

Vanliga fel i fjärrvärmecentraler

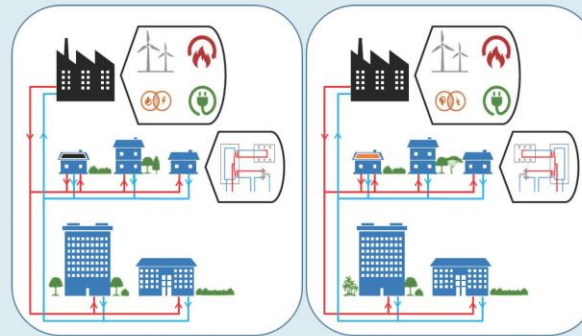
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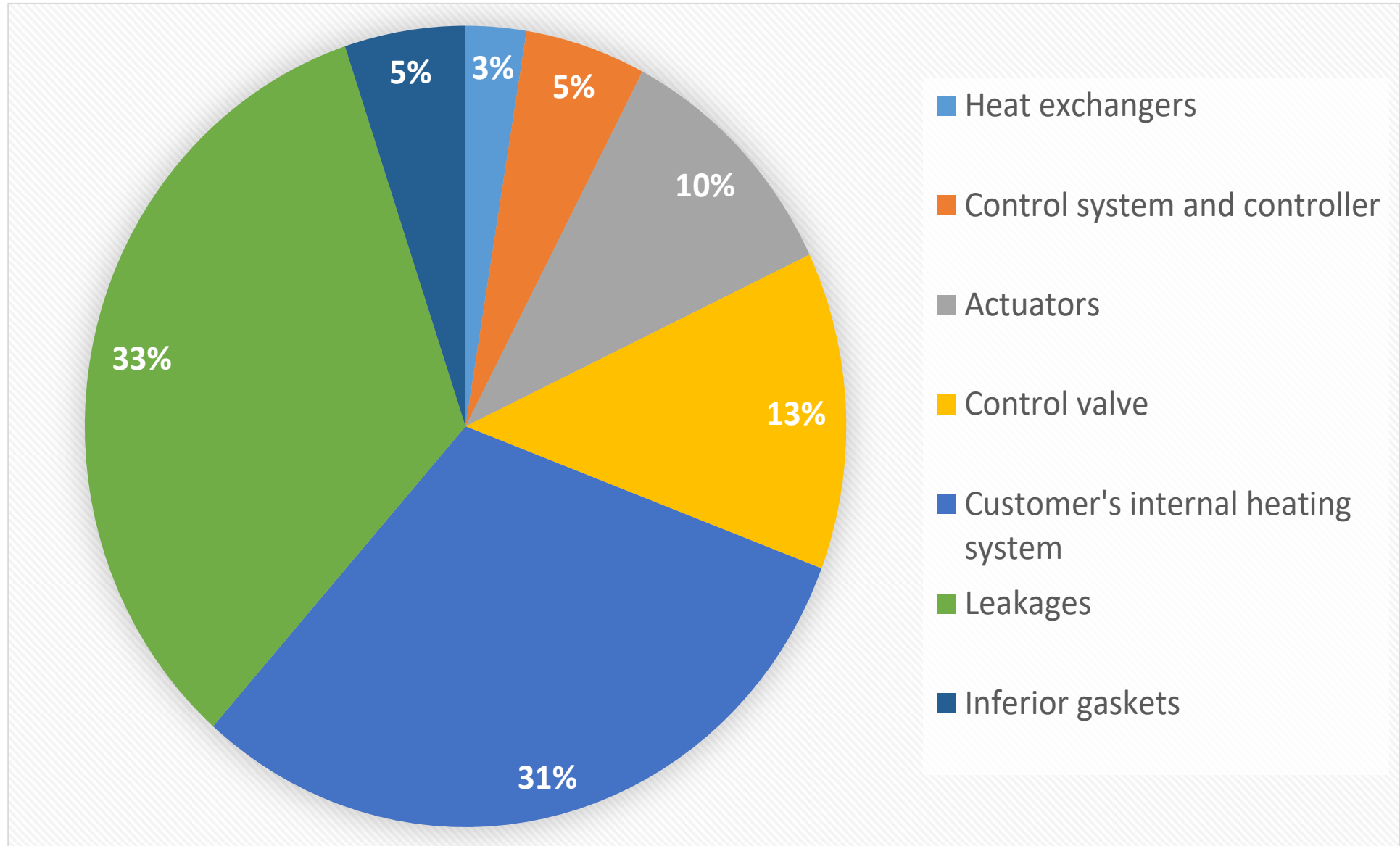
Spot the difference!

