

High pressure coolant systems incorporating Hydra-Cell seal-less pumps are contributing to success stories at UK users of Star sliding head machines

Performing under pressure

THE metalworking industry broadly accepts the advantages of delivering coolant to the cutting tool or the grinding wheel at high pressure. The potential for improvements in swarf control, cutting data, tool life, work piece quality and productivity when upgrading from a low pressure (eg 10 bar) system to a high pressure system is well documented. But there is more to it than exchanging a low pressure coolant pump for one that will perform at pressures of 70 bar or higher.

Bob Hunt, managing director of Star Micronics GB gives special attention to this aspect of cutting efficiency. Four years ago he invited Warwick-based coolant system specialists Pumps & Equipment to re-evaluate his company's high pressure coolant requirements on Star sliding head lathes and mill-turning centres. The company was already providing high pressure coolant delivery on its machines, but the system had limitations.

Among the issues evaluated were the need to work at optimum speed and feed rates, maximise up-time, maximise tool life, remove swarf from the cutting area and minimise the size of swarf produced. Following appraisal, development and prototyping, Pumps & Equipment offered a complete customised high pressure coolant (HPC) system meeting all the criteria - with the assurance of reliably consistent performance through time. Designed as a 'plug and go' package, it incorporates power unit, controls, pipework, fittings and purpose-designed spray nozzles. A productive working relationship ensued, Pumps & Equipment is now a fully integrated supplier to Star Micronics GB, and the HPC system as it evolved has contributed to some outstanding application achievements.

One of the key components in Star's current system is

the high pressure pump. Many HPC systems on machine tools use screw or piston-type, or centrifugal pumps - all intrinsically vulnerable as they incorporate dynamic seals (always subject to wear) and are designed with narrow clearances between static and moving surfaces. Their manufacturers therefore require that the pump is protected by fine filtration. The HPC system previously offered on Star machines in the UK used piston pumps rated at 140 bar, protected by filtration down to 5microns. However, filtration levels are expressed nominally. In reality a '5 micron' filter may pass much larger particles, depending on their shape. There is potential, confirmed in the field, for premature pump failure, as well as a gradual decline of flow and pressure performance as seals begin to wear.

Pumps & Equipment was confident its chosen HPC pumps - from the Hydra-Cell range of seal-less pumps manufactured by Wanner - would extend the life expectancy of Star's coolant systems, and also that flows and pressures could be sustained at optimum level. In the absence of seals there can be no loss of performance through seal wear. 'Seal-less design is one reason for our confidence in Hydra-Cell reliability,' says P&E director Lee Bott. 'The pump is tolerant of particles if there's a filter problem and can handle any type of coolant from neat oil to low-lubricity emulsions.' He also cites positive displacement and smooth low-pulse output, with multiple hydraulically-balanced (stress-free) diaphragms in a single head. Other factors are robust construction, simple build (easy maintenance), ability to run dry without damage, and high efficiency with consequent low power consumption. Not least important, flow at any pressure is directly proportional to motor speed - a linear relationship that makes the Hydra-Cell very easy to control.

Automotive plants in the USA, Japan, Germany, Italy, France and India are among major users of machine tool coolant systems incorporating Hydra-Cell pumps. For Star machines fitted out in the UK, Pumps & Equipment currently supply G10 and G04 models - conservatively employed by P&E for this application in 70 bar and 140 bar HPC systems. Users of these machines have seen notable advances in productivity, efficiency and cost reduction.

At B&D Patterns, a leading supplier of aero engine pipe assemblies to Rolls Royce, Star lathes with 140 bar high pressure coolant revolutionised stainless steel component production. Time savings of 25% or more were achieved on some components, previously produced on fixed head lathes without HPC. And UK sub-contractor DKW Engineering (where 'HPC greatly assists machining of stainless steel') was able to replace with new, more complex work, business previously lost to Chinese competition. 15% of turnover is now in direct exports - to China.

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Users of Star machines report notable advances in productivity, efficiency and cost reduction as a consequence of HPC systems 

