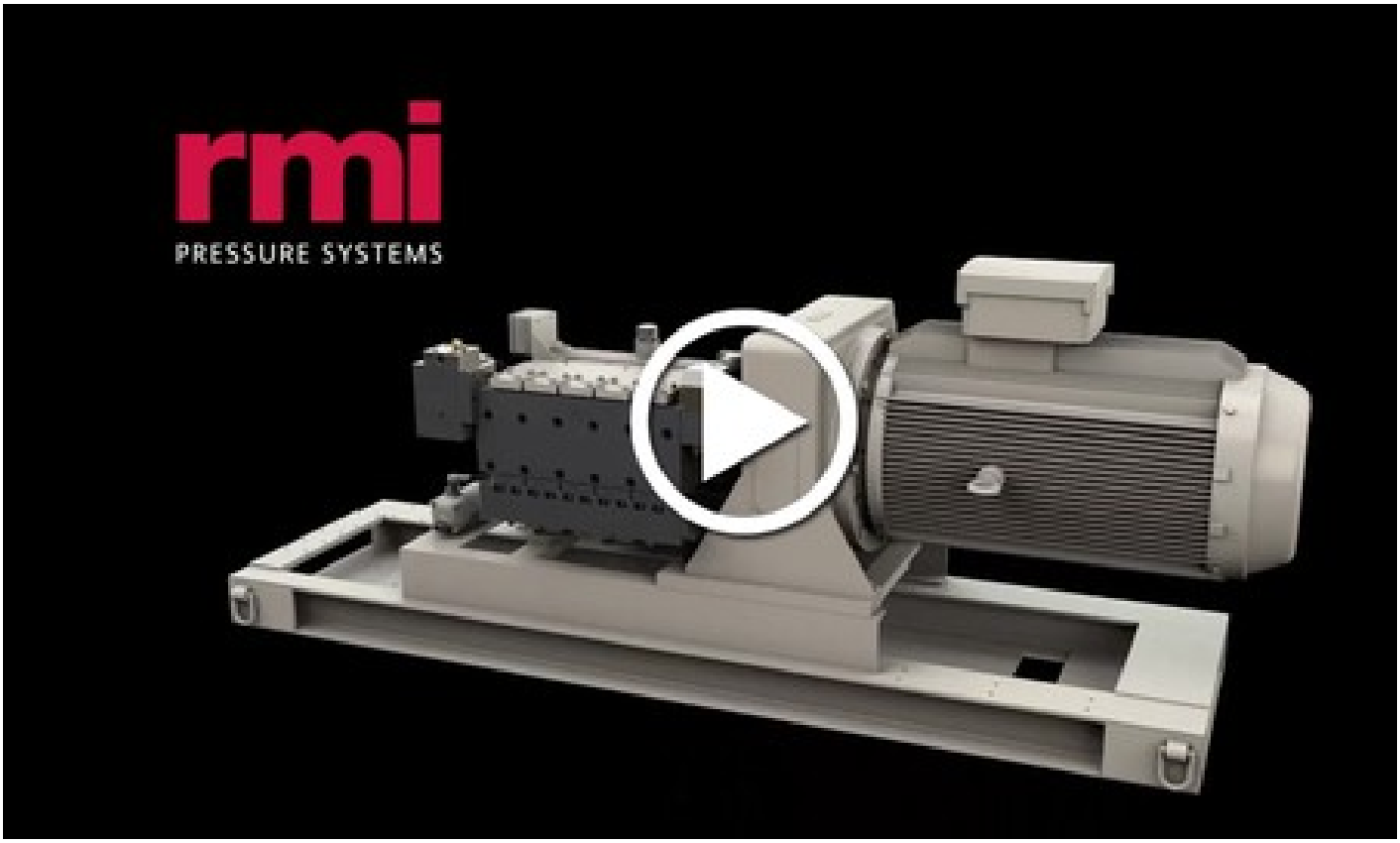
Reliability & Innovation - crucial in High Pressure Pump Design



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The use of high pressure pumps, up to 1,000 bar, is widely seen in a variety of industries, including mining, steel production and oil & gas, each of which presents its own set of challenges. In industries such as these, where production losses during unplanned downtime can be astronomical, reliability is crucial. OE manufacturer innovation is therefore essential in order to reduce costs associated with maintenance and operation. Lee Derbyshire, Engineering Manager at RMI Pressure Systems, offers an insight into the design of the latest Quinmax S500 pumping system.

The designers at RMI have used their years of experience in the mining, power generation and manufacturing environments to produce a versatile product that is capable of operating in a multitude of situations. The S500 is designed such that all the working parts are totally enclosed, enabling it to operate in dust laden and other hazardous atmospheres. The use of the highest quality materials, manufactured to exacting standards, ensures that the final product will provide continuous, reliable performance.

