CASE STUDY

Megaroyal® Pumps – the Perfect Fit for the Plastic Pellet Market

PROJECT

NFM Welding Engineers, located in Ohio (USA), is a leading manufacturer and provider of turn-key Extrusion Systems for organizations operating in the plastic pellet production industry. With its reputation for tailored and reliable solutions, NFM has set its sights on meeting the demands of an important client in China to develop a customized system to pump and meter a highly viscous polymer product.

To cover all aspects of this complex project and complete the task diligently, NFM enlisted Milton Roy's engineers to provide a pump that would fit perfectly into their client's application. Known for its expertise and accuracy in critical chemical dosing applications, Milton Roy endeavored to come up with a solution that provided the appropriate amount of power to inject an extremely viscous product (over 10,000 centipoise) at high temperatures. As a reflection of the continually changing demands of Asia's plastic pellet market, manufacturers are seeking efficient pumps that offer high flow rates to maintain elevated production rates.

FOUR UNITS OF MEGAROYAL PUMPS

After a deep analysis of the client's application and its needs, Milton Roy experts decided to use four Megaroyal triplex monobloc pumps, which are chosen frequently in the oil & gas industry as well as chemical & petrochemical processing as they comply with the API 675 standard for positive displacement pumps making them highly accurate and reliable.

The client's process uses a polymer solution which is fed from a pressurized tank and heated to 194°F (90°C). The Megaroyal triplex monobloc pumps provided by Milton Roy inject the product through a preheating system and into a buffer tank, then into an extrusion machine. The product is then water-cooled and cut into pellets by a rotating razor-sharp blade.

Designed for high-volume chemical injection and transfer of hazardous substances, Megaroyal pumps met the customer's most crucial requirements by offering reliable, continuous operation in this mission-critical process and a high flow rate of 2245 GPH (8.5 m3/h), while withstanding variations in discharge pressure.

OVERWHELMINGLY SATISFYING RESULTS

Due to the success of this project, NFM Welding Engineers are currently working on a new production line with the same Megaroyal model of pumps.

"The four pumps have performed well. The first installation also allowed us to check the accuracy of our calculations on-site," says Gaëtan Spude (R&D Manager)

"The field results showed that we had met the required flow rates. We proposed a pump with a speed of 117 strokes per minute and were expecting to achieve the targeted flow rate with 94 strokes per minute, and that is exactly what happened."

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SAFETY FIRST

Operating with toxic, hazardous and radioactive products requires a highly effective safety system to maintain safe and reliable performance. Liem Chau, Global Product Manager at Milton Roy, explains: “the Megaroyal pump features an internal refill valve that automatically controls the hydraulic oil to guarantee a consistent, accurate flow rate whereas its hydraulically piloted valve protects the diaphragm from rupture. Even in the case of a blocked suction valve, the process continues and the facility is still able to operate at full swing in full safety”.

In the system design, Milton Roy engineers incorporated a double-diaphragm leak detection system with a sensor to detect pressure increases and send a warning signal in the unlikely event of a diaphragm leak. As a result, the pump can continue operating until the end of the production batch, even with a damaged diaphragm. The Megaroyal pump’s double-diaphragm remains hermetically sealed to prevent the possibility of external leaks.

TECHNOLOGY THAT HANDLES EXTREMELY VISCOUS PRODUCTS

The Megaroyal pump can deliver flow rates of up to 220 GPM (50 m3/h) and withstand discharge pressures of up to 3655 psi (252 bar) thanks to its unique 3-headed liquid-end. Equipped with special check valves, it can handle extremely viscous polymer solutions and its accuracy allows the synchronization with the extruder rotation speed to produce a constant high-quality plastic pellet.

Since producers are always looking to gear production towards demand, a flexible production process is highly desirable to make production more efficient. The Megaroyal pump is fitted with a variable speed motor that can reduce production times by a ratio of 1:5. To enhance its flexibility, it is also available with three different liquid-end sizes to accommodate various flows and pressures.

A SPECIAL DESIGN TO OPTIMIZE PERFORMANCE

To comply with this polymer injection application, the Milton Roy team faced the challenge of reconciling compressibility with viscosity. Namely, high viscous fluids need to maintain a specific temperature of 194°F/90°C, as otherwise, when the liquid’s temperature drops, the level of viscosity increases, and then, the pump will not be able to deliver the correct flow rate.

Gaëtan Spude, R&D manager at Milton Roy, commented ‘’we had to strike the right trade-off between avoiding oversized cross-sectional areas of the check valves to prevent a fall in flow rate, due to the high viscosity and having large enough cross-sectional areas to prevent cavitation in the pump”. To achieve this goal, the engineers carried out Computational Fluid Dynamics (CFD) calculations to optimize the flow passage.

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