On the way towards automated fault handling in district heating buildings

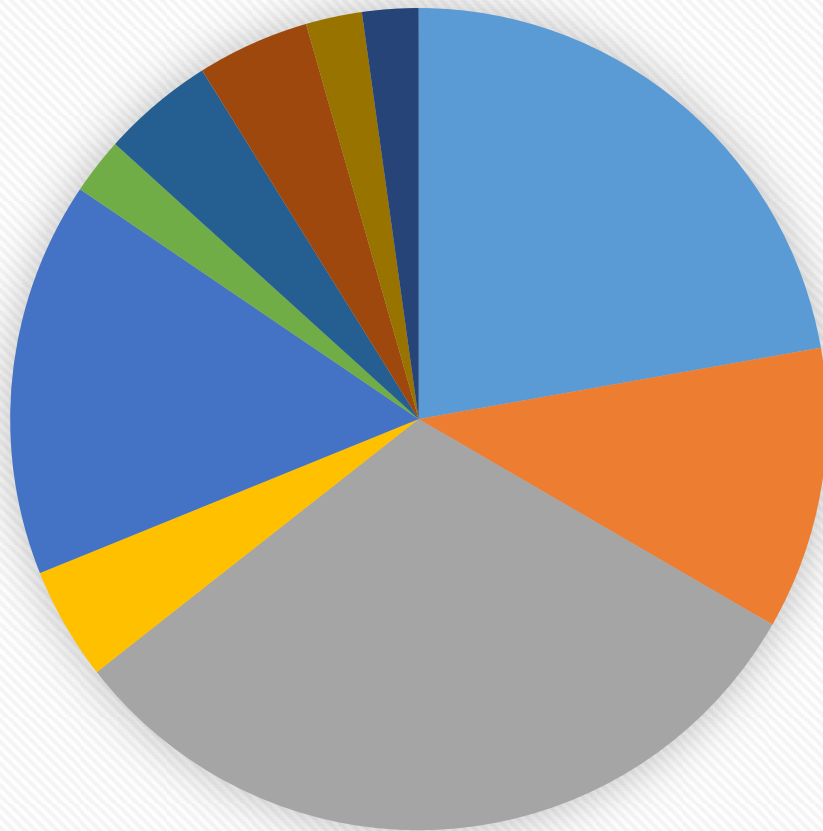
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Vanligaste felet, kundens interna system



- Radiatortermostater saknas/är trasiga
- Kundens begärda temperatur ligger mycket nära, eller högre än, fjärrvärmesystemets framledningstemperatur
- Dåligt injusterade radiatorsystem
- Avsaknad av reglering av flöden i sekundära kretsar
- Varmvattencirkulation saknas
- Dåligt tryck i expansionskärlet
- Luft i systemet
- Onödigt stort flöde i varmvattencirkulationen
- Varmvattencirkulationen inkopplad före förvärmaren

- Enkät med ca 50 FV-bolag i olika storlek
- Påtaglig variation i svaren på frågan om förekomst av specifikt fel.

1. Förekommer aldrig

2. Mycket sällsynt

3. Sällsynt

4. Vanligt

Fixarfrasse!





A taxonomy for labeling deviations in district heating customer data

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ABSTRACT

This paper suggests a taxonomy for labeling deviating patterns in district heating (DH) customer data. The taxonomy contains several fault labels intended to register information about faults in the DH systems that cause deviations in customer data. This taxonomy is needed because the DH industry is currently missing a unanimous way to label identified faults. The lack of a taxonomy makes it hard to develop automated fault detection and diagnosis methods based on the analysis of DH customer data. Such methods usually require training on historical data sets known to contain deviating data patterns caused by specific faults. By developing a taxonomy for labeling these faults, this study aims to create value for DH utilities in current and future DH systems. The taxonomy structure was based on literature studies, workshops, and discussions with partners within the Swedish FutureHeat collaboration organization Smart Energi. Once the basic structure was decided, it was sent out for evaluation amongst Swedish DH utilities. The evaluation was carried out as a survey study. The results from the survey were compiled, and the finalized version of the deviation cause taxonomy was produced. The study includes the results of the survey study and the finalized version of the deviation cause taxonomy.

