Whitepaper

District heating network optimization with DWEEN Heat

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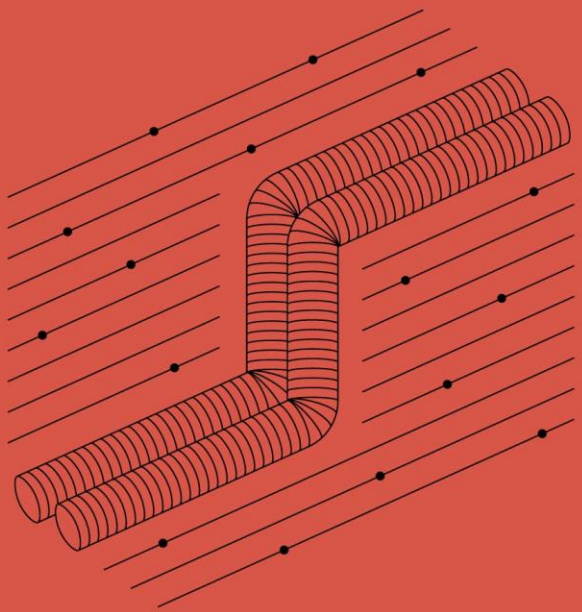
DWEEN Heat



Executive summary

One of the main challenges for district heating companies is to transform business from the 3rd District Heating Network generation up to 4th or even 5th generation. Main challenges are supply temperature reduction, heat flow rate stabilization, reduction of losses, optimization of investment and efficient operation.

Dweeen Heat solution allows to design and operate District Heating Network ensuring efficient operation and reduction of heat energy losses. Included modules:

- Intelligent Automatic Control of flow temperature and pressure
- EA-PSM Hydraulic software for hydraulic network modeling and calculations
- Heat energy, hot water and hot water heat energy production and supply forecast
- Consumer side smart meter data collection,
- Heat production side data collection and analysis.

Company background

Energy Advice is a Technology Development and Advisory company. Dween Digital Cloud Solutions help energy-intensive industries to increase operational efficiency and sustainability.

Our strength is deep knowledge of engineering systems, technologies and processes. We use real time data analysis in our intelligent products to automate and control process flow, improve quality and reduce energy consumption.

Energy Advice is ISO 27001:2013 and ISO 14001:2015 certified.

Dween Heat functionality

- Intelligent Automatic Control of Flow temperature and pressure to the grid by artificial intelligence in ¼ minute intervals:
    - flow rate-based pump output pressure control through VFD frequency,
    - flow rate change speed limitation to avoid hydraulic ram,
    - control of multiple / parallel flow pumps.
- Distribution of heat production between boilers:
    - by minimum costs,
    - by HDN flow limitations,
    - by minimum HDN losses,
    - by flow temperature to the grid.
- Online Thermal-Hydraulic flow calculation for optimum flow and temperature control:
    - Connection of Heat Consumers to the GIS Thermal Hydraulic model,
    - Preparation of HDN hydraulic data and GIS scheme (powered by ESRI ArcGis Technology) for Thermal Hydraulic calculations,
    - Heat energy production connection to the HDN,
    - Heat energy production distribution among primary and balancing boiler,
    - Visualization of hourly calculation results vs online HDN data on map.
- Heat energy demand forecast (heating, water):
    - Short term planning (hourly),
    - Long term planning,
    - Fuel supply forecast, quantity / cost.
- Real-time comprehensive assessment of HDN operation:
    - Heat energy supply to the network,
    - Heat energy consumption,
    - Heat energy losses,
    - Heat losses coefficient kWh/degree Day (HDN insulation quality),
    - Operational costs: real-time, hourly, daily, monthly,
    - Notifications of deviations from normal operation by email and SMS.
- Reports, data visualization:

    - Daily thermal energy supply to HDN, MWh,
    - Daily consumption of thermal energy, MWh,
    - Cost of energy supplied, Eur/MWh & Eur/toe,
    - Electricity consumption kWh/MWh thermal,
    - HDN pump efficiency analysis.
- Real-time performance data and control system settings are accessible online.

Scope of Services:

- GIS data preparation,
- Preparation of data retrieval and project integration,
- Automated data reading of heat energy consumers metering (REST Web Service),
- Automated data reading from heat consumers data base and linking with GIS,
- Data import of heat energy consumers data from file,
- Ambient temperature data reading,
- Automated Scada metering data retrieval and linking with GIS,
- Heat energy, hot water and hot water heat energy forecasting module,
- EA-PSM Hydraulic - software for hydraulic network modeling and calculations,
- Dween Heat Hydraulic thermal model commissioning and validation.

Outcome / Benefits

- Reduced HDN thermal energy losses,
- Increased lifetime of HDN due to reduced flow temperature,
- Increased validity of maintenance, reduced maintenance and repair costs - due to data-driven decisions,
- Data archive - information about the HDN, related equipment and process is stored in the Dween DataWarehouse for 1 year,
- HDN, Smart energy and water meters, boiler house data in single platform,
- GIS model of the network, equipment (properties) inventory to increase reliability.

Detailed scope of Services

- GIS data preparation

GIS data collection, conversion and preparation for hydraulic-energy calculation. Existing database conversion to *.gdb (ESRI technology). Bad data and inconsistency would be resolved and prepared for real time calculations.

- Preparation of data retrieval and project integration

Data exchange REST Web Service models are prepared for the project.

- Automated data reading of heat energy consumers metering (REST Web Service)

Data reading of heat energy consumers meters from the database using REST Web Service. Data reading is performed once per hour.

- Automated data reading from heat consumers' data base and linking with GIS

Consumers' database import to digital hydraulic network. Data is linked with GIS.

- Data import of heat energy consumers data from file

Data import from file for consumers who do not have remote energy consumption reading and declare energy amount at the end of the month. Data import is performed once per month.

- Ambient temperature data reading

Ambient temperature data reading is performed via Web Service once per hour. Not included in the price: data provider costs.

- Automated Scada metering data reading and linking with GIS

Scada metering data reading and linking with GIS elements.

- Heat energy, hot water and hot water heat energy forecasting module

Heat energy, hot water and heat energy forecasting module performs energy forecasting for each consumer separately. Heat energy consumption forecast is based on ambient temperature, humidity, air velocity, direction forecasts and historical consumer data. Model launch and coordination and adaptation to the existing database and its quality. Prediction uncertainty is <10%.

- EA-PSM Hydraulic - software for hydraulic network modelling and calculation

One free license with each Dween Heat license. Desktop version for the calculation results and GIS network preview. Calculations are performed, calculations' results and GIS network data is stored in the Dween DataWarehouse.

- Dween Heat Hydraulic thermal model commissioning and validation

An analytical software solution for District Heating Network Management Digitization:

- Operation modeling is performed so modeled operation modes matches the real situation on all parameters,
- Operation modes are tracked so it is possible to monitor instantaneous deviation. Deviations are evaluated and its causes are identified. Information regarding network fluctuations is being collected. Recurrent / planned / controlled and accidental / unpredicted operation fluctuations are determined,
- Operation modes are being planned and maintained. Evaluation of standard and planned (modeled) situations is performed,
- Instantaneous and periodical (for determined period) line losses economy evaluation is performed,
- Instantaneous and periodical (for determined period) operation modes economy evaluation is performed.