

ENGINEERING  
TOMORROW

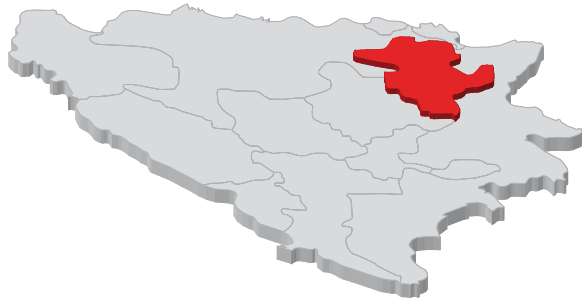
*Danfoss*

Case story

# Ambitious renovation of Bosnia and Herzegovina's largest CHP district heating network

**36%**

capacity increase  
through  
reengineering



**“After careful analysis of the current system set-up and operational data, we opted for a step-by-step modernization and replacement of most system components, from substations to energy meters in individual homes.”**

**Amer Karabegović,**  
managing director of the Tuzla District heating company



**It is no more cold winter mornings for the citizens of Tuzla. Since 2011, the local District Heating Company (“Centralno grijanje” d.d. Tuzla) has carried out a major renovation of the city’s comprehensive district heating network, providing reliability of supplies, improved comfort as well as energy and cost savings. Based on thorough analysis and a long-term strategic approach, the 30 year old system is gradually transformed into a modern and smart energy system.**

Located in the Northeastern part of Bosnia and Herzegovina, the historic city of Tuzla enjoys a continental climate with cold winters and hot summers. To meet the heating demand of the city, surplus heat from the large, municipal coal-fired power plant is used to supply district heating to a large number of homes and other buildings within the metropolitan area.

The available flow capacity of the existing, 30 year old system was 2,300 m<sup>3</sup>/hour, whereas the required flow to fulfil the heating demand of the connected homes, public and commercial buildings and other facilities was closer to 2,800 m<sup>3</sup>/hour.

The shortcomings of the system were especially felt in the mornings, when the inhabitants got up to cold rooms during the winter months.

In order to maximize system efficiency, raise the level of end-user satisfaction and improve the stability of the system, the local Heating Company TPP Tuzla decided to carry out a complete renovation of the system.

**Structured analysis and reengineering boost efficiency**

The Tuzla District Heating Company wished to create a long-term, viable solution based on thorough analyses of the current system set-up, application of state-of-the-art technology and implementation of an energy management system.

“When addressing capacity problems, many district heating operators resort to fast and easy solutions, for instance by installing additional circulation pumps. We chose another approach to achieve a long-term, sustainable solution. After careful analysis of the current system set-up and operational data, we opted for a step-by-step modernization and replacement of most system components, from

substations to energy meters in individual homes”, said Amer Karabegović, managing director of the Tuzla District heating company.

**The following goals were set up to succeed with the ambitious renovation project:**

- Supply low-temperature district heating to existing and new buildings added to the network
- Distribute heat with minimum grid loss
- Recycle heat from low-temperature sources and integrate renewables, e.g. solar and geothermal heat
- Implement a smart energy system balancing demand and supply at all times
- Ensure suitable planning, cost and motivation structures to achieve a sustainable energy system



Heating station “Cipelići” before reconstruction



Heating station “Cipelići” after reconstruction





Heating station "SKPC Mejdán" before reconstruction



Heating station "SKPC Mejdán" after reconstruction

**The structured reengineering process consisted of the following, main phases:**

1. Inspection of all substations that were not part of the central control system and subsequent specification of required improvement measures, for instance installation of ball valves, strainers, pressure regulators, control valves, temperature and pressure sensors, weather stations, safety thermostats and electric controllers.
2. The daily operation of substations and network was then measured to collect data that could be used for increasing capacity and efficiency of the system and potentially adding new connections and new supplies of thermal energy.
3. The measurements and subsequent analyses revealed the need to reconstruct a number of critical substations and to carry out further analysis of pipelines to avoid soiling that hampers the network efficiency. Furthermore, the analyses revealed the need to get all operators and system components into one, integrated control and management system.
4. A plan for renovation was then drawn up and the renovation commenced. A number of new control components were installed to optimize system capacity and efficiency, among others flow and temperature meters, pressure and temperature sensors, ball valves, strainers, pressure regulators, control valves, electric controllers, etc. Later, reconstruction or replacement of heat exchangers and circulation pumps will be performed to increase capacity and efficiency even more.

**Facts about the Tuzla district energy system**

Annual heat carrying capacity: 300,000 MWth

Temperature: 130–60°C

Transmission network length: 19.6 km (2x9.8 km)

Distribution network length: 142.4 km (2x71.2 km)

Power station fuel: Coal



Heating station "BKC" before reconstruction



Heating station "BKC" after reconstruction



**“Experience from other heating companies who have introduced this measure show, however, that energy consumption may drop by up to 30 %. Therefore, we have to have a new business model in place to deal with the dynamic changes in energy consumption, energy supplies and new technological opportunities.”**

Amer Karabegović,  
managing director of the Tuzla District heating company



### Ongoing optimization of the district heating system

By 2016, 98 substations have been retrofitted and 46 substations are still to go. Energy consumption has been reduced to below 22 kWh/m<sup>2</sup>, and at the same time the space heating capacity has been increased to more than 322,000 m<sup>2</sup> within the existing flow of 2,300 m<sup>3</sup>/h. The total savings have been calculated to be almost 449,000 MWh.

Public facilities have received extra attention in order to match daily/hourly use of the facilities with supply of heating and hot water. In this way, significant cost and energy savings have been achieved and a much more balanced use of the system according to the actual demand at any time.

Based on the successful renovation, the Tuzla District Heating Company has

decided to add 16 new district heating zones to the current system. On the future wish list are also reconstruction of the hot water network and pumping stations, replacement of the current spiral heat exchangers with plate heat exchangers and implementation of energy efficiency measures throughout the entire system.

“Individual energy metering is one of the options we are contemplating to control energy consumption. Experience from other heating companies who have introduced this measure show, however, that energy consumption may drop by up to 30 %. Therefore, we have to have a new business model in place to deal with the dynamic changes in energy consumption, energy supplies and new technological opportunities”, says Amer Karabegović, managing director of the Tuzla District heating company.

### Results achieved by reengineering the Tuzla district energy system

- 30 % energy savings compared to old system before retrofit
- Capacity expanded by 36 % within the existing flow of 2,300 m<sup>3</sup>/h

Danfoss is a pioneer in district energy solutions. It all started in the early 1970s when the oil crisis demanded new responses to energy scarcity. Since then, the quest for high efficiency and low carbon solutions has accelerated across the world.

Today, district heating and cooling have become favored solutions to improve urban efficiency and combat climate change. The Danfoss product portfolio for district energy is wide, comprising substations, flat stations, heat exchangers, control valves, control panels, power and water meters, and thermostatic and electronic radiator valves.

Danfoss helps municipalities, building owners and other parties to get the most out of surplus heat from power plants, industries, and waste incineration plants or from renewable energy sources like wind, sun and biomass.

### Danfoss deliveries to the Tuzla project

- Reengineering of 98 substations, fitted with Danfoss components: ball valves, strainers, pressure regulators, control valves, temperature and pressure sensors, safety thermostats, weather stations, electronic controllers, thermostatic radiator valves (TRVs), energy meters
- Consulting, monitoring, measurements and data analysis to support decision-making and investment strategy

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