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1. Introduction

District heating (DH) systems have been identified as an essential part of the future, smart energy systems based on renewable energy sources [1]. This is due to the DH systems' inherent ability to utilize local fuel or heat resources that would otherwise go to waste [2]. However, the current DH systems have to undergo significant improvements to fulfill their role in future energy systems. One of the main areas of improvement would be to decrease the distribution temperatures to the temperatures of the fourth generation of district heating (4G-DH) [3]. A reduction of the temperature levels would make it possible to include larger amounts of waste-to-energy and geothermal and solar thermal heat sources [3]. It would also increase the power-to-heat ratio in combined heat and power (CHP) plants [4], make it possible to integrate more low-temperature excess heat [5], and decrease the heat losses from the DH systems [6].

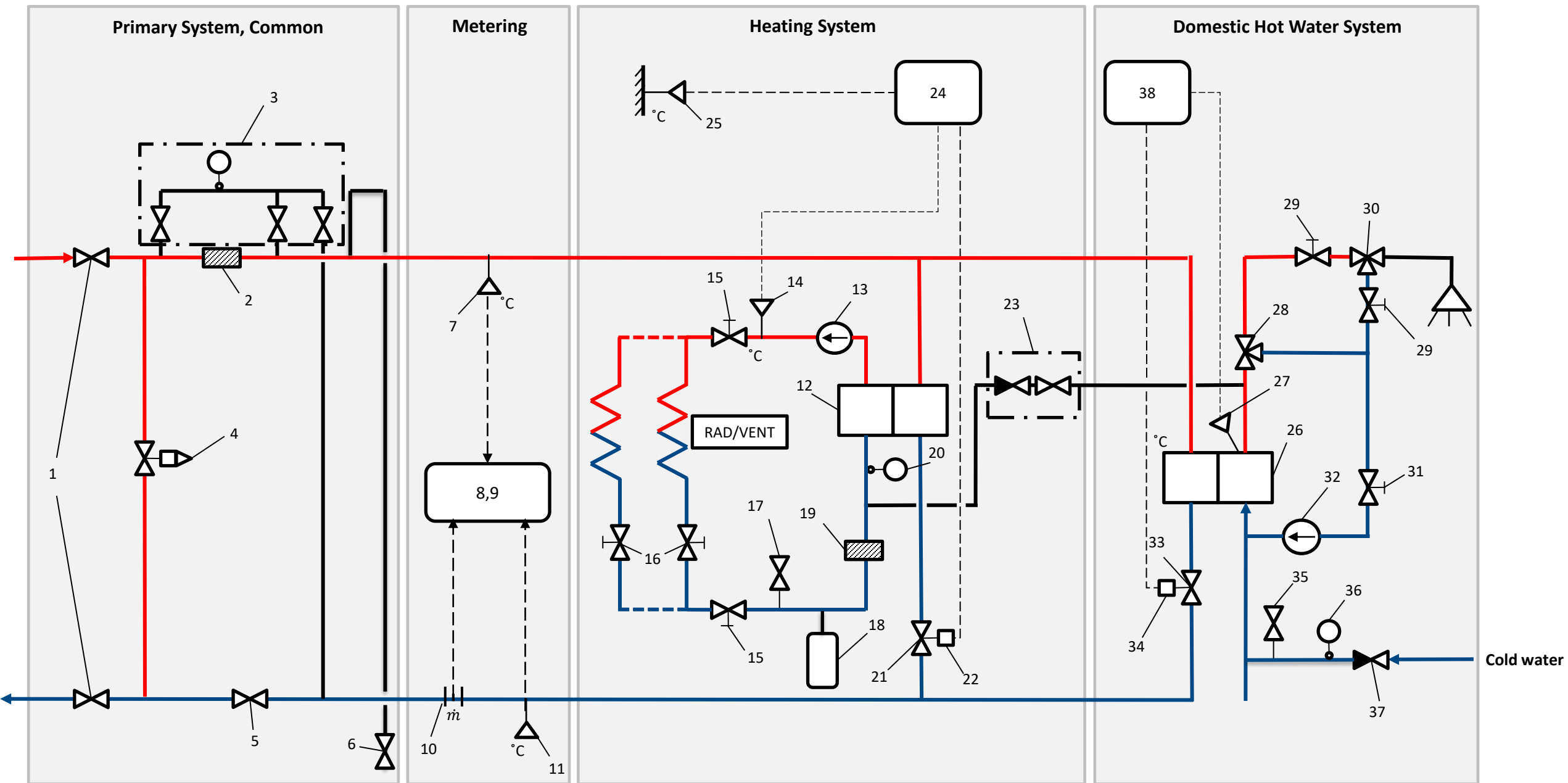
To a large extent, the high-temperature levels in the current DH systems are due to faults in the systems that cause high return temperatures [7]. Therefore, this study focuses on the detection of the faults that cause high distribution temperatures. In this study, a fault is not only broken components but rather something that cause the system, or part of the system, to perform poorly. Such issues include summer bypass valves and leakages in the DH system [2]. A large number of faults also appear in the customer installations [2]. Thus, the current DH systems contain many faults that need to be detected and corrected to reach lower temperature levels. However, successful fault detection will be an even more important aspect in future low-temperature DH systems. Such systems will be significantly more cost-sensitive to unwanted temperature increases due to the heat sources included in the systems, as has been shown by Averfalk and Werner [8].

