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TS WOC 4 3

SMART MONITORING GAS GRIDS

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Eandis, Belgium



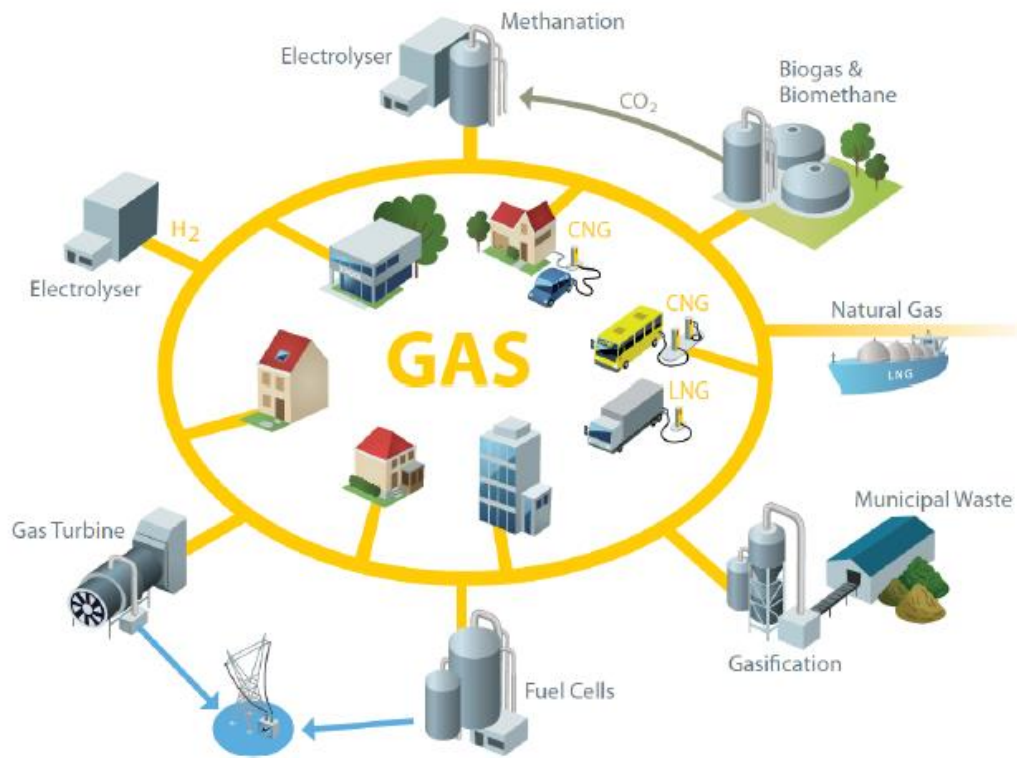


■ Eandis = grid operator

- **E**lektriciteit - **A**ardgas - **N**etten - **d**istributie
(*Electricity - Natural gas - Networks - Distribution*)
- for a well-defined part of **Belgium**
- manages, builds and services the **distribution grid** for **electricity** and **natural gas**
- promotes the rational use of energy, manages the access registry and acts as a social supplier for domestic customers who have been 'dropped' by their commercial supplier
- *Some key figures:* 4,050 employees, active in 234 towns and municipalities, **± 42.000 km gas grid**, **1.6 million connections** for natural gas

Background

- Smart gas grids; we will not talk about...:



P2G

Bidirectional flows of gas

Methanisation

State-of-the-art new
appliances

...

Source: "Smart gas grids for a smart energy system" – Gerg/Marcogaz/Eurogas

- But about...

