

Key challenges of pumping and metering highly viscous resins



UK Flowtechnik

Specialists in flow metering, pumps, couplings and process measurement equipment

Pumps and flow meters are essential equipment in the composites industry. Recent developments in technology means that more advanced pumps and flow meters are now being used to dispense special resins. However, there are several challenges that composite manufacturers face when it comes to pumping and metering resins.

One challenge that many face is that the thick and sticky consistency of the resin means it loses pressure when it is pumped through a pipe. A single bend in the pipe will take away even more pressure; therefore it is crucial that the pump is able to generate enough force to allow the viscous resin to flow freely at the desired rate.

UK Flowtechnik deal with challenges like these day in and day out. Conventional gear pumps and flow meters are usually large, expensive and can be unreliable. UK Flowtechnik has a range of positive displacement pumps specifically designed to deal with a range of viscosities which, in turn, makes the pumping of thick and sticky resins a lot easier.

The main property of UK Flowtechnik's pumps that makes them so effective, is that they operate at a steady flow and pressure at a given viscosity, coupled with a high volumetric efficiency meaning they are able to be exceptionally accurate and are ideal for dispensing and dosing in composite manufacturing.

The viscosity of resins and/or its component parts if mixed near the point of discharge from the system can range from one to one million centipoise (a measure of viscosity - cPs). Where water measures at 1 cPs, thicker liquids, like oils vary from 10 to 2000 cPs (depending on temperature) and an exceptionally thick and sticky substance like silicon can measure in the 100,000's cPs. But whatever the viscosity, when pumping and metering resin, it is vital the materials that make up the resin are mixed to the correct ratio and their combined flow rate must be spot on.

UK Flowtechnik's pumps start at very low flow rates of two millilitres per minute, rising up to 3,000 litres per minute. They work well on a closed-loop-control, allowing composite engineers to check the speed of the flow meter against the pump so they can adapt the flow of the resin and hardener until the correct ratio is obtained. It is vital that the ratio of resin to hardener is accurately controlled. If not, the strength of the composite assembly is reduced, or in the worst case the resin does not harden leading to components being scrapped.

At low flow rates you can lose resolution in the flow meter, but increasing the number of pulses overcomes this. This is because, within the pump, there are more teeth than traditional pumps; therefore it can deliver more accurate pulses. The pumps consist of at least two separate and rotating gears with intermeshing teeth. As these meshed teeth separate, they create a partial vacuum which is filled by the fluid component being pumped. As the gears then continue to rotate the fluid becomes trapped and is carried around the casing to the discharge side of the pump. Here, as the gear teeth begin to re-mesh, the fluid is ejected.



Resin Transfer Moulding (RTM) can be used to make everything from very small components to large carbon fibre parts such as wing panels, car doors and wind turbine blades. Pumps and flow meters play a vital role in RTM. Any pump used in RTM has to be calibrated so it can fill moulds over a range of accurately measured speeds. Moulds need to be filled fast enough so that the resin is not cured before it goes into the mould. However, it cannot be filled too fast otherwise it can leave gaps in the mould which can lead to scrapping of the component.

It is essential that the right amount of resin is in the right place when it comes to bonding parts, so a high accuracy flow is essential (if not, the component could fall apart due to inadequate bonding). This is achieved by fitting the flow meter with innovative interpolation electronics. These produce additional signals and pulses so the composite engineer can control the variables in a more responsive way and adjust the volume of resin that is pumped out; which ensures every finished product is of the same high quality.

Changing the temperature of resin changes its viscosity. Just turning the heat up or down by ten to twenty degrees can have an impact on viscosity. However, the pump has a closed loop control sensor, which is specially designed to monitor and adjust for temperature. So, pumping and metering of viscous resin can be challenging. Resin is prone to hardening, by its very nature, it is thick and sticky, it is sensitive to temperature and it loses pressure. However, with accurate pumping and metering, it is possible to ensure that resin reaches the right place of a component at the right time, provided you've got the right pump for the right job!

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Call us on: **0800 433 4770** for more info and our other brochures in the range...



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