PRESS RELEASE

KAWASAKI CHANGES FROM SOLVENT TO AQUEOUS CLEANING

Washing at lower temperature solves lapping paste removal problem

A £500,000 upgrade and reorganisation of the pump manufacturing section at Kawasaki Precision Machinery (UK), coupled with a steady increase in production volumes, prompted the Plymouth manufacturer to replace solvent cleaning machines at the beginning of last year (2012) with aqueous models from Mafac, Germany. The three machines were supplied by Turbex, following extensive trials at its Alton showroom and technical centre.

The axial piston, hydraulic pumps are used in mobile and industrial applications and often run at pressures in excess of 5,000 psi and at speeds up to 2,700 rpm. The smallest amount of contamination could cause early failure, so Kawasaki goes to considerable lengths to ensure component cleanliness.

Even though the previous cleaning machines were closed-loop systems with minimal loss of solvent to the atmosphere, Kawasaki was keen to avoid the environmental impact altogether by swapping to water-based washing of components.

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The change brought with it a reduction in processing temperature from the solvent system operating at 80ºC to the water system at 55ºC. It is resulting in an ongoing energy reduction, which is another benefit for the environment and also reduces Kawasaki's electricity bills.

Two washing machines are positioned in each of two production lines, one pair for the K3V pump, of which over two million have been sold to mobile equipment manufacturers worldwide, and the other pair for the K3VL pump used in mobile and industrial applications (see www.kpm-eu.com for details).

"Despite operating at the lower temperature of 55ºC, the aqueous machines achieve very high cleanliness levels," said Kawasaki Process Engineer, Mr Ron Wilday. "The Mafac machines effectively remove all contaminants and debris left from the manufacturing processes."

One of the reasons the cleaning action is so thorough is Mafac's patented feature whereby the spray bars and the basket containing the components are able to counter-rotate, creating more turbulence than if they rotate in the same direction, which is also possible.

Kawasaki exploits this patented feature in a Mafac Elba machine in both production lines, rocking a basket of pump internal components back and forth while spraying the load through 360 degrees. Plastic posts in the stainless steel baskets separate the parts, eliminating a potential cause of

damage and allowing the wash spray to reach all areas of every component.

An important issue for the company when washing pump internal parts is the need to remove the residue of a 14-micron, aluminium oxide lapping paste from the cylinder, valve plate and piston. The paste is difficult to clean from the surfaces, while at the same time customers such as JCB, Volvo and Caterpillar are stipulating tougher cleanliness specifications.

A mild alkali (pH 10.3), salt-free cleaner is added to the wash tank water to assist the cleaning action and to impart rust inhibiting properties to ferrous parts. Subsequent rinsing takes place in a separate tank, which requires filtration to maintain required cleanliness levels.

Included in both pump production lines is a second aqueous machine for cleaning the cast iron pump case and valve cover that house the other components. In the case of the K3VL line, a Mafac Java machine performs this duty, while a pre-existing machine cleans K3V castings in the other line.

The Java differs from the other Mafac machines in that it is capable of fully immersing the load in the wash chamber, as well as being able to spray and contra-rotate the basket in both stages. Advantage is again taken of the latter facility. Four castings for two K3VL pumps are clamped to a base

plate in the basket, allowing the load to rotate through 360 degrees in one direction while the spray rotates in the other. The same alkali cleaner is used for degreasing and particulate removal.

Mr Wilday added, "The large inspection windows in the Mafac machines, which clearly show the high degree of turbulence created, impress quality auditors from our customers when they visit our factory.

"This happens frequently, so being able to demonstrate an effective component cleaning regime is an important sales tool for us, as product quality is of major importance."

A further advantage of Mafac machines is the ability to program different washing cycles and store them in the control for reuse. In the case of the Java, only one cycle taking 6 minutes 50 seconds is needed to process the castings. It comprises spray and flood immersion in the wash tank, drop-off, spray rinsing in the second tank, drop-off, steam exhaust, and impulse warm air drying to atomise and drive any remaining water droplets from the surfaces of the components. The spraying and drying motions both contra-rotate with the basket.

Each of the two Elba machines requires 10 minutes 20 seconds to process the internals. The cycle differs in that the basket rocks rather than rotates and steam exhaust takes place after the wash stage as well as the rinse.

However, these machines are programmed to perform seven additional cycles for cleaning batches of other pump components separately, such as springs, circlips, screws and many different types of bolt.