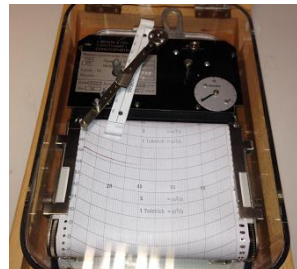
SMART MONITORING THE LOW PRESSURE NETWORK

Total length of the low pressure network(≤ 98 mbar): 34.000 km

Total length of the medium pressure network(<15 bar): 7.700 km

Background

- In the past:
 - **Medium pressure network**
 - ✓ An already well monitored grid
 - Stations in real time, data available on DMS,...)
 - Network digital pressure monitoring, no remote
 - **Low pressure network**
 - Only a « global » monitoring, without a well thought out vision
 - No intelligence/telecommunication

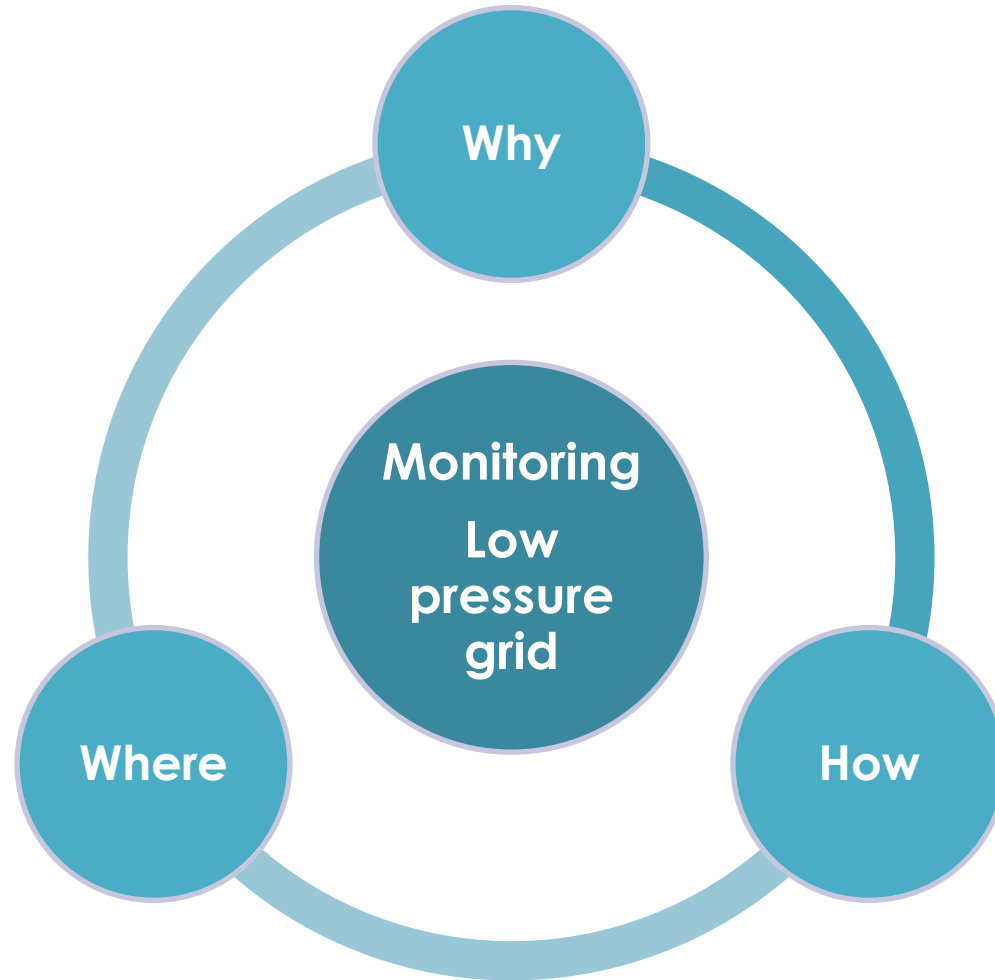


Background

- Now:
 - **Medium pressure network**
 - Still well monitored
 - An ongoing evaluation where to remote control
 - **Low pressure network**

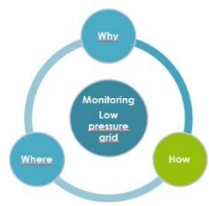


Aims





- Following Belgian **legislation**
(which does not specify the « how » and « where »...)
- Supporting new grid **investments**
 - Investing « right on time » while avoiding over-investing
 - Supporting studies with accurate data
- Ensuring a **safe** and **reliable exploitation**
 - Effective handling of gas incidents
 - Monitoring gas incidents
 - Managing received complaints
- Optimising the technicians' **workload**

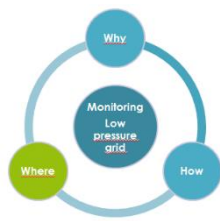


How smart do we want to measure?



