

One Pass Threading

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AT-1 thread mill creates high quality threads in one pass without chatter and deflection in hydraulic component production

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Time savings in the machining of hydraulic components can significantly reduce overall production cost even in small batches. Eliminating double passes, chatters, harmonics, and taper of threads were the objectives of Walvoil S.p.A. in its production of hydraulic components



Walvoil's headquarters, commercial and production site in Via Adige, Reggio Emilia, Italy.

Founded in 1973 and headquartered in Reggio Emilia, Italy, Walvoil is a global manufacturer of integrated products, electronics, and complete mechatronics systems. Since 2015, Walvoil has become a part of the Interpump Group. In 2016, Walvoil added two brands to its group, Hydrocontrol and Galtech, which were founded in 1969 and 1953 respectively. The Walvoil group has eight facilities within Italy, seven of which are equipped with manufacturing capabilities. The company also has eight foreign branches and a total of 2,300 employees globally.



Inside Walvoil's factory in Via Adige, Reggio Emilia, Italy. The Walvoil group has eight facilities within Italy, seven of which are equipped with manufacturing capabilities. The company also has eight foreign branches and a total of 2,300 employees globally.

Walvoil's core products include hydraulic components such as distributors and hydraulic servo controls, pumps and motors, compact hydraulics, electronic components and PHC systems. Walvoil's headquarters, commercial and production site in Via Adige, Reggio Emilia is equipped with 32 numerical control machining centers, enabling the company to efficiently optimize work cycles in various batch sizes and materials, such as aluminum, steel and gray cast iron, vermicular cast iron and nodular ductile iron.



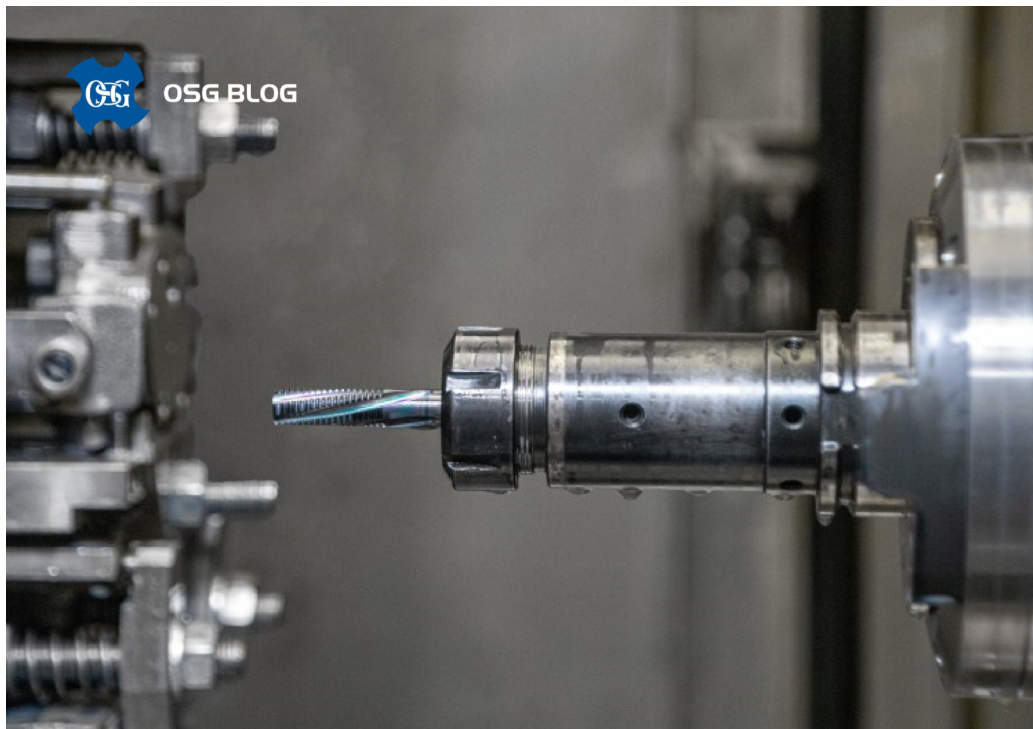
Walvoil uses a MCM MP10 horizontal machining center for the production of hydraulic distributors.

Walvoil was experiencing problems of chatter, tapered threads, bad surface finish and poor tool life in the production of DLS8 hydraulic distributors made of EN-GJL-300 cast iron using a competitor thread mill that is 14 mm in diameter, Z4 and with internal coolant. The part has two G3/4-14 gas threads at an ap of 18 mm. Walvoil has been manufacturing the DLS8 hydraulic distributors since 1996. Batches of several thousand pieces are made annually.



