

Cogeneration: optimizing pump performance in Thermal Power Plant 27 (TPP-27), Mosenergo



Oleg Makarov, General Manager

Mosenergo is the largest thermal generation company in the world. As the General Manager of Thermal Power Plant 27 (TPP-27), Oleg Makarov is accountable for strict implementation of scheduled plans for electric and thermal energy supply received from the load dispatching office at parent company Mosenergo, provider of electric and thermal power for Moscow city. Oleg is responsible for all business activities i.e. effective planning, delegating and coordinating internally and externally, staffing, organizing and decision making to achieve desirable profit figures. Most often this is related to increasing the operational efficiency of equipment by minimizing fuel consumption in power generation, introducing new technology and providing overall trouble-free operation. Pump Engineer caught up with him recently to find out more.

By Andrew Peers



Circulation double suction pumps, CE 2500-60 series, made by HMS Group.

“Every day is different”, begins Oleg. “In addition to daily briefings there may be unscheduled meetings to deal with sudden issues arising with the equipment in use or for backup, while regular tasks include maintaining the output received from the load dispatching office. Of course it’s not possible to do this alone; under my command is a team of highly qualified like-minded specialists who I can rely on. Power generation companies have dedicated teams of professionals who carry out the maintenance of boilers, turbines, drives, pumps and other equipment such as automation and desalination systems. During operation,



Igor Kulagin, Shift Operations Manager. At night he is in charge of all operations, the third main figure in the plant after the General Manager and Chief Engineer.

deviations from the normal mode unfortunately sometimes occur or we may face challenging repair issues which fall outside of the ordinary scope of procedures. In these cases we work on the solution as a cross-functional team with my direct involvement.” “The main goal which we strive to achieve in pump operation is to maintain or even increase efficiency. This is achieved through the following actions:

- Monitoring pump condition,
- Timely maintenance and repair,
- Carrying out repairs when necessary
- Replacing the stuffing box - an enclosure containing packing to prevent leakage -with mechanical seals
- Maintaining conformity of the pump operation mode in line with established parameters
- Pump retrofits/upgrades to increase efficiency, operational life, mean time between repairs (MTBR), and reduce vibrations and noise.

Maintenance matters

While much of the organization and implementation of maintenance and repair work is outsourced, TPP27 has a small team of highly qualified pump specialists who can carry out planned maintenance as well as handle unscheduled and emergency repairs, explains Oleg. “This team also supervise the work of contractors during planned repairs. We stop the pumps to carry out maintenance and while we working, the backup pumps are in operation. Before a planned shut-down for maintenance, all pumps are inspected for flaws and defects. Vibration levels are checked as well as current operating parameters, to see if they are consistent with name-plate data. The most important practical tip on the safe running of pumps is to strictly comply with all safety guidelines and manuals with regard to operation and maintenance information as supplied by the manufacturers. It is always better to double check parameters so as to avoid unexpected flaws in operation, which would only lead to expensive downtime and repair. Since the launch of our thermal power plant





Feed water barrel pump, PE 580-185 -5 series made by HMS Group, in glass wool insulation.

we have established certain monitoring procedures which are strictly maintained, and consist of:

- Periodic rounds by on-duty personnel of all operating equipment
- Random rounds by maintenance personnel of all operating equipment
- Weekly rounds of all equipment by maintenance personnel before the weekend
- Periodic vibration control of all pumps according to the schedule/plan
- Equipment monitoring after being repaired/serviced
- Involvement of outsource service company specialists for diagnostics of feed water pumps before and after their maintenance and in cases of increased vibration level in other pumps.”

Tips to improve pump performance

On the subject of how to extend running times and lower power consumption, Oleg said: “First of all, actual flow rates must be brought into line with operating parameters of pumps. The importance of this can be seen in our own example: at the design stage of our TPP, feed pumps were selected with 1250 ton/hour capacity for raw water and 500 ton/hour capacity for heated water. In practice, the required feed capacity turned out to be less than 200 ton/hour. By replacing the pumps with models with lower capacity, we managed to significantly lower power consumption and thus made our operations more energy efficient. For heated water, power consumption dropped by 15%, and by 20-30% for raw water. Secondly, carry out timely pump maintenance: their servicing and repair is needed to maintain their



Group of condensate pumps, KsV 125-140 series, made by HMS Group for PT 80-140 turbine, have recently undergone the upgrade.

rated efficiency. Thirdly, it is still common to apply flow throttling for control, which is fraught with significant losses; in some cases the use of frequency inverters or fluid couplings would also add to the piggy bank of energy savings.”

Purchasing new pumps

The question arose whether to purchase new pumps or to keep existing pumps up and running. Oleg continued: “By industry standards our TPP is relatively young and equipment in operation has not been worn out. Therefore purchasing new equipment is not on our agenda. However we are faced with pump upgrades or retrofits in order to increase equipment energy efficiency, lower vibration and optimize the overall performance in all modes. For example - with assistance of HMS Group - we carried out the inner cartridge upgrade of a boiler feed pump to increase efficiency.” Oleg suggested the following recommendations to suppliers and manufacturers to make his job easier:

- Increase the quality of pumps supplied (this is especially true with domestic manufacturers);
- Lower the prices of equipment they offer;
- Lower the vibration and noise levels of equipment during operation;
- Provide high-quality service and maintenance of equipment supplied;
- Arrange supply of equipment and spare parts without breach of contract terms.

About TPP-27



Thermal Power Plant 27 (TPP-27), located in Chelobitevo, Mytishchi District, Moscow Oblast, Russia, provides heat and power to Mytishchi and the Northern and Northeast districts of Moscow. Part of Mosenergo, the largest Russian power generating company operating on fossil fuel and the largest thermal generation company in the world.

Installed capacity = 1060 MW

*Year of
commissioning –
1996.*

Thermal capacity = 2180 MW/h

Primary fuel = gas