Impact on “total life cycle” costs of the whole system

- By withholding **technical criteria**:
 - **1 and 2 channel loggers** → measuring medium and low pressure with one logger must be possible
 - **Battery powered** and **ATEX** safe
 - **Continuous** measuring
 - **Wireless** communication not in real time but concentrated datacommunication once / day
 - An **automatic warning** system in real time
 - Setting an alarm level
 - Realtime GPRS via mail/phone



- Having a **company policy** for a 34.000 km grid is **necessary**
 - **Where** do we install the loggers and **how many** are needed?
 - Calculating the « **total cost of ownership** »
 - Minimum number of loggers required by legislation
 - Solving bottlenecks known by exploitation
 - « Measuring is knowing »

Methods

■ Key success factors:

Policy

- Analysing in detail
- Working in team + Change Management

Testing

- Field tests of several loggers
- Writing a good technical specification

Data

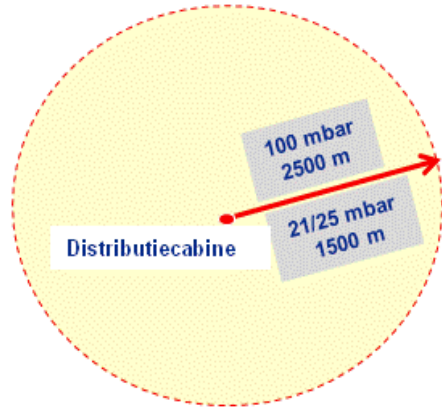
- Calculating the total cost
- Evaluating which system to use

Opti+

- Optimising the alarm settings
- Monitoring performance (communication/battery)