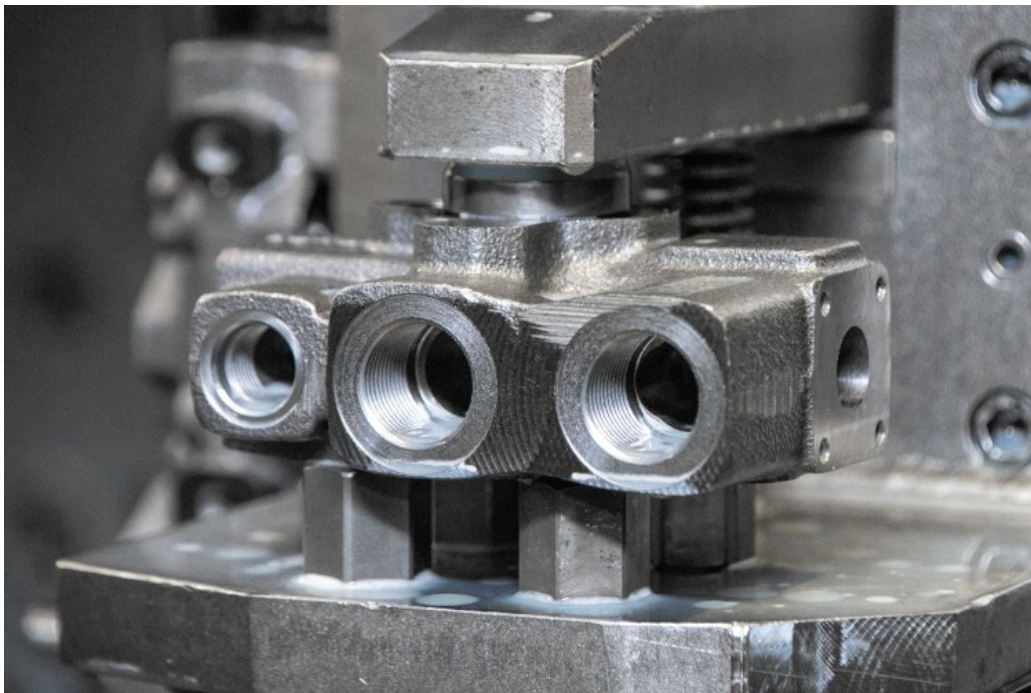
Pieces of hydraulic distributors being unloaded on a roller conveyor on the MCM MP10 horizontal machining center.

In hopes to optimize cycle time, increase tool life and improve the quality of threads, Walvoil's Tooling Manager Davide Cabassi reached out to OSG Italia for support. Upon a detail evaluation of the application, OSG recommended a diameter 15.67 mm AT-1 thread mill (EDP# 8331087).



To solve the problems of deflection and long cycle time, OSG has developed the AT-1, a revolutionary 1-pass thread mill for high-quality threading, with two patented technologies registered in Japan for its tool geometry. The first patented technology is the AT-1's left-hand helix geometry. Conventional right-hand helix thread mill is most vulnerable to deflection as the cutting process begins from the tip. In contrast, the AT-1's right-hand cut and left-hand helix geometry begins the cutting process from the shank side, thereby minimizing deflection. The second patented technology is the unequal spacing and variable lead flute geometry, which is commonly applied in end mills. The unequal spacing and variable lead flute geometry minimizes chatter. Even though the amount of cut has increased with one pass cutting, superior and consistent surface finish can be achieved. Applying the unequal spacing and variable lead flute geometry in thread mills involves a high degree of difficulty because the thread pitch has to be adjusted accordingly to the flute geometry, which requires special manufacturing techniques.

The AT-1 was tested at Walvoil's Via Adige facility using a MCM MP10 horizontal machining center. The tool was mounted on a 140 mm long HSK-63 tool holder with an ER-32 collet. The total presetting was 192 mm. In terms of cutting condition, the competitor thread mill was used at a cutting speed of $1,000 \text{ min}^{-1}$ and a feed rate of 150 mm/min, completing a thread in two passes. The AT-1, in comparison, was used at a cutting speed of $2,200 \text{ min}^{-1}$ and a feed rate of 250 mm/min, completing a thread in a single pass. The AT-1 was able to complete 2,645 pieces versus the competitor's 470 pieces, achieving more than five times the tool life.



A hydraulic distributor mounted on the locking equipment.

With capabilities to complete threading in a single pass and at higher speeds and feeds, the AT-1 is able to generate an annual cost savings of 62 percent for Walvoil. The problems of chatter and deflection have been completely eliminated.

Moreover, the quality of thread is optimal and complies with the UNI-ISO 228/1 standard.



From left, Walvoil NC programmer Egidio Lemmi, OSG Italia Sales Engineering and Marketing Manager Andrea Severi and Walvoil Tooling Manager Davide Cabassi pose for a photograph with the AT-1 thread mill at Walvoil's manufacturing facility in Via Adige, Reggio Emilia, Italy.

With great satisfaction, Walvoil has extended the AT-1 thread mill to other similar applications with 1/2 gas threads. The AT-1's unique features made it possible to machine under unstable conditions with increased reliability, surface finish and accuracy. With the AT-1's capability to generate threads in one pass at high cutting parameters, it is an optimal thread milling solution that can generate significant cost savings for manufacturers.