Periodically, to verify the effectiveness of the new cleaning procedures and provide documentation to customers, if required, Quality Assurance Engineer, Rachel Hockaday, runs an inspection facility in a self-contained room on the shop floor. It is equipped with a Pall Cleanliness Cabinet PCC 502, which extracts any soils that may remain on the cleaned components, using successive filtration down to 200, 100 and finally 15 microns.

Fluid containing minute amounts of debris washed off the components is collected and passed through a membrane, which is inspected under an Olympus BX51 scanning microscope. Analysis Filter Inspector software records information on particle size distribution, numbers and types of contamination present, and also produces a standard report which can be adapted for each individual customer's requirements.

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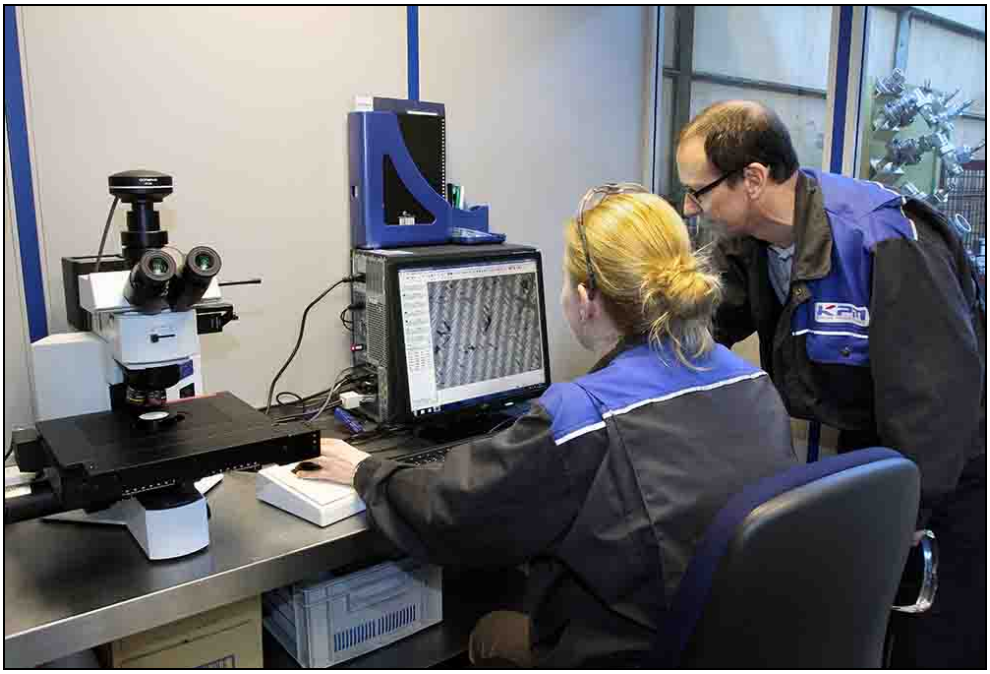
1. The Java being loaded with pump castings prior to cleaning. The Elba that washes the internal parts can be seen behind it. Both machines feed the K3VL pump assembly line through the rear wall.

2. A pair of cast iron cases and valve covers for two Kawasaki pumps is clamped into a stainless steel basket, allowing full rotation in the machine while the spray jets contra-rotate.

3. Internal parts for a K3VL pump being loaded into a basket for cleaning in one of the Elba machines. They include the cylinder, valve plate and piston, on which the contamination includes lapping paste, plus swash plate and support, shoe plate, servo piston and shaft.



4. Kawasaki Process Engineer, Ron Wilday, looks on as Rachel Hockaday, Quality Assurance Engineer, views the results of the Pall Cleanliness Cabinet test after analysis on the Olympus scanning microscope.

On behalf of: Turbex Limited, Unit 1, Riverwey Industrial Park, Newman Lane, Alton, Hampshire, GU34 2QL.
Tel: 01420 544909. Fax: 01420 542264.
E-mail: john.huntingdon@turbex.co.uk
Web site: www.turbex.co.uk
Contact: John Huntingdon, Managing Director.

Issued by: *THE RIGHT IMAGE Ltd*
PO Box 42, Twickenham, TW1 1BQ
Tel: 020 8891 0603
Contact: Chris Wright
E-mail: chris@therightimage.net
Web site: www.therightimage.net

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