Fault handling in district heating substations
- Experiences from the industry
Why investigate fault handling in substations?

• Two common reasons to increased return temperatures:
  – Faults in customers’ internal heating system
  – Faults in customer substations

• Many installations are poorly performing in some way → higher return temperatures

• Substations must be well performing in 4GDH systems to maintain low temperatures
Research questions and method

How do the utilities work with fault handling today?

- Interview study:
  - Qualitative interviews with representatives from 6 utilities
  - Focus: how the utilities worked with the customers to decrease the return temperatures

What faults are most common today?

- Survey study:
  - Survey was sent to 139 different utilities in Sweden - 56 utilities answered
  - Focus: what are the most common faults and how the utilities work with them

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Results from interview study

What incentives do DH utilities have to work with customer fault handling?

**Incentives for DH utilities**

- Maintain good system efficiency
- System advantages when certain production units are used, e.g. flue gas condensation
- Diminish pump effort and electricity use by avoiding high flow
- Enhanced customer satisfaction

**Incentives for DH customers**

- Relationship with the utility – information and willingness to help
- Flow component in price model
  - Information extremely important!
- Collective responsibility to keep DH prices down
Results from interview study

How are the utilities working with fault handling?

**Fault detection and fault diagnosis**
- Using customer data for fault detection
- Overflow/overconsumption
- Return temperature analysis
- Own analysis methods
- Most faults are identified on-site by service technicians

**Access to and mandate of the substations**
- Important to gain physical access to the installations
- Service agreements - Some utilities included this in the price
- Free of charge inspections
- One of the most important aspects of the fault handling process
Survey study

What faults are most common today?

Five different categories of faults were identified:

1. Heat exchangers
2. Control system and controller
3. Actuators
4. Control valves
5. Customer’s internal heating system
Results from survey study

What faults are most common today?

- Heat exchangers: 33%
- Control chain and controller: 23%
- Actuators: 13%
- Control valve: 10%
- Customer's internal heating system: 5%
- Leakages: 5%
- Inferior packings: 3%
- Slow thermostats: 3%
- Pumps: 13%
Conclusions and future work

• How do the utilities work with fault handling today?
  – Incentives for customer are important
  – Information and willingness to help
  – Access to and mandate of the substations is very important!

• What faults are most common today?
  – One overall category is most common: leakages
  – Faults in customer’s internal heating system are common

• Future work:
  – Continued work with current fault handling procedures
  – Further investigation of the most common faults
  – Develop methods for identifying the most common faults off-site
Thank you for your attention!

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