This has been proven in the field by the numerous pumps which have been delivered into critical applications, such as mining roof support systems. Having completed a year long field trial in 2011, the Quinmax S500 high pressure pumping system was awarded full acceptance for applications above and below surface from UK Coal Ltd. Due to its increased flow rate and superb reliability record, UK Coal was able to run an entire face of a longwall mine with a single pump and save approximately £24,000 in energy costs at the same time.

Design innovation

The S500 pump is the latest addition to the industry leading S-Series of crankshaft driven reciprocating pumps from RMI. Unlike the more traditional 3 plunger design, the S500 features a five piston crankshaft which allows it to pump higher flow rates (340 – 1080Ltr/min) at greater pressure (190 – 500Bar) with reduced loads on the shaft and bearings for greater periods before maintenance is required. The range is driven by 300 – 450kW motors and features ram diameters spanning 50mm to 80mm.

Overall the pump features a smoother pressure profile which reduces the impact of surges on other critical items of equipment within the system - such as hoses and valves - which means that the entire system offers increased reliability over competitors. However, despite RMI's 98% reliability record, unforeseen problems can still occur. Fortunately the S500 features a modular design which means that spare parts are readily available and easy to install, reducing maintenance costs.

The S500's crankshaft is manufactured from high tensile steel using advanced machining and drilling techniques for maximum durability. Reliability is further enhanced thanks to precision ground gears, lead bronze big and small end bearings, stainless steel stuffing boxes and solid ceramic plungers with Kevlar seal packing. A selection of digital and analogue readouts are included for easy monitoring of internal pressures, temperatures, lube levels etc.

In addition, to make it suitable for use within the oil & gas environment, the entire system can be designed to be intrinsically safe; meeting Class I, Div II classification for both offshore and onshore use. The design of the pumping system enables the units to operate in hazardous conditions without modification. However, to meet the intrinsically safe specification, several modifications can be specified including the installation of a nitrogen purge system for the Variable Frequency Drive (VFD) and various explosion-proof fittings.

Improved control

Many pump designs operate a bypass system where the system pressure actually increases due to the reduced flow. This can lead to increased wear in both the pump and the pipework. The range of Quinmax industrial pumps is carefully tailored to each application. In the case of descaling plants, the pumps can be equipped with the Stored Energy Offloading System, which gives the stop-go capability required for this industry. The unloading system is a soft action solenoid control system which allows the pump to run without generating further pressure. The pump continues to idle in a pressurised standby condition so that it can quickly and efficiently return to the pressure and flow settings dictated by the grade of steel which is passing through the descaling plant.

Many of the more recent systems that RMI has designed have been supplied using the very latest On Demand Intelligent control system (ODIN). Working closely with the client to understand the varying demands for flow and pressure is critical to achieving the maximum reduction in energy usage from the pump station. Traditionally, in a steel rolling mill, the mill stand pumps are selected to cater for the design flow rate required for the maximum coil, billet, bloom or slab size. However, during operation the mill will produce various sizes and differing material specifications, all of which have a direct correlation to the actual flow and pressure required.

Cost effective solutions

As part of the specification process, RMI assesses all the various control methods and calculates a whole-life-cost, including original supply, servicing and running costs – which is then submitted to the client. In some cases, where variable speed pumps have been specified for applications such as heavy presses and steel pipe de-scaling systems, the calculated payback period or ROI has been less than two years, illustrating how the RMI pump can be an extremely effective investment.

For further information on how RMI can help in designing and building a high pressure pumping system, visit the website, www.rmipsl.com or contact the experienced technical sales team on +44 (0)1612 742 451.

Photo Captions:

Photo 1: The designers at RMI have used their years of experience in the mining, power generation and manufacturing environments to produce a versatile product that is capable of operating in a multitude of situations

Photo 2: Unlike the more traditional 3 plunger design, the S500 features a five piston crankshaft which allows it to pump higher flow rates (340 – 1080Ltr/min) at greater pressure (190 – 500Bar)

Photo 3: The range of Quinmax industrial pumps is carefully tailored to each application

Photo 4: The S500's crankshaft is manufactured from high tensile steel using advanced machining and drilling techniques for maximum durability

About RMI Pressure Systems

For more than a century, RMI has been producing premium-quality high-pressure pumps for global mining and industrial applications. An early innovator in the design and manufacture of high-pressure systems for Longwall mining, today RMI employs the expert resources at its UK engineering research centre to great effect, introducing new solutions designed to reduce process complexity and optimise customers' productivity.

The collaborative relationships RMI forms with clients creates a climate of proactive response, inspiring progress and resulting in consistently high service levels. At RMI, we aim to deliver enhanced value and reliability to customers, focusing our efforts on helping them to become more productive by cutting operational costs and boosting output. We can only achieve these advancements by listening to - and learning from - the issues that are important to our clients. It is this unwavering commitment to the learning process that helps RMI drive innovation with, and for, the customer. It elevates our ability to better serve our customers - and, ultimately, the world in which we live.

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