

## The benefits of precision metering

**Neil Anderton, Slack & Parr's hydraulics & industrial director, discusses the benefits of incorporating precision metering technology into extrusion processes used in the manufacture of thermoplastic composites.**

**S**lack & Parr is a global market leader in the manufacture and supply of high precision gear metering pumps, rotary hydraulic flow dividers and industrial dosing pumps. The company works closely with manufacturers in the composites industry to develop solutions that make resin and polymer metering more accurate and efficient.

Extrusion offers a way of manufacturing thermoplastic composite materials and parts cost-effectively using

polymers in pellet form. The pellets are melted and mixed, and the molten polymer is forced, or extruded under pressure, first through a screw thread and then a die head before being dosed onto a fibre substrate to form a composite material which can be moulded or slit and wound into a part.

The process is used in a wide range of applications, from aerospace and automotive to medical and industrial. But when it comes to manufacturing high performance components with special characteristics, such as lightweight, safety-critical parts for aircraft and

**Below**  
Slack & Parr supplies gear metering pumps, rotary hydraulic flow dividers and industrial dosing pumps

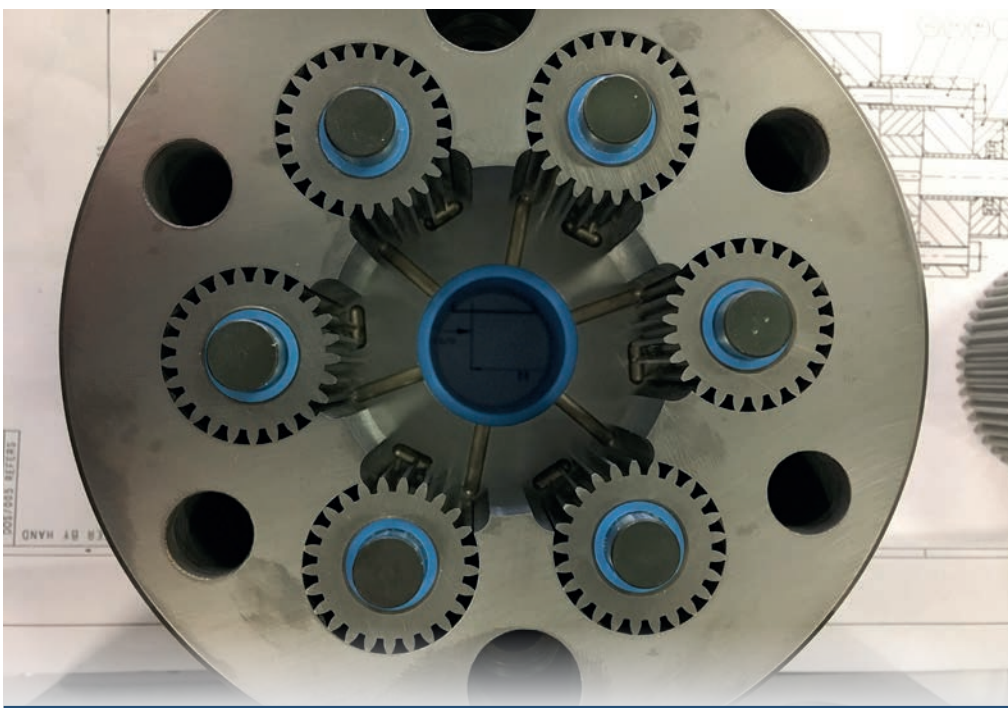
surgical products for the medical industry, the level of accuracy achieved by extrusion alone isn't enough. In these situations, using a gear or melt pump to meter the outlet flow from the extruder can significantly increase dosing accuracy and consistency in the finished product.

### Fine-tuning the process

A gear pump provides a way of fine-tuning the rate and volume in which the polymer is dosed onto the material. This is critical where manufacturers need to specify the precise ratio of fibre to polymer in order to determine the exact weight and thickness of the finished product, and to guarantee that the same recipe can be repeated. Slack & Parr's metering pumps are recognised as the most accurate in the world. Built around hardened steel involute gears, they are machined to precise tolerances of one or two microns, with extremely small, controlled clearances - measuring significantly less than a human hair - between the gear and mating components. This ensures almost no internal slip, even at high pressures and varying flow rates or operating speeds, and means the pump is able to control or meter a flow with high levels of accuracy and repeatability.

### Boosting flow accuracy

By fitting the gear pump between the extruder outlet and the die head, we are able to increase accuracy of flow from a level of around 8%, which is typical of standard extrusion technologies, to



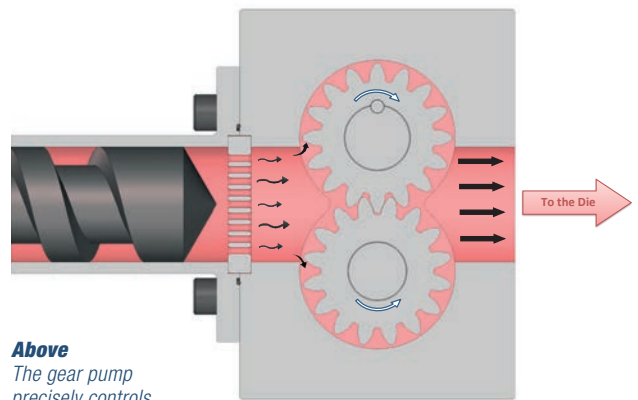
greater than 1%. In practical terms, this means that the amount of polymer flowing from the extruder is precisely controlled in order to achieve thermoplastic composites that conform to very high tolerances of weight, strength and finish in a way that is consistent and repeatable.

The viscosity of the molten polymer is also a key consideration in the extrusion process and one that a gear metering pump can help to address. Higher viscosity polymers require greater pressure to move them through the process while pumping low viscosity polymers in a precise and consistent way is challenging because of their natural propensity to flow freely. Our precision gear pumps are tailored to accommodate fluids of different viscosities to ensure constant levels of speed and accuracy are maintained throughout the process, at operational pressures of up to 400 Bar or even higher in special cases. Moreover, they are also designed to give very accurate delivery of fluids even if the temperatures – and therefore the viscosities – change throughout the process.

Linked to this, the gear pump also removes variations in output from the extruder. In other words, it smooths out any pulsation created as the polymer is fed through the screw thread and on through the die head. Pulsation can be a cause of inconsistencies in the dosing action which can lead to difficulties spreading the polymer evenly over the substrate. Using a high-precision metering pump eliminates pulsation, even when handling low viscosity fluids under high pressures.

Worcester-based Boston Matthews has been developing extrusion technologies for the international plastics processing industry for over 65 years. The company has over 35,000 machines in operation in more than 70 countries, supporting end users in the aerospace, automotive, medical, construction and industrial markets.

Slack & Parr's precision metering technology has been specified by Boston Matthews for applications including the manufacture of thermoplastic tubing measuring 1 mm or less in diameter for use in medical procedures and lightweight, safety-critical aircraft components.



**Above**  
The gear pump precisely controls the amount of polymer flowing from the extruder and removes any pulsation in the flow

"When the tolerances required are above those that a standard extruder can achieve, a precision gear pump can add an important layer of precision and control," says Simon Brookes, managing director of Boston Matthews. "Slack & Parr's gear pumps provide a way of fine-tuning the rate, volume and consistency of flow with identical results every time, which is essential to achieve very tight parameters demanded by very high-performance applications." ●

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