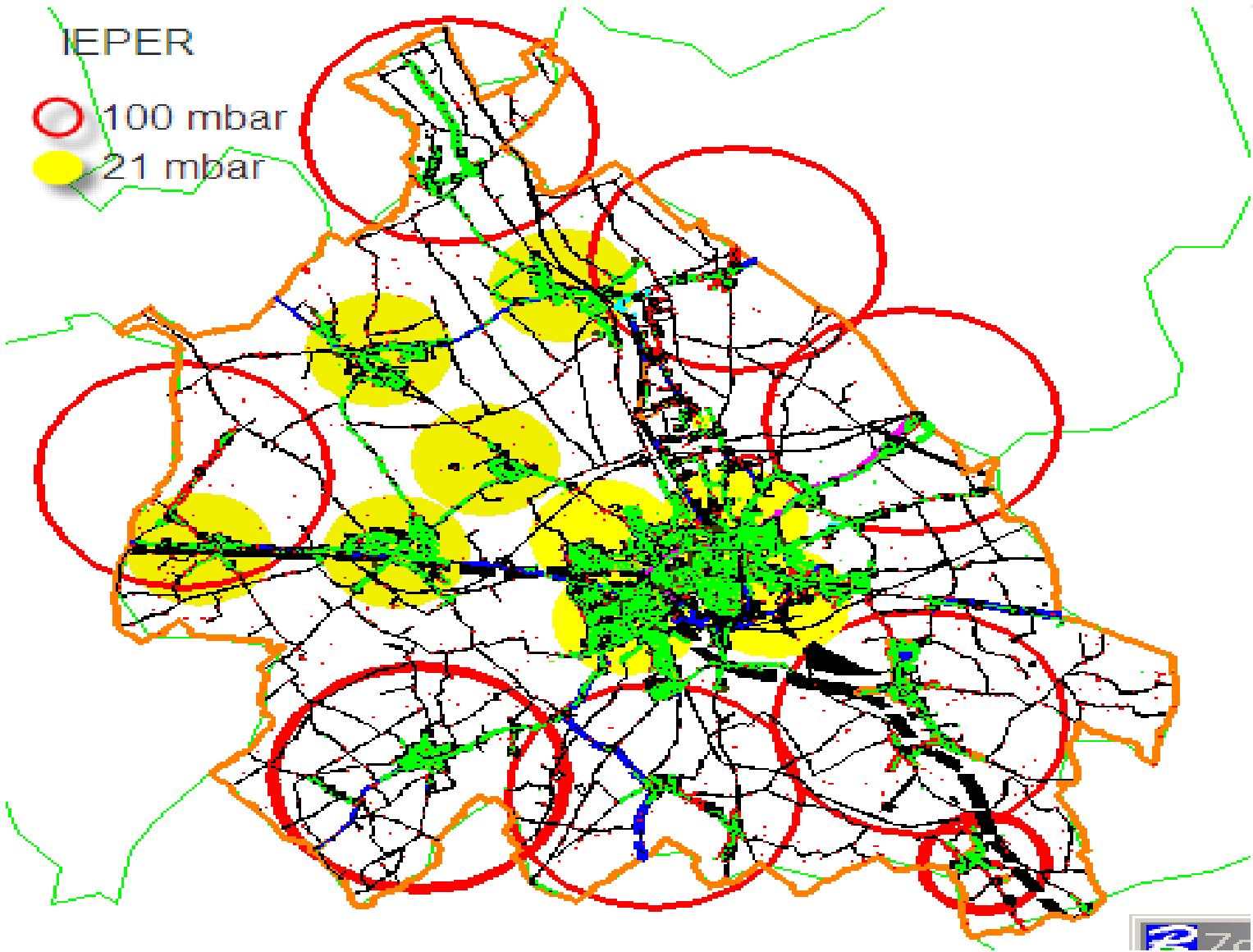
Technical policy

- Duration: 1 year
- Key issues:
 - Evaluating the most effective way to monitor the entire grid → a fixed radius depending on distribution pressure (20/25/100mbar)



- Determining the alarm levels (in order to avoid false alarms due to specific fluctuations of a low pressure grid)
- Analysing the entire low pressure grid

