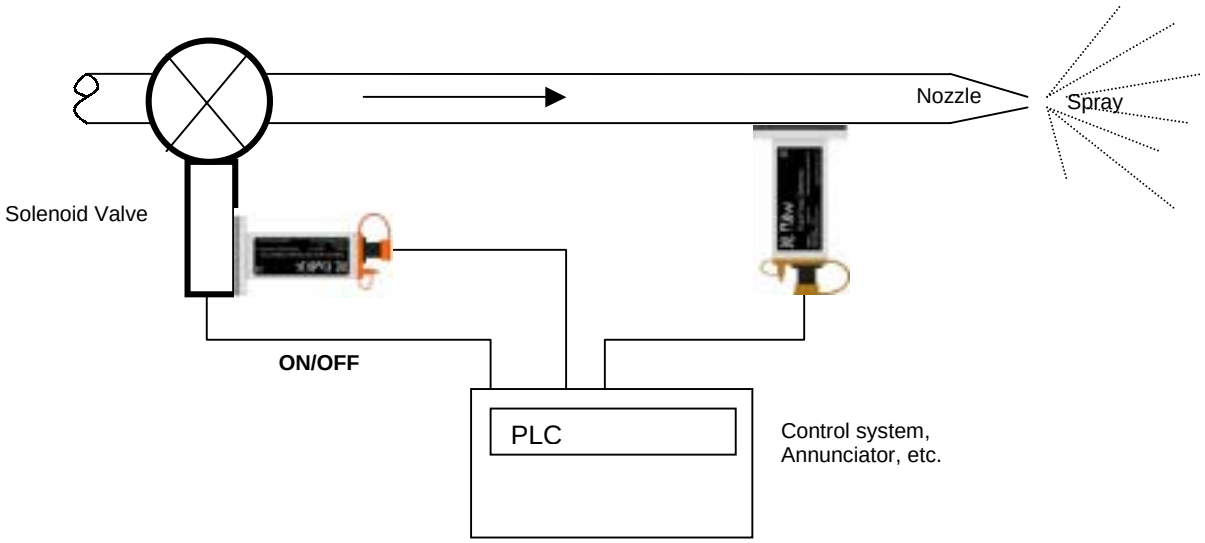
Equipment and Task Identification

As part of processing operations in a steel rolling mill the billet passes quenching sprays. Occasionally their nozzles and upstream valve seats become blocked (or worn) due to the poor quality of the recycled water and the result is variation in the process quality. Additionally the use of water on the billet line is complex and various so its total control is process critical.

DrX is used in various ways to firstly improve the monitoring and control of the quenching system, and secondly to provide an additional and independent level of safety and accountability to the whole process.

Flow verification:

Consider a single spray line:



Fitting a DrKnock, mechanical noise detector, to the solenoid valve will indicate to any simple control system that the solenoid has moved, and consequently flow should start or stop within a given time. The result of this valve movement can be confirmed downstream by means of a DrFlow, liquid flow detector.

The logic rules are simple:

IF ON/OFF is asserted by the controller THEN an impulse is expected from the DrKnock on the solenoid valve.

IF no impulse then EITHER the valve has failed electrically OR the valve has mechanically ceased.

IF there is an impulse THEN the downstream DrFlow should detect liquid flow within a given time.

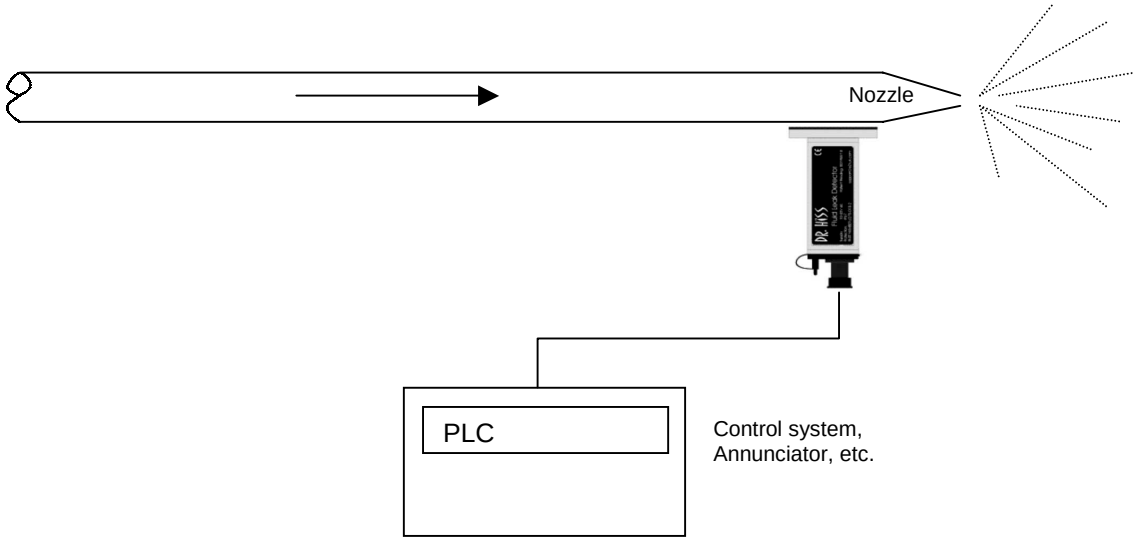
IF no flow detected EITHER the valve is mechanically ceased OR there is no process liquid.

This method is applicable to single and two phase flows since it relies on the movement of the process liquid creating some acoustic noise.

(If the process is transporting solids such as grain, granulated chemicals, plastic pellets, etc., then the movement of the solids against the pipewalls creates high levels of ultrasonic noise. In these cases we recommend the use of a DrHiss since it operates in the ultrasonic spectrum and is much less prone to environmental noise.)

Nozzle blockage:

As an additional level of integrity the quenching system was able to monitor any nozzle blockages which may have occurred. This was due to the fact that the compression of the water at the nozzle creates a high level of ultrasonic noise in the steel walls of the pipe. Applying a DrHiss close to the nozzle gives a continuous indication of the process in operation.



Again the logic is very simple since failure of any signal suggests either no process liquid or a blocked nozzle.

Using a local PLC enables local level control with only status reporting returning to the main control room. In this particular case the PLC had a local alarm light to indicate nozzle failure.