Enormous Saving Potential
Sustainable drive concepts for the Chemnitz combined heat and power plant

The economical and ecological balance can be improved considerably with energy-efficient drive technology. The Chemnitz City Council Services therefore converted the cooling water and district heat pumps at their combined heat and power plant to variable speed operation. The energy requirement for the district heating pumps alone was reduced by about 35 percent.

The Chemnitz heating power station supplies the city's population of 240,000 reliably with electricity and district heating. It operates using the environmentally friendly cogeneration of heat and power: The steam used to generate electricity heats up water in a further stage. This is heated up to 140 °C and reaches the customers as district heat through a 300 km long overground and underground pipe system where it is used for heating and as hot water. There is an enormous saving potential in the pumps which convey the district heat to its destination, or to put it more exactly: in their drives. With the conventional control method, the pump drives always run at the speed designed for maximum displacement. But this is rarely needed in practice, because the district heat requirements fluctuate considerably and depend on the time of day, season and day of the week. More district heating is required during the day than at night. The demand is also lower at the weekend because schools, offices and factories do not have to be supplied.

Variable speed operation saves 35 percent of energy

In order to optimize the power station’s internal energy balance against the background of the heavily fluctuating requirement, the city council services decided to convert the flow control of the hot water circulation pumps from flow coupling to speed control with frequency converters. The frequency converter always adapts the speed exactly to the currently required volume and therefore only consumes as much energy as is actually required. The saving potential is particularly high in flow machines such as pumps, fans and compressors. For this reason and because the motors are no longer overdimensioned in variable speed systems, the energy requirement of the drive system drops by approximately 35 percent. At about 6,000 operating hours per year, this investment is amortized after approximately 18 months. With this measure, the Chemnitz heating power station not only sustainably improves its cost effectiveness but also its environmental balance. The variable speed operation also has other advantages in addition to saving energy: the conveyed volumes can be adapted faster and more accurately to the current requirements than with a fixed speed motor with mechanical control. The soft starting and stopping also relieves the stress on the mechanics of the entire powertrain, reduces wear and maintenance and prolongs the life of the components. This drive solution also eliminates shock waves in the pipe system.
Suitable motor-converter system

Variable speed drive systems are now in operation in Chemnitz in the district heat pumps of the power station units B and C. The systems consist of compact, reliable and efficient 690 kW low voltage motors of the N-compact type and SINAMICS G150 frequency converters which control the speed of the low voltage motors. The SINAMICS G150 frequency converters are tailor-made for single drives which require no mains feedback. This includes pumps in addition to fans, compressors, extruders, mixers and mills. SINAMICS G150 converters are highly reliable, quiet, compact and user-friendly as well as being inexpensive - from planning right through to service. The Chemnitz City Council Services are also exploiting the advantages of the frequency converters in the cooling water pumps for an energy-efficient, exact operation which is kind on the plant. Here, however, the drive task is solved in medium voltage because of the higher powers. H-compact high voltage motors are therefore used on the motor side which, like the N-compact low voltage motors, prove to be very reliable, compact and low-maintenance, and offer high efficiency. Here, the motor speed is controlled by medium voltage converters of the Robicon Perfect Harmony type. All variable speed drive systems of the heating power station are integrated into the master control system from Siemens. There, the actual conveyor volume requirement is determined based on various measured values and passed on to the drive systems as a nominal value setting. Chemnitz has therefore implemented an exemplary economical and environmentally friendly drive concept in the combination of converters, motors and control system.

The number 1 in medium voltage drives

Robicon Perfect Harmony is the medium voltage converter with the world’s biggest market share. It is very compact: the transformer, power unit and control are incorporated into one unit. The entire system can be commissioned by the plug & play principle without assembly teams on site. It also has an extremely high voltage quality with an almost perfect power factor. It prevents losses by harmonics, is kind on the mains and motor and also meets the strictest harmonic content requirements. The device also features high availability values: the innovative cell bypass concept ensures that a failed cell is bypassed in less than half a second, the device stays in operation, the process continues.

Variable speed systems with N-compact motors and SINAMICS G150 frequency converters control the displacement of the hot water circulation pumps quickly and exactly by the motor speed.