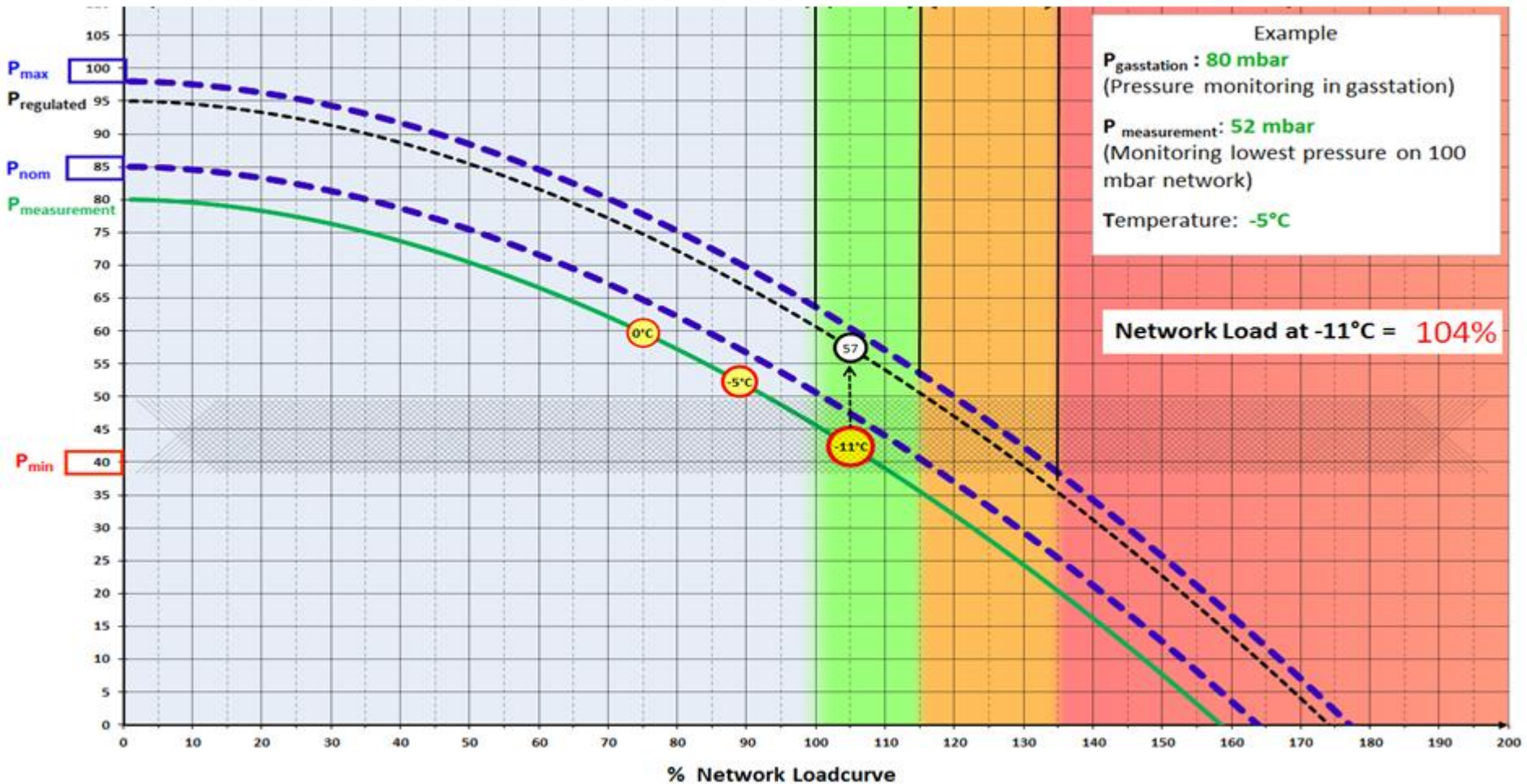
Technical policy



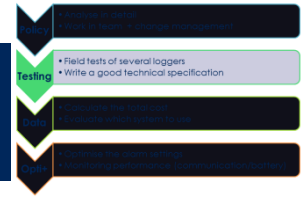
Technical policy

% Loadcurve for a LP 100 mbar -network

Pressure in mbar

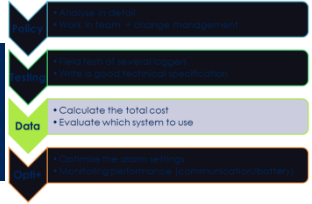


Testing + development



- Duration: 1 year
- Key issues:
 - Testing 4 loggers from two different suppliers in 3 different areas within Eandis
 - Building up experience in preparation of purchase: evaluating the requirements
 - Writing a specification based on existing systems
 - Purchasing the devices
 - Average cost per logger
 - » 1-channel: 700 €
 - » 2-channel: 1.100 €
 - Average cost for GPRS per logger: 0,9 €/month

Data Management system + implementation



- **Duration:** 1 year + 3 years
- **Key issues:**
 - Using existing software to manage the data
 - Most problems are due to communication settings impairing the data connection
 - Budgeting the costs requires an implementation over 3 years



