

Cutting procedure further improved for almost all materials

Waterjet can now cut with 6,000 bar

Waterjet cutting is a modern technology that was developed as recent as in the sixties. It is suited for cutting modern materials such as composite materials or ceramics. But the technology can also be used to cut steel, aluminum alloys or glass in an exact, effective and cost-efficient way. The crucial factor for high cutting performance lies in the form and the speed of the waterjet. Physical laws dictate that higher pressure will increase the energy yield of the „cutting tool“ water while reducing the jet diameter and water consumption at the same time. A new „HyperPressure“ system uses this effect to considerably improve waterjet cutting by using 6,000 bar. Productivity increases, cost per part decreases.

Bretten, September 17th, 2007 - The waterjet cutting technology is a tried and tested technology that still holds a lot of potential for innovation. As the world market leader and the inventor of the abrasive waterjet cutting technology, the American company Flow International Cooperation has set a new milestone in the machine tool industry by introducing a waterjet cutting system that produces a permanent working pressure of 6000 bar. The system has been already standing the test in several practical applications. The goal of this new development was to increase cutting quality and especially reduce cutting times and costs per part. The new HyperPressure system sets the standards.

Cutting powerfully

The heart of a waterjet system is the ultra-high-pressure pump. An oil pressure of 210 bar acts on a large piston. Small pressure pistons are attached to the ends of this piston that build up the actual water pressure. The working pressure follows from the ratio between the surface of the hydraulic piston and the surface of the pressure piston. In case of a surface ratio of 30 : 1, more than 6,000 bar are created from 210 bar (Picture1).

What is so easily explained here, however, is rather complicated in its implementation. In the past, the standard working pressure for commercial waterjet cutting systems was around 3.800 bar. The step towards 6,000 bar meant to enter new technological territory as the materials behave completely different at high pressures as opposed to

normal pressure. Considering that similar pressures in the earth's crust convert rocks and salts to minerals, one can imagine how difficult it is to develop permanently resistant components for high-pressure applications. The changed tribological properties (friction, lubricating characteristics and wear) can only be managed with selected materials and with long experience and an extensive know-how. The trouble-free operation of more than 40 systems installed worldwide shows that the special materials have been properly selected for the piston as well as other high-pressure components and – above all – the seals.

„Cost-pressure“

The water pressure which is almost 50 % higher than in conventional systems is not an end in itself but physically, technologically and especially economically sensible. Because: the higher the water pressure at the orifice, the higher the kinetic energy (speed) of the jet. Thus, in many cases it is possible at 6,000 bar to strongly reduce the addition of abrasive sand. That pays off as the abrasive sand is the main cost driver. At the same time, the water consumption is reduced compared with the 4,000 bar systems and the higher energy yield of the jet improves the cutting performance as well as the quality of the cutting edge (Picture 2). For the user, it means the following: Thanks to a faster waterjet, he can cut more precisely and requires 30 – 50 % less abrasive sand while saving water on top of that. The cutting speed increases by 30 to 50 %, the productivity increases and the costs per unit are reduced.

Real world solutions

The systems are designed to be maintenance-friendly and the scope of delivery includes a special tool set for the maintenance of the HyperJet pump. A regular, professional maintenance is important since even the best materials - seals in particular – do not last forever. An exclusive service and maintenance program is available to the user for the first year of operation. This way he receives an "on the job training"; a training that for all intents and purposes could become standard for other systems as well.

Only 3 steps are required, for example, to take apart the high-pressure component of the pump, to remove the old seal and to replace the seal with a new one. The unit is assembled in the reverse order. The entire replacement takes only about 22 minutes which has never been achieved for this pressure range. Thus, the downtimes of the systems are kept short.

The new generation of waterjet cutting systems (Picture 3) that are equipped with the high-pressure system applying pressure of 6,000 bar has set new records in several areas: Cutting speeds and quality of the cut have increased thanks to a higher energy yield of the jet and easy and quick maintenance avoids long interruptions. This ensures that the cutting performance in practice will indeed lead to higher productivity.

Picture 1 High-pressure generation by means of hydraulics

Picture 2 High quality cutting area thanks to a faster waterjet

Picture 3 The tried and tested WMC model equipped with the HyperPressure system

All pictures courtesy of Flow Europe GmbH

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With more than 30 years of experience and more than 9,000 installations Flow is the world market leader in the development, design, and sales of ultrahigh-pressure pumps and complete waterjet and abrasivejet cutting systems for processing a wide variety of materials.

Flow Europe is a subsidiary of Flow International Corporation, USA, and European Headquarters for all products relating to ultrahigh-pressure waterjet cutting technology. Flow Europe has subsidiaries in France, Italy, Spain, and the UK.

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