INCREASING INTELLIGENCE IN UNDERGROUND DISTRICT ENERGY NETWORKS – new role of valves?

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May 8th, 2019, Nantes
1st generation
– First commercial DH systems launched in the US in the 19th century, temperatures below 200°C

2nd generation
– CHP, biomass and renewable generation for greater efficiency and sustainability, temp 100-200°C

3rd generation
– Many existing district energy systems are 3rd generation, temperatures below 100°C

4th generation
– Transition to low temperature networks, which operate at 60°C and lower
– Rely uniquely to renewable or secondary heat production
– New generation of renewable resources solar, hydro, wind and geothermal
TRANSITION FROM 4th TO 5th GENERATION

Needs to respond the needs of future Sustainable Smart Cities

- Energy at the right place at the right time
- Intelligent control of complete energy systems from energy production until the end customer
INDUSTRY DIGITRANSFORMATION CHALLENGE

IoP
People (consumers)

IoS
Services (maintenance)

IoI
Industry (process)

IoT
Things (hardware)
INTELLIGENCE IN TRADITIONAL DISTRICT ENERGY SYSTEMS

Power plants

Pumping stations

Underground transfer and distribution networks

Substations

HVAC

EFFICIENCY
Network optimization

RELIABILITY
Leak detection

MAINTENANCE SUPPORT
Network surveillance, preventive maintenance
Energy utilities are looking for new digital solutions to help in:

- Locating pressure losses
- Locating heat losses
- Locating internal flow loops (crazy circles)
  - Pumping efficiency is lost in internal flow loops
  - Know the flow direction => optimized the flow => improved pumping efficiency

"Network conditions are not known and network is steered with high safety factors to assure heat supply to the most demanding points of the network"

Energy utilities estimated 1 %-unit improvement in efficiency resulting to savings of

- EUR 100,000 per year in small networks
- > EUR 1,000,000 per year in large networks
RELIABILITY

“We know there is a leakage in the network, but locating the leakage takes too long”

Finnish energy companies have in average 10.8 distribution interruptions per year*, of which
  – Planned 8.4
  – Unplanned 2.4

Leak detection happens*
  – 90% of the cases manually by third party
  – Current alarm systems 0%, heat cameras 1%, additional water 2% and other 7%

Case sample of leakage situation of a medium sized city

- Locating the leakage takes 8 hours
- Additional water during 8 hours 12,000 m³ ~ EUR 12,000
- Average fixing cost in pipelines over DN250 EUR 20,027
- Estimated lost invoicing in detached house EUR 1,666
- TOTAL 33,693 € per leakage

Energy utilities are looking for new digital solutions to help in:

- Improved maintenance efficiency and less footwork
- Remote monitoring of most challenging chambers
- Possibility to act proactively to any emerging problems i.e. water in chamber

"District energy networks are getting older, renewal is slow and their condition monitoring requires lot of manual work. Key issue would be to know in what to do and when to improve life expectancy of networks"
INCREASING INTELLIGENCE IN UNDERGROUND NETWORKS REQUIRE...

- Underground operation
- Wireless operation
- Self-powered power generation
- Possibility for post assembly
UTILIZATION OF UNDERGROUND VALVES TO ENTER 5TH GENERATION

- Pressure 1
- Pressure 2
- Temperature
- Vibration
- Leakage detection based on pulse technology via alarm wires
- Chamber temperature
- Chamber humidity
- Chamber water level

FOR OPTIMIZATION
FOR FAST LEAKAGE DETECTION
FOR REMOTE CHAMBER MONITORING
ON-GOING PILOT IN FINLAND FOR 5TH GENERATION SMART VALVES
INTELLIGENCE IN FUTURE DISTRICT ENERGY SYSTEMS

EFFICIENCY
Know your network conditions and optimize

RELIABILITY
Detect leakages fast and precisely

MAINTENANCE SUPPORT
Monitor wells remotely and efficiently
INSPiRed BY YOUR FLOW

Come and meet us at stand ME-003!