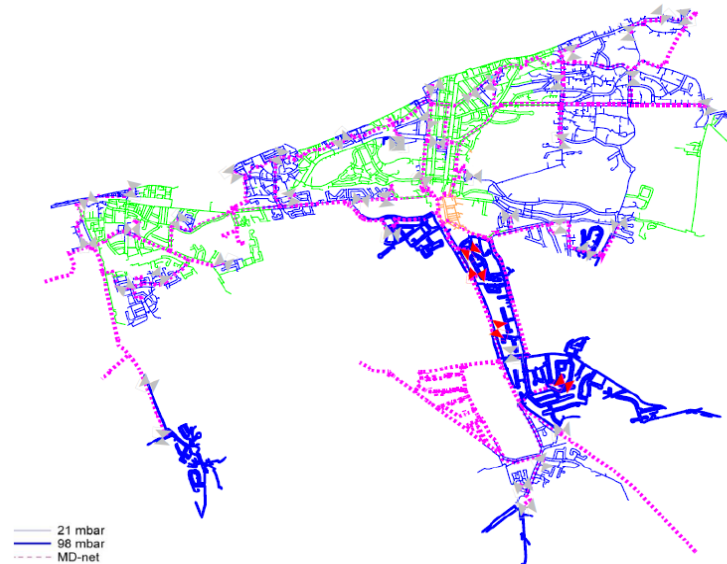
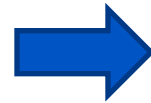
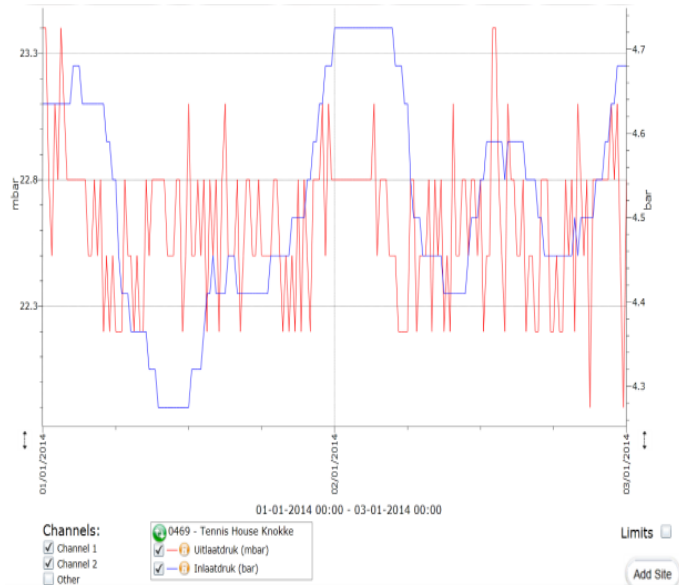
Optimalisation



- **Duration:** ongoing
- **Key issues:**
 - Optimising the alarm settings
 - Monitoring the performance of the communication: 2% of all communications are inaccurate
 - Analysis of battery lifetime
 - Essential updates of the loggers' firmware

Results

■ Optimising new grid investments



Results monitoring grid

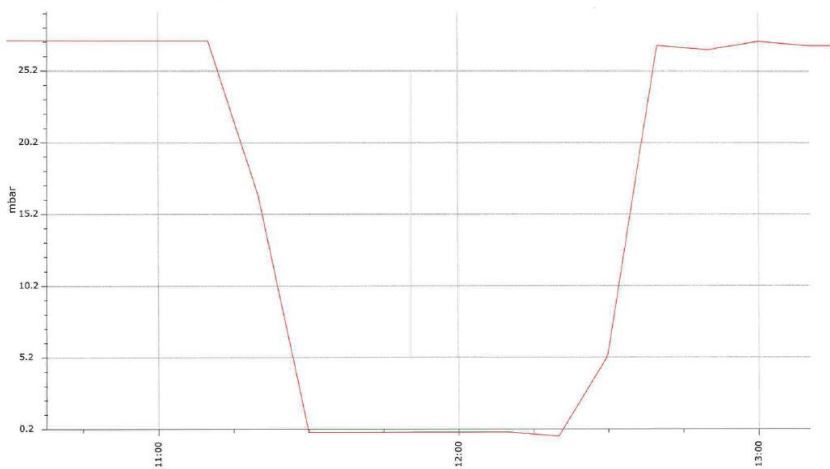
Results study

Important to bring together the theoretical findings with the actual pressure results

Results

- An increasingly reliable and safe exploitation

Duffel - Franselei 19 - uitlaatdruk (mbar)



