

Custom pump gives higher pressure with less energy

Today's contract manufacturers demand high flexibility in their machine tools, according to AXA Entwicklungs- und Maschinenbau GmbH, a machine tool manufacturer based in Schöppingen, Germany. Production runs can change frequently, so to keep costs down, manufacturers must keep set up times short. Machines must also be able to adapt to widely variable production scenarios - such as producing 25 pieces for one client, 5,000 for the next client, and so on - in a cost-effective and sustainable way.

Internally cooled machine tools are meanwhile becoming more widespread. These units need very high pressures - up to 30 bar - to get lubricant through the tool's spindle and out to the tip and back again at the flow rate of 35 l/min.

Up through early 2011, AXA needed two pumps to supply coolant to such a machine. One of these pumps was a standard, multistage Grundfos MTR immersible unit, delivering a maximum pressure of 20 bar. AXA had to add a booster pump to increase the pressure to 30 bar.

The company's Head of Engineering, Ludger Doedt, considered increasing pressure with a screw pump. "But the way they are designed means that these pumps are more sensitive to impurities than centrifugal pumps," says Doedt. "An extra filter stage is sometimes necessary."

So Doedt issued a challenge to Grundfos: create a variable, centrifugal pump delivering up to 30 bar without the need for an additional booster pump. The result could be a cheaper, simpler system.

CUSTOMISED SOLUTION

TOPIC:

AXA gets 'super' unit for internally cooled machine tools

LOCATION:

Germany

COMPANY:

AXA Entwicklungs- und Maschinenbau GmbH

A large team of engineers and technicians in Grundfos Industrial Solutions are constantly adapting standard solutions to unique, customer applications. In this case, the answer lay in a customized, Grundfos "E-pump."

The MTRE3 is a multistage, frequency-controlled immersible pump, in which the frequency converter is integrated with the motor. It runs at 57.5 Hz instead of Europe's normal mains frequency of 50 Hz. This causes the pump drive motor to run at 3347 rpm instead of 2910 rpm. As the speed increases, the pressure does, too. The physics of this is explained by the affinity laws governing centrifugal pumps in Figure 1.

To increase the value of the system, AXA adds a Profibus data communication module to the highly variable E-pump, says Ludger Doedt. "The Profibus makes it easier to implement the interface between our machine control system and the pump," Doedt says. For example, the Profibus communicates changing pressure requirements to the pump's frequency converter.

"With Profibus, the entire 'machine tool' system can handle more information, and the operator can organise the process more precisely," adds Alexander Saar, Managing Partner at AXA.

An MTRE-3 pump being tested at AXA - delivering the required pressure of 30 bar at a flow rate of 35 l/min.

SAVING ENERGY

The loss of the booster pump meant saving investment, extra piping and storage costs, but that was not all.

"One major benefit of the MTRE pump is that the operator can use the control system to run the pump with different pressures depending on the tool and the particular application - this saves energy," explains Ludger Doedt. "Thanks to the frequency converter, the pump uses only the energy it needs to do the work. If a pump is not frequency-controlled, it wastes energy, because the pressure generated is not needed and so the emulsion returns to the purification tank unused."

In addition, the frequency-controlled MTRE pump already meets the 2017 requirements of the EU's Energy-Related Products (ErP, also known as EUP), putting it well ahead of the new, strict, European motor regulations.

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