Many faults in the DH systems manifest themselves in DH customer data, where they appear as deviations in the typical heat use patterns and temperature levels [9,10]. It would thus be possible to detect them by analyzing customer data. One important contributor to the success of fault detection will be to utilize different information and communication technologies (ICT). ICT

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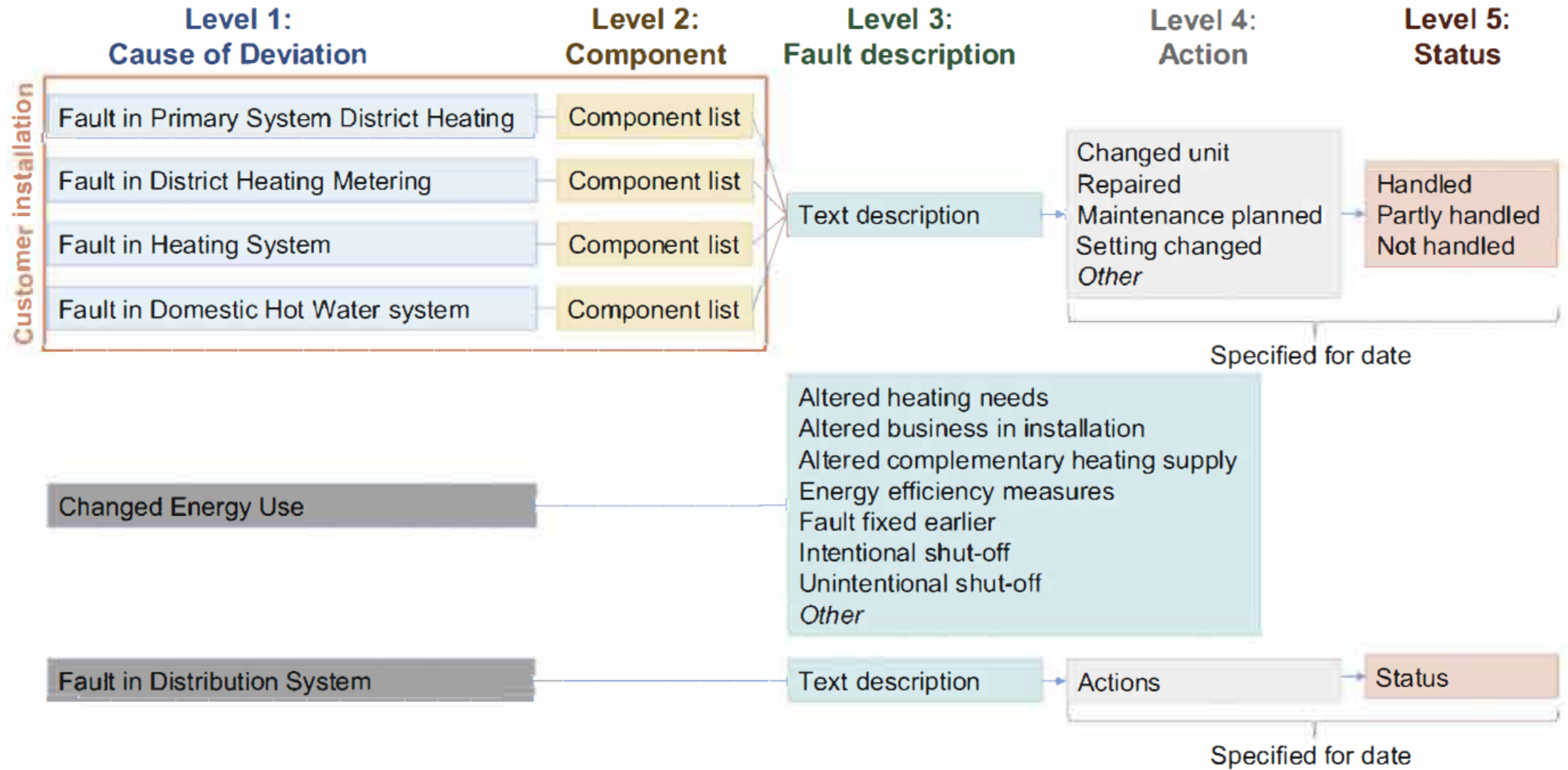
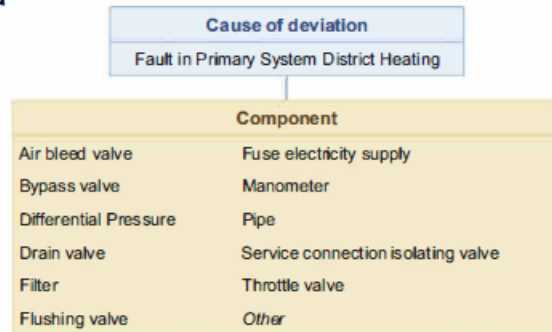
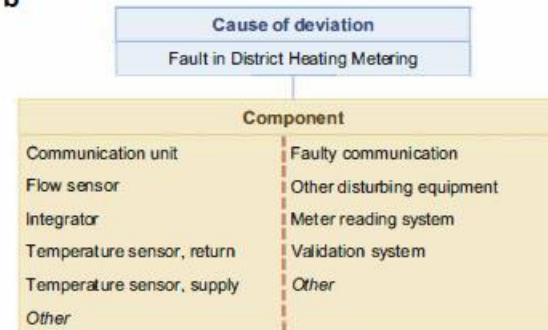
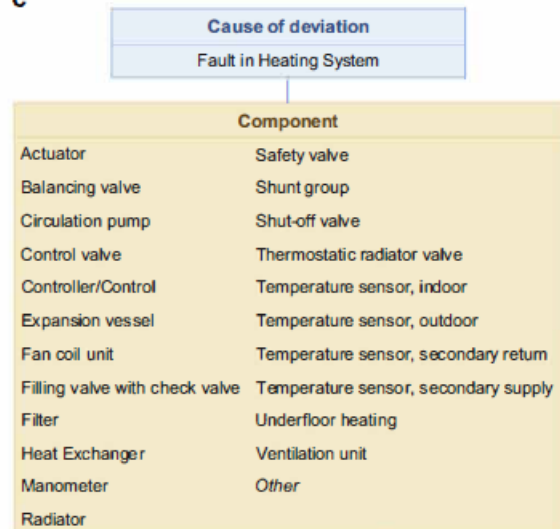
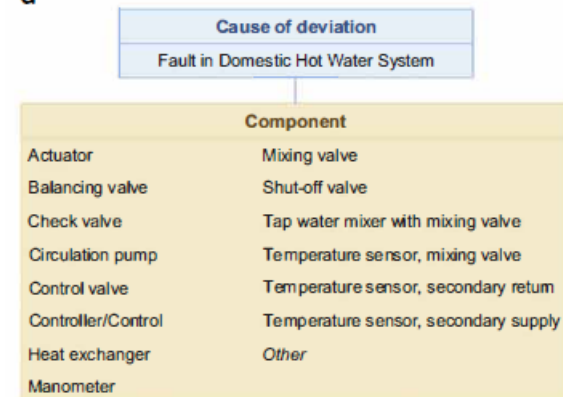


Fig. 3. Overall structure of the deviation cause taxonomy.

