

## Complete care of your safety applications

### Heat transport network in good hands



#### VWS Pipeline-Control

Responsible for the maintenance of the installations of their client Warmtebedrijf Rotterdam.

Since 2014 VWS Pipeline-Control is responsible for the maintenance and the availability of the installations to transport hot water to the operators of district heating networks which distribute it to thousands of houses in Rotterdam area. With this hot water, the households can heat their houses as well as use it for the kitchen and the bathroom.

#### VWS Pipeline-Control Your asset is our concern anytime-anywhere-anyhow-anyway

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Marc van den Heuvel

Regular maintenance of your safety loops ensures increased safety and availability of your processes

#### Challenge for the customer

The challenge of VWS Pipeline-Control is to ensure continuous and sufficient hot water supply delivered in a safe manner to the hospital, offices and houses in Rotterdam area via safe and healthy pipeline.

For VWS Pipeline-Control safety is a paramount. With hundreds of kilometers of pipeline in The Netherlands, gas or liquids are transported in both urban and rural areas. Any changes to the product specifications or the capacity can damage the pipeline and potentially bring people at risk. Therefore it is of great importance to have an optimum maintenance plan. Its execution ensures the safe operation of the pipeline so that any unsafe product/capacity changes can be detected and unsafe operation prevented.

Safety Instrumented Systems (SIS) are designed to prevent hazardous events to ensure human safety, prevent damage



to facilities, and protect the environment.

#### Realization of proof test

To ensure a required Safety Integrity Level (SIL) of the safety loop is achieved, all the instruments in the safety loop need to be checked timely and with an appropriate assessment. The assessment differs per application requirement and is defined as either a full functional proof test or a partial proof test.

A full proof test returns the PFD Average back to/or close to the loop's original targeted PFDavg. Probability of Failure on Demand average (PFDavg) represents a probability that the system will fail and that its safety function will not succeed in bringing it back to safe operating mode.

A partial proof test brings the loop's PFDavg back to a percentage of the original PFDavg. PFDavg is in direct correlation with the SIL rating, therefore the quality of the functional proof tests and their frequency are ensuring that the required SIL is achieved and maintained (i.e SIL2).



VWS Pipeline-Control Maintenance team and DWG Automation.

*'It was the first time that I had to work with Endress+Hauser as a subcontractor in relation to test the safety SIL loops. I had no idea or experience in testing these kind of instruments. So therefore I needed the knowledge and experience of specialists. The cooperation between companies was excellent. During the preparation of the SIL proof validation, we have exchanged several information and have had a few meetings to discuss the substantive and supplementary questions on both sides and explain the system and the instruments. Especially the knowledge, both on physical and electrical level, was great, whereby at the end the safety interlock circuit of a complete operational process installation was successfully Full Proof validated. For me it is only one of the yearly maintenance work I have to do, but I feel comfortable by doing this kind of work together with Endress+Hauser.'*

*Marc van den Heuvel  
Installatiebeheerder Pipeline Control*

## Yearly Functional Proof testing of the SIS

Functional Proof tests were performed in 3 different locations where in total of 22 SIL loops were tested.

One inlet SIL loop consists of 2 pressure transmitters, PLC and a pump (1oo2 rating). The outlet SIL loop consists of 3 pressure transmitters, PLC and a pump (2oo3 rating) as presented in the picture.

This configuration is chosen to increase the process safety and production availability (compared to single channel systems) and to ensure that required SIL2 is achieved. The pressure transmitter used in this application is the Cerabar PMP51 with a SIL2 rating according to IEC 61508 and IEC 61511, therefore designed to fit in SIL2 applications.

Safety loop tests were performed during the planned annual maintenance shutdown. All the pressure transmitters were firstly calibrated to confirm that their working accuracy matches application requirements.

The process was put in operation and full and/or partial proof tests were performed per SIL loop.

The unsafe conditions were then simulated in order to observe the response of the Safety Instrumented Function (SIF), i.e the pump stops working to prevent the unsafe operation within a given number of seconds. Subsequently the SIS is returned to its safe operating mode. Additionally, the redundancy tests were performed for all 1oo2 and 2oo3 ratings. Reports were created and results were discussed with

### The results

- Functional proof test performed by functional safety specialist according to the procedure in place
- Partial or full proof tests performed dependent on the application
- Redundancy tests performed for 1oo2 and 2oo3 rating configurations
- Work performed in a planned and timely manner
- Extensive and detailed reports readily available

### Benefits

- Increased safety and process availability of the safety instrumented systems are ensured with a maintenance plan in place and the performance of regular functional proof tests
- The city of Rotterdam is supplied with sufficient hot water!

## Nederland

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