SmartGuard

Meier Tobler AG

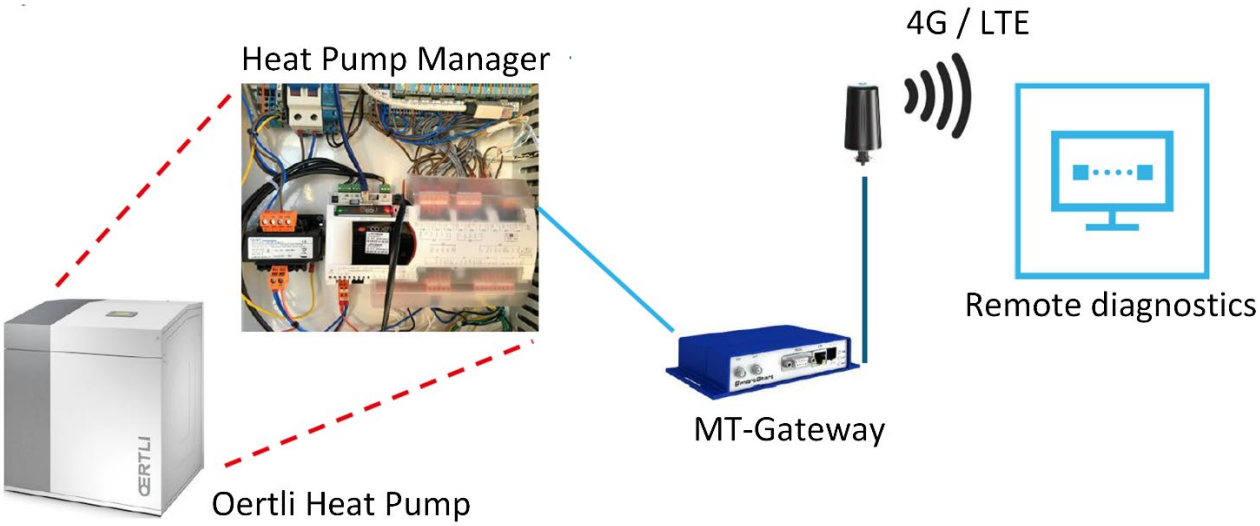

Figure 1: SmartGuard system setup [1].

Summary of IoT case

Heat pump malfunctions are often not detected until comfort loss is experienced by the occupants of the building. The resulting analysis of the malfunction through service personnel of the HP supplier then usually takes place on-site. Only after an on-site inspection by the service personnel can the defect in the HP be identified and determined whether spare parts are needed for repair. The necessary spare parts must be obtained and installed in a subsequent step. By the time the HP is fully operational again, the building may have cooled down and affected customer satisfaction.

Meier Tobler AG developed an IoT solution called "SmartGuard" to enable remote diagnostics for heat pumps. The goal is to guarantee efficient and safe operation of the HP and facilitate maintenance workflows. SmartGuard is offered as a service with an annual subscription cost (free during the warranty period of the heat pump).

The SmartGuard system setup is divided into three parts: The heat pump manager, the MT-Gateway and the remote diagnostics. The heat pump is controlled and monitored by the heat pump manager. The heat pump manager can redefine various control parameters. In addition, the HP-manager collects over 200 data points of the heat pump in a resolution of up to 1 second. The heat pump manager is directly connected to the MT-Gateway. The MT-Gateway has its own antenna on the building facade and thus communicates via 4G/LTE (LTE CAT1M) with Meier Tobler's remote diagnostics.

The remote diagnostics are carried out both automatically and manually by trained service personnel. In particular, the detection of faulty heat pumps is done by an automated algorithm. The service personnel have the power to decide on the resulting actions. Detailed technical details on data analysis and fault detection are not publicly available [1].

SmartGuard enables the correction of simple settings and minor faults remotely. If a heat pump fails, SmartGuard can detect this and service personal has the possibility to contact the customer before comfort loss occurs. Due to the remote diagnostics, the technician is able analyze the fault and identify the required spare parts. Another aspect of the remote diagnostics is the optimization of the control parameters of the HP in the first years of operation, to

increase the efficiency of the heat pump. These functions are based on the heat pump's previous operating behavior.

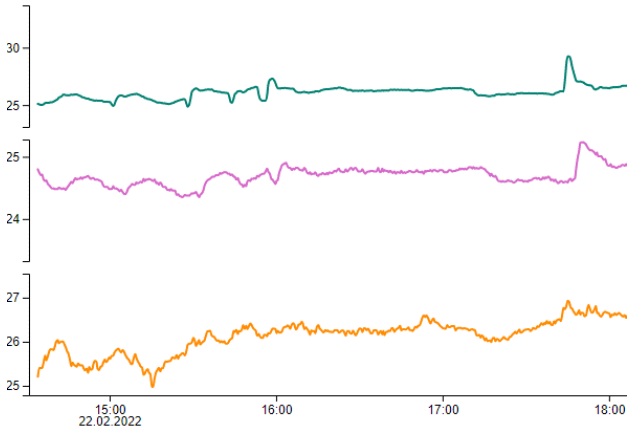

Figure 2: Graphical display of various HP data points for manual remote diagnostics by the service technician [1].

In the near future, costumers will have access to all their system data via a mobile app and will be able to make their own adjustments to the settings. For example, the room temperature can be automatically lowered when the occupants are on vacation. In the days before their return, the heat pump will automatically start to heat up the building to the desired temperature avoiding unnecessary excessive energy use [1].
SmartGuard can currently be installed in Oertli heat pumps installed by Meier Tobler. It is possible to retrofit older heat pumps with SmartGuard.

Achieved Results

- Automated fault detection and facilitation of repair of heat pumps through real time diagnostics enabled.
- Optimization of heat pump operation based on past performance can be done remotely. With the mobile app, the customer can customize his desired user profile and has insight into all changes made by the personnel.

FACTS ABOUT THE IOT CASE

IoT catagory: optimize HP operation, predictive maintenance, installation error analysis

Heat supply capacity: 1-150 kW (in cascading possibel)

Heat source: multiple sources covered

Analysis method: HP operation data visualisation and manual failure detection

Modelling requirements: no requirements

Data required: HP operation data, meta data of the building, user profile

Data interface:LTE CAT1M

Transmission protocol for data: n.A.

Quality-of-Service: real time (faults and alarms), deferrable (expert analysis)

Technology Readiness Level: TRL 9

Link to webpage:
https://www.meiertobler.ch/de/loesung-und-produkte/smart-guard

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[1] R. Di Cerbo, “SmartSolutions – innovative Digitalisierungslösungen,” Spreitenbach, Apr. 07 2022, Online Available: https://dokumente.meiertobler.ch/files/doc-portal/55038/ffnhmzkda.pdf (accessed Dec. 20 2022)