Maximum Throughput and Maximum Cleanliness

A Benchmark for Cleaning Pipes

An innovative cleaning system for copper pipes sets new standards for throughput and cleanliness. With a maximum batch weight of 4.6 tonnes, the machine can clean three batches per hour leaving minimal residual contamination.

A southern European manufacturing company produces high-quality copper and copper-alloy pipes for almost all conceivable purposes, including general industrial uses and specialist applications in the drinking water and medical technology sectors. In the medical technology industry it is no longer sufficient to provide general information about remaining levels of contamination. Instead it is essential to keep within the clearly defined limits.

Peter Hösel, head of the technical department at Emo, has been confronted with increasingly stringent requirements over recent years: "The specifications are becoming more and more challenging. In this case, the residual carbon level after the copper pipes have been cleaned must be lower than 0.1mg/dm2. Requirements like this cannot be met using conventional cleaning machines, in particular given the high throughput that is needed."

Strict specifications for cycle time and cleanliness

The pipe manufacturer's additional requirements for the cleaning system also presented a challenge. The machine must be able to handle pipes of different lengths up to a maximum of 8.2 metres and with diameters between four and 160 millimetres. However, the real problem lies not only in the cleanliness levels but also in the required throughput. For example, the time taken to clean a batch of pipes which are 8.2 metres long and 60 centimetres in diameter and weigh a total of more than two tonnes must not exceed 20 minutes.

In order to be able to meet these demanding requirements reliably, Emo simulated the application in its in-house technical centre under real-life production conditions. In the adjacent laboratories, Emo carried out its own cleanliness analyses. This simplified the choice of a suitable process and machine and enabled the size of the machine to be determined. After the results had been presented to the pipe manufacturer, the company decided to invest in a toploading system (Vaiocs) from Emo Oberflächentechnik which had been customised specifically for this application.

High-speed filling and emptying

The technology in question is the first choice when it comes to this type of problem. Emo constructed the cleaning machine to meet the customer's specific requirements. The top-loading machine is designed to take up as little space as possible when compared

The pipe cleaning machine offers high standards of cleanliness, a large throughput and an excellent mechanical design.

While the front parts container waits to be unloaded, the batch at the back is making its way into the cleaning chamber.

with other systems. Nevertheless, a high-performance machine of this kind is still large. Including the automatic loading system, the machine is 16 metres long, seven metres wide and 4.5 metres high. It weighs around 40 tonnes and has a connected load of around 300 kilowatts.

One of the key technical features of the enclosed system is the parts containers, which are angled by four degrees. As Peter Hösel explains: "Angling the pipes makes the cleaning process significantly easier. Together with the high-performance pumps, it also allows the cleaning chamber to be filled and emptied at high speed, which is essential to enable the cleaning process to be completed within such a short time."

The process consists of three stages. In the first of these the cleaning chamber is flooded with around 6000 litres of hot solvent. Once this vacuum stage has been completed, the solvent passes through a filter unit and is returned to the tank. The next stage involves degreasing the pipes with solvent vapour. Finally, the pipes undergo an intensive drying process. All the stages of the cleaning process take place in a vacuum. In the first stage, perchloroethylene is used as the cleaning agent. "The machine can easily be converted for use with non-chlorinated hydrocarbons or cleaning agents based on modified alcohols," explains Hösel.

The angle of the container helps the cleaning process and allows the chamber to be emptied quickly.

Excellent cleaning results

The Vaiocs toploader complies with all the customer's specifications. The pipes are cleaned to the required standard of cleanliness and the process is fast and cost-effective. With an average batch weight of significantly above two tonnes, the cleaning process lasts just under 20 minutes, which is within the required timeframe.

To ensure that the machine can operate 24 hours a day and seven days a week, Emo has designed a new, easy-to-use loading system. This consists of a chain conveyor at the side of the machine which transports the parts containers to the loading and unloading areas. It also has an electrohydraulic handling system that loads the containers into the cleaning chamber and removes them after the process has been completed. This means that two containers are constantly in use. While one is in the cleaning chamber, the operators are removing the cleaned pipes from the other and refilling it with contaminated pipes.

During test operations at Emo's site, the machine demonstrated that it could meet all the requirements and in particular those regarding the speed of the process. As a result, the customer will need employees who can work quickly and efficiently and a sophisticated internal logistics system in order to keep pace with the machine's fast cleaning cycles. *Ralf Högel*

Contact:
www.emo-ot.de