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PU	Public	
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CO	Confidential, only for members of the consortium (including the Commission Services)	

1. Introduction: Heat substations in District Heating networks

To maintain energy balance in the buildings or complex of buildings it is required the supply of utilities, hot and cold. These utilities can be generated locally by local boilers, refrigerators and air conditioners. In these cases the possibilities of process integration methodology are limited. In urban areas, where buildings of different kind are closely situated, the supply of utilities can be done from centralized distribution network in a form of steam, hot water or chilled water. It is made by District Heating (DH) systems, which nowadays represent the most energy efficient way of utilities supply in densely populated areas.

A district heating substation is a component in a District Heating system that connects heating system of the building (or group of buildings) to the main DH network. The heating station that connect group of buildings to DH network is called Central Heating Station (CHS). Such substations were very popular in Eastern countries before 1990th. They have capacity from 1 up to 20 MW and handle inner circuit of radiator water for group of buildings and also hot tap water heating for these buildings. That time CHS were made based on tubular heat exchangers and required separate buildings for their installation. The temperature regulation for individual houses and flats was not maintained, it required four pipes to connect to the houses (two for radiator water and two for tap hot water). In such piping were excessive heat losses. The size of tubular heat exchangers and noise of that time pumps not permitted to install substations inside buildings.

Figure 1. Central Heating Station with total capacity 10 MW at railway terminal in Kiev produced and installed by SODRU

The introduction in DH of compact heat exchangers (especially PHEs) and low noise pumps has enabled to install heat substation inside the buildings and also to reduce the size of CHS. In Figure 1 is presented the view of CHS based on PHEs.

The heat substations at individual apartment buildings and family houses are constructed based on Individual Heating Modules (IHM) which produced beforehand in a workshop. The installation on site requires just to connect primary side (DH) pipes and pipes of the inside building circuits to the IHM. In Figure 2 is presented heat substation based on IHM for apartment house and in Figure 3 smaller IHM for family house.

Figure 2. Individual Heat Substation with total capacity 1.2 MW in apartment building at Dnepropetrovsk produced and installed by SODRU.

Figure 3. Individual Heating Module with capacity 200 kW

The Individual Heating Module normally has one or more of the following parts:

- Plate Heat exchanger
- Pump

- Flow Control valve with actuator
- Temperature controller
- Temperature sensor
- Strainer
- Shut off valve
- Compensating tank

In addition, a district heating substation may also include:

- Heat meter
- Safety valve
- Balance valve
- Manometer
- Non-return valve

In earlier days the design of heat substations required a lot of efforts from DH designing engineer to calculate elements of heat substation and pipes arrangement inside the compartment for installation. With IHM it requires to formulate temperature, pressure, space requirements and scheme of IHM. According to these requirements IHM is calculated and fabricated at the work shop and is supplied to the customer, where it is required just few pipes connections to DH and inner building circuits. The main process requirements for IHM are DH and inner circuit temperature programmes and available pressure drops.

This report is a user guide for the software tool developed for calculation of the main IHM components developed by Spivdruzhnist-T in the framework of EFENIS Project.