SIGNIFICANT ENERGY BENEFITS

One of the world's largest wind turbine manufacturers, Enercon, is using MasoSine SPS sinusoidal pumps from Watson-Marlow Fluid Technology Group to optimize the delivery of protective impregnating resin at its Magdeburg production facility in Germany. (Courtesy: Watson-Marlow Fluid Technology Group)

Sine pumps optimize high viscosity resin delivery for Enercon, one of the world's largest wind turbine manufacturers.

By RUSSELL MERRITT

One of the world's largest wind turbine manufacturers, Enercon, is using MasoSine SPS sinusoidal pumps from Watson-Marlow Fluid Technology Group to optimize the delivery of protective impregnating resin at its Magdeburg production facility in Germany.

These robust and efficient positive displacement pumps were selected for their powerful suction capability.

RING GENERATORS

Among the core wind-turbine components produced at Magdeburg is the ring generator, which is exposed to particularly high stresses during operation.

"In the interests of long service life, resin impregnation is an important process stage," said Manfred Müller, the plant's technical operations manager.

By performing impregnation, several objectives are achieved: Firstly, the windings of the generator are protected against humidity, dirt, and chemically aggressive substances. Secondly, a potentially disturbing hum from the wind turbine is prevented and any resulting heat can be better directed to the environment.

At Magdeburg, two MasoSine SPS 400 sine pumps were deployed. Each of the pumps delivers approximately 40,000 l/h of (15,000 mPas) impregnating resin at a pumping pressure of about 4 bar (58 psi), to coat the copper windings of the ring generator.

INNOVATIVE DESIGN

MasoSine sine pumps are particularly suitable for use with high-viscosity fluids as the rotation of the sinusoidal rotors creates four equal circumferential chambers into which the impregnating resin is delivered. Sealing from the pressure side to the suction side is ensured by means of a gate on the rotor, which diverts the pumped material by 90 degrees in the direction of rotation, or to the outlet. Since the chambers are moved as a whole and the volume during the process does not change, MasoSine sine pumps process even viscous and highly viscous media with ease.

Another benefit of the MasoSine pumps at Enercon is their high suction capability. The impregnating resin is first pumped from a reservoir through a pre-filter before it is directed to the dipping tank. However, this task proves no problem for the SPS sine pumps, which, with a vacuum of up to 0.85 bar (12 psi), have the necessary suction capacity.

Since the formation of small lumps in the resin can never be ruled out (despite using a pre-filter), the pumps also must be capable of transferring larger particles without sustaining damage.

"For the SPS 400 pumps, lumps of resin up to the size of a grape are absolutely no problem," Müller said.

CONTINUOUS COOLING PREVENTS GELLING

Despite the attributes of MasoSine SPS technology, the impregnating resin used at Enercon has proven to be an extremely problematic fluid to pump.

"Without a cooling system, the resin naturally begins to gel quickly, which, particularly with high rotational pump speeds, can lead to clogging, especially of the shaft seal," Müller said. "As a result, the service life of the seal — and consequently the whole pump assembly — can decrease significantly."

Thanks to intensive cooperation between Enercon's Magdeburg plant and MasoSine, these initial difficulties were quickly resolved, and both pumps were retrofitted with a continuous cooling system that delivers coolant from heat exchangers through the pump housing and front cover.

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The cooling system ensures a certain temperature is maintained on the mechanical seal, and gelling of the resin as well as clogging of the seal is thus reliably and permanently prevented.

ENERGY EFFICIENT PUMP PRINCIPLE

Sine pumps also offer significant energy benefits, especially in applications with high-viscosity fluids. In contrast with other operating principles, the rotor of the sine pump does not cut through the product to be delivered, meaning that, even with high-viscosity media, there are only minimal frictional losses. Nor does the torque need to be appreciably increased, so there is practically no rise in energy consumption even with higher viscosity fluids.

Depending on the medium and the application, sine pumps consume up to 50 percent less energy than comparable displacement pumps.

Watson-Marlow Fluid Technology Group (WMFTG) is a world leader in niche peristaltic and sinusoidal pumps and associated fluid path technologies. It is founded on nearly 60 years of supplying engineering and process expertise, with more than 1 million pumps installed worldwide.

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ABOUT THE AUTHOR

Russell Merritt is the marketing manager for Watson-Marlow North America. Contact him at russell.merritt@wmftg.com.