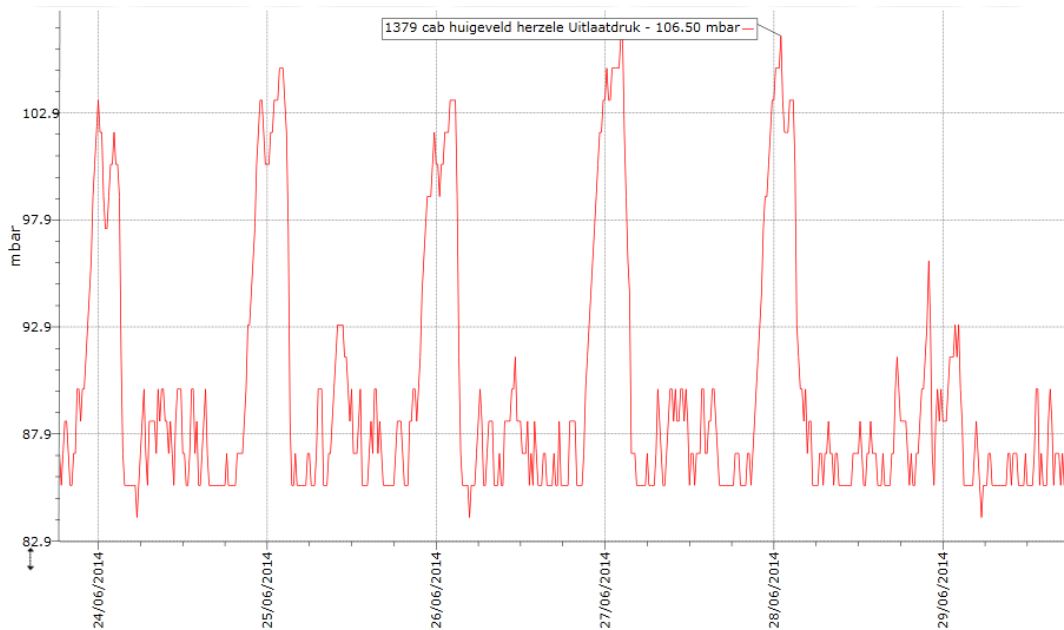
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Faster reaction time in case of pressure problems

Results

- Detecting malfunctioning of regulating devices installed in gas stations



After analysis:

→ Installation
overdimensioned

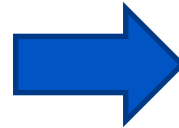
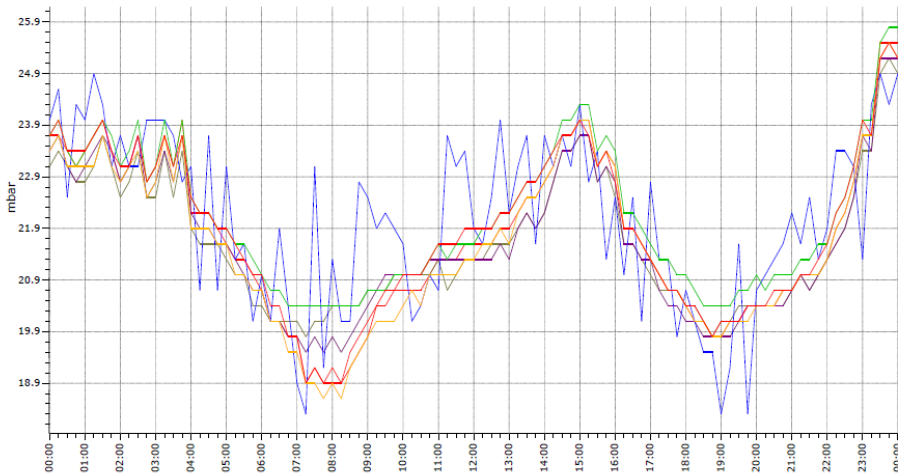
→ Regulating device is OK

