Energy Audit at Neustrelitz municipal utility

Identifying energy savings potential and lowering operating costs

Stadtwerke Neustrelitz GmbH (as a wholly-owned subsidiary of the municipality) is responsible for supplying approx. 22,000 residents with electricity, natural gas, district heating and drinking water. As part of this remit, the water supply is particularly important. The required raw water is taken from 11 deep wells (up to 200 m deep) in two catchments of groundwater. The quality of the raw water is impeccable because it originates from the ice ages of the Tertiary/Quaternary period.

In terms of water treatment, only iron and manganese must be eliminated using sand filters. The treatment results in high-quality drinking water. With the help of two pressure boosting systems (boosters), the drinking water is fed into the supply network by way of two storage tanks in Kiefernheide (2800 m^3) and Strelitz-Alt (2 x 1200 m^3). Both boosters feed into one common network, increasing reliability.

Booster in the rebuilding phase – old pump technology in front, 3 new NBE 65-200/198 at the rear (June 2022)

Old control technology in the control cabinet during the conversion phase

New CU 352 control unit - The pressure boosting system has been running without any failures since July 2022.

Like in many other municipalities, consumer behaviour has fundamentally changed in recent decades. While consumption in the 1970s/80s was 12,000 m^3/day, today it is only 4500 m^3/day max. In response to changing consumption patterns, the pumps in the pressure boosting system put into operation in Kiefernheide in 1976 were completely replaced in 1991. At the time, this equipment was state of the art. Over the last 30 years, however, there have been further considerable changes. Energy costs have increased steadily but water consumption per resident has decreased. This is what prompted the operator to start thinking about fundamental changes to the pump technology.

An Energy Audit provides clarity

If you look at the cost of a pump over its life cycle, it can generally be divided up as follows: 5% is the investment cost, another 10% goes into maintenance and servicing, and energy costs make up the largest part at 85%. Lowering operating costs can be accomplished with an Energy Audit. It starts with a meeting to gather information about the site and general conditions. An analysis is then carried out. This includes inspecting the pumps used and installing measuring equipment to determine the exact performance data. Based on these measurements, a load profile is created, on the basis of which recommendations are formulated for the new pump technology. In 2021, Stadtwerke Neustrelitz decided to perform an Energy Audit for their Kiefernheide pressure boosting system. The following year, the measuring technology was installed and Grundfos Service carried out the Energy Audit. The results were available at the end of January 2022. The analysis was carried out in compliance with DIN EN ISO 14414 for pump system energy assessments including measurements and calculations. This was based on the following parameters:

- Head and flow rate
- Motor power
- Load profile
- Operating hours/year
- Year of installation
- Application and operating conditions

Left to right:
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During the Energy Audit, the entire system, including pumps, valves, actuators, pipes and other system infrastructure, was examined. This is because the overall efficiency of a pumping system depends on how all of the individual components involved work together. Measurements were taken at the Kiefernheide pumping station for a total of 13 days and a potential saving of 67,920 kWh/year was identified. At the time, that corresponded to a savings of €14,943 per year (as of January 2022). Based on investment cost of €43,750 this resulted in an amortisation period of approx. 2.8 years (taking into account annual increases in energy prices). For these reasons, the optimisation of the system was brought forward by one year to enable the operator to benefit from reduced operating costs as soon as possible. The first step was completed in June 2022 when three pumps were replaced. The remaining two pumps were then commissioned in July 2022. In total, five NBE 65-200/198 block pumps, each with an 22 kW engine, were installed. For comparison, the existing pumps each had an 37 kW engine. Along with the motor power, the output of each pump also decreased from ~180 m^3/h to ~120 m^3/h.

Facts and Figures

Customer:	Stadtwerke Neustrelitz GmbH
City:	Neustrelitz / Kiefernheide
Facility Operator:	Stadtwerke Neustrelitz GmbH
Built and installed:	June – July 2022
Energy-Audit:	January 2022
System Builder:	MBA Melms & Brückner Anlagenbau GmbH, Neubrandenburg
Pump techn. & Energy Audit:	Grundfos GmbH, Schlüterstr. 33 40699 Erkrath

Customer benefits of an Energy Audit:

- Identify energy saving potential
- Dimension the new system based on actual measured values
- Calculate the life cycle costs of the system
- Optimise operational safety through demand-driven pump selection
- Calculate the amortisation period for the new system

Pump dimensioning based on measured operating data

If you want to limit energy costs, you need to consider that only a pump that has been dimensioned according to the actual operating data will guarantee optimal performance. That is why you need a detailed analysis of which type of pump is best suited to your conditions. The installed NB Pumps have a flatter performance curve, that is why they were most suitable for this application. The NBE 65-200/198 is a non-self-priming, single stage centrifugal pump in accordance with ISO 5199, with dimensions and performance ratings as per EN 733. The block pump features an axial inlet port and radial outlet port as well as a horizontal shaft. The compact design of block pumps allows installation even in limited space. The pump has a fan-cooled asynchronous motor equipped with a frequency converter and a PI controller for electronic speed control. This makes it possible to continuously adjust the pump performance according to the current demand of the network.

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Pressure boosting system Neustrelitz/Kiefernheide - 5 NBE 65-200/198 block pumps with CU 352 control unit

Technical data of the installed pump type

Type: NBE 65-200/198 Block pump
Motor power: 22 kW
IE-Efficiency class: IE 3
Flow: 117,6 m^3/h
Head: 47,48 m
Pump housing: Cast Iron
Impeller: Cast Iron
Control Unit: CU 352

The CU352 control unit (installed in a control cabinet) ensures reliable operation. The pumps are switched on as needed according to automated cascade control for optimum efficiency. Additionally, automatic pump changeover ensures an even pump utilisation.

Savings achieved:

- Annual energy consumption prior to optimisation: **220.210 kWh**
- Annual energy consumption after optimisation: **152.290 kWh**
- Annual energy costs prior to optimisation: **48.446 €**
- Annual energy costs after optimisation: **33.503 €**
- Annual savings potential after optimisation: **14.943 €**
- Annual savings potential (%): **30,8 %**
- Annual CO2-Emission prior to optimisation: **91,8 Tons**
- Annual CO2-Emission after optimisation: **63,5 Tons**
- CO2-Savings over 15 years: **424 Tons**
- Amortisation period: **2,8 years**
- Costs calculated based on an electricity price of **0,22 €**

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