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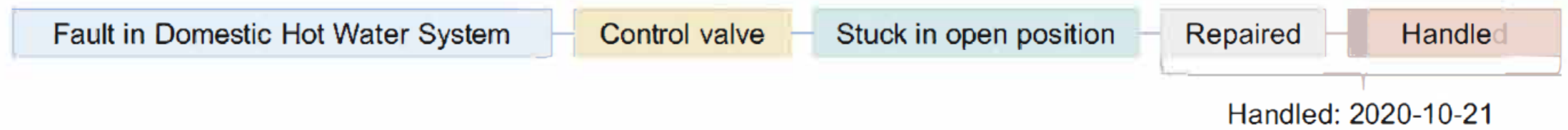
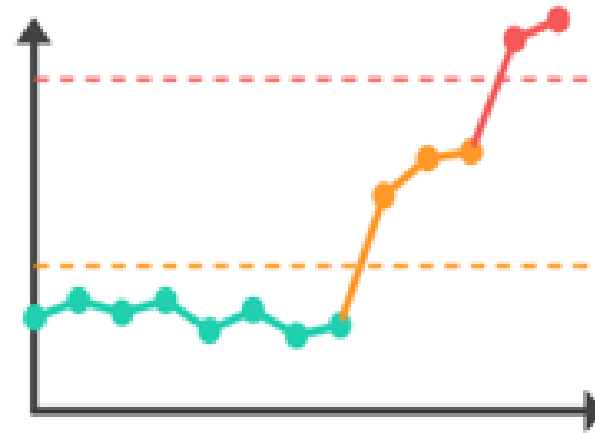
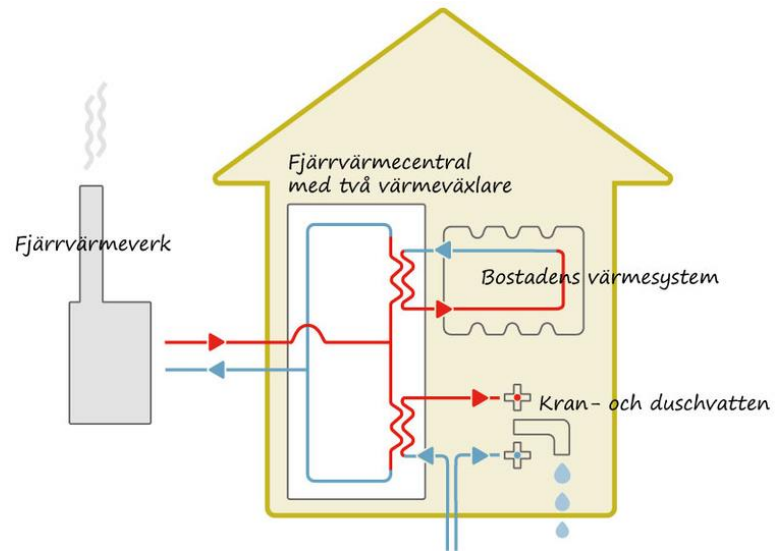


Fig. 4. Example of how an actuator stuck in an open position may be labeled according to the taxonomy.

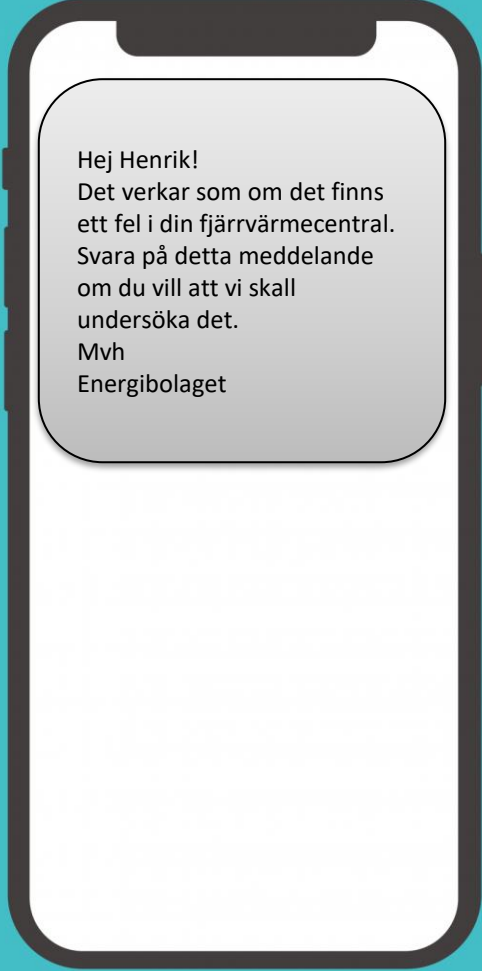
Dokumentera mera!



Prediktivt underhåll!



Prediktivt underhåll!



Hej Henrik!
Det verkar som om det finns
ett fel i din fjärrvärmecentral.
Svara på detta meddelande
om du vill att vi skall
undersöka det.
Mvh
Energibolaget

Fråga:

Är det någon som tycker att prediktiv felavhjälpling är fel väg att gå?

Tack

för uppmärksamheten och gå hem och dokumentera mera!

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