Specific input for detail analysis

Results

- Detecting malfunctioning of regulating devices installed in gas stations

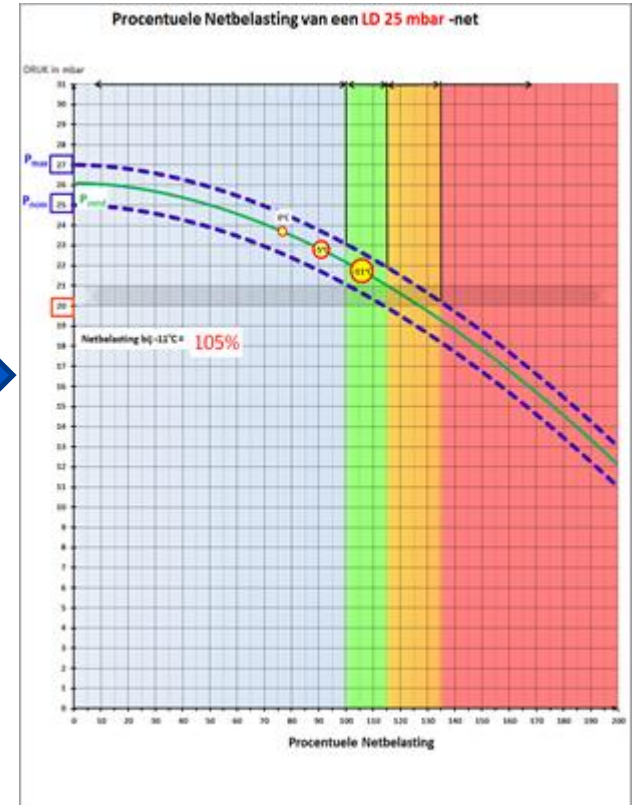
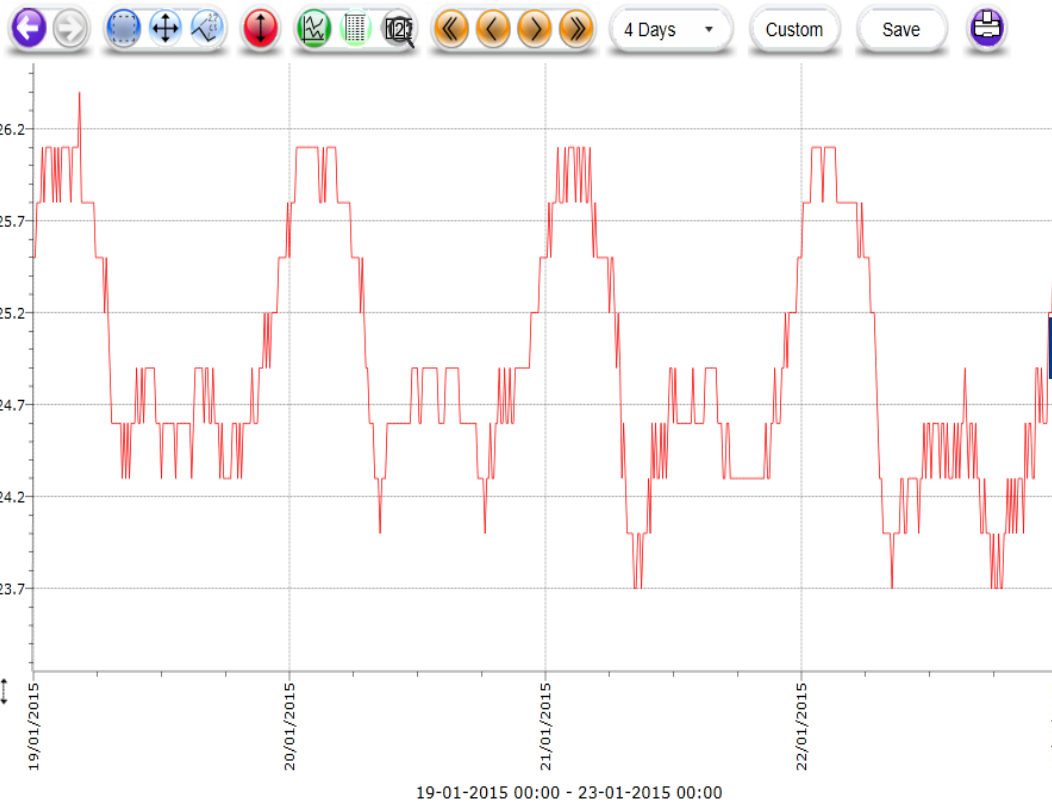
0936 Tielt 1168 Beneluxlaan — Uitlaatdruk (mbar)
0030 Tielt 1299 Galgeveldstraat — Vertrek LD (mbar)
1630 Tielt Holdestraat — Uitlaatdruk (mbar)
1624 Tielt Bedevaartstraat — Uitlaatdruk (mbar)
1631 Tielt - Burggr. Vandev Dries — Nedruk (mbar)
0913 Tielt 544 Kauwstraat — Uitlaatdruk (mbar)
1628 TIELT Oude Stationstraat — Uitlaatdruk (mbar)



Specific input for detail analysis

Results

Evaluation of network Load



After monitoring smart analysing

A smart grid does not necessitate large investments and research.

Using mature technology in a smart way creates interesting opportunities!

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