

## Application: Monitor open path of pressure relief valves

### Intro:

A typical chemical or oil & gas company has various use cases for manual valve positioning that can be made economically viable nowadays through IoT. In general, the IT and OT systems remain clearly separated and the valve position information generated is strictly used for IT.

### Why:

In a typical chemical or oil & gas plant, you find thousands of manual valves that are often only operated during maintenance or turnarounds. Due to the large number of manual valves, it can be challenging to keep a good oversight of their position during the different stages of maintenance. Leaving a valve accidentally in the wrong position has proven to be dangerous and has led to incidents and catastrophic accidents in the past all across the industry.

Relief valves are very critical safety valves that can be seen as the final mechanical protection layer in a plant. Relief valves (RV) or pressure safety valves (PSV) are used to automatically release a substance from a vessel, boiler or other pressure containing system when the pressure exceeds the preset limits. Because these relief valves need regular maintenance or calibration, typically, there is always redundancy meaning at least one relief valve can be taken offline for this type of maintenance activity. Extremely dangerous situations occur when relief valves are accidentally left offline and, hence, the required capacity to relief pressure is not met.

### What

In a set up with main relief valves and a redundant relief valve, block valves are introduced to take the relief valve offline. These block valves are normally installed on the inlet and outlet of every relief valve and are typically manual valves. When one of these manual block valves is left closed after a switch over from one spare relief valve to another, the relief valve is offline so with thousands of relief valves in a plant, this is considered a high risk. Having multiple relief valves offline results in insufficient relief capacity in case of overpressure and compromises this final layer of protection.



### How

When applying relief valves a general rule is applied to install N+1 number of relief valves whereas 'N' is the number of relief valves required to meet the required capacity and '1' is added to create an additional relief valve in case of maintenance. Therefore, a relief valve system consists minimal out of 2 relief valves and 4 block valves (inlet and outlet valve), however, PSV systems can consist out of 3 relief valves and 6 block valves, 4 relief valves and 8 block valves, etc. In some cases, for very critical applications, dual block valves are used and could result in double the number of manual valves involved, which increases the chance of making an error. This is identified by the industry as highly critical since many

years and companies have taken measures such as mechanical interlocks, lockout-tagout or regular walking-the-line checks for every set of relief valves. Having position feedback provides an additional layer of safety for all three of these measures.

To further improve safety and increase visibility, Aloxy's valve positioning solution is introduced. A LPWAN network (DASH7 or LoRaWAN) is installed and all block valves within a PSV system have been equipped with the Aloxy pulse valve position sensor. When more than one inlet block valve is closed or an inlet and outlet from a different PSV are simultaneously closed an alarm is generated in the control room to go out and rectify the position of the manual valves.



*Set of 3 PSV's and 3 inlet block valves*

### **Benefits**

Increasing safety has enormous benefits, but most importantly, this application is not about limiting the impact, this is about prevention and getting it right all the time.

When a block valve is accidentally left closed, this is not immediately identified, and could go unidentified for months leaving the plant exposed to risk for a long period. Unfortunately, it is only exposed when it goes wrong in the event that the over pressure could not be relieved. As PSV's are the final mechanical layer of protection this also means that when this goes wrong, something ruptures or even explodes with serious consequences.

An accident has multiple negative aspects associated, first and most important the injury or loss of people. Secondly the economic costs are tremendous. The cost of plant downtime is enormous and damaged assets add up quickly. Finally, accidents get a lot of media coverage which damages the company's image.