

INTEGRATED EQUIPMENT

THE SECRETS TO PRODUCTIVITY AND RELIABILITY IMPROVEMENTS AS WELL AS REDUCED DOWNTIME IN THIS AGGREGATES CRUSHER LIE IN THE PUMPS AND MOTORS THAT HAVE BEEN INTEGRATED

The demands of the users of off-highway machinery have led machinery manufacturers to produce a wide range of accessories suitable for machines equipped with hydraulic systems. These accessories are essential for the more flexible and productive use of excavators, skid loaders, wheel loaders, backhoe loaders and cranes.

CAMS is a company focused on the design and maintenance of roadworks machinery, and in recent years – in order to progress and supply its customers with the most complete yet specialized service – it acquired TEM. TEM has been involved in the crushing and recycling field for over 40 years, developing machines like log washers, FTR crushing plants for glass and transportable plant for the treatment of construction and road rubble, for which it became well known over the years, both in Italy and abroad.

For this specific processing, movable and auto-loading plants for crushing and recycling was born. The UTM range is designed to be transported without the need for special trucks and permits, with its compact dimensions allowing for installation in small areas. Equipped with tracks, the plant is very easy to load or be moved around the yard.

The UTM uses a working system that is completely different from that of traditional crushers and mills, while the FTR1500MC crusher features two axles counter-rotating at low speed with a high-resistance three-blade cutter made from Hardox 400 steel capable of crushing the hardest material. Rock and construction materials generally offer minimal resistance to shearing stress, but the UTM is overengineered, to ensure high production and the reduction of



FIGURE 1: Pumps GHP series with cast iron flange and cover

energy consumption.

This technology has many advantages, one being the possibility to work with a wide range of difficult materials such as asphalt, earth and clay. Therefore, the UTM range does not require an operator to be on top of the machine to adjust the inlet flow, but only an excavator operator to feed the plant. The in-feed hopper feeds the machine directly, meaning a pre-dosing machine is no longer necessary, which results in reduced maintenance and wear.

After filling of the in-feed hopper, the material goes directly into hopper – it is not necessary to use a traditional feeder. Thanks to the low rotation speed of the crusher, the consumption of milling disks is reduced, so CAMS has patented the exclusive system to easily and quickly replace the portion of worn disks.

The large dimensions of the hopper allows for loading of long objects such as pillars, causeway edges and girders usually found in demolition materials. The wide working surface allows for high production of the crushed material.

A magnetic device sorts out the inert

material from the ferrous material; a method that facilitates the recycling thanks to perfect separation during the crushing process. In case of demolition of reinforced concrete, the dimensions of the UTM plant allow the long iron bars to fall directly into a magnetic device so that it avoids stopping the machine due to their unpredictable rotations on the transportation belt. This way, the belt has a longer lifetime.

The machine shears through material instead of just crushing, which is more efficient as it offers less resistance which results in a reduction of energy consumption. Wearing of the plant is very low thanks to the low rotation speed and the use of the toughest blades on the machine disks.

All UTM operations are managed through a control unit interfaced with a PLC. This allows control of the working and safety parameters, automatically reversing motor rotation to free the mill from stuck material.

Driving the flow

A Marzocchi GHP3A-D-60 pump is used to carry out all the hydraulic operations



FIGURE 2 (TOP): Power unit of UTM with GHP3AD60 Marzocchi pump

FIGURE 3 (ABOVE): UTM plant at work

of the UTM plant. Thanks to its small dimensions and high specific power, it was possible to make the crushing plant movements independent, equipping it with an efficient and economic hydraulic circuit.

The GHP3AD60 pump is directly connected to the motor PTO. It sends power to the piston motors to move the tracks, which requires over 30kW, and is used in four other important auxiliary functions. The CETOP 5 valve is connected to the pump's outlet and it is fitted after the pressured filter. This valve controls the folding of the transportation belt, the closing of the in-feed hopper, and a CAMS patented device that allows the regulation of the size of crushed materials.

During material crushing, the pump has the only task of filtering the oil of the hydraulic circuit, increasing the machine's reliability. The circuit characteristics help to reduce the pump's energy input – the high mechanical efficiency of this pump has made possible the integration of the crawler unit without requiring major changes to the power unit.

The GHP3A-D-60 is therefore a very compact unit, but despite its small dimensions, it is very robust due to the spheroid cast iron flange and cover construction that allows the pump to easily handle peak pressure up to 295 bar and rotational velocity up to 3,500rpm, while covering displacements from 20c-87cc/rev.

This pump belongs to the new series of products purposely developed for the off-highway market to give the end user the possibility of complying with the constraints typical of mobile applications. The optimized design of the pump allows the user to enjoy outstanding volumetric and mechanical efficiency across most of the working conditions, with maximum values reaching 97%. These high efficiency values provide the user with improved autonomy and economy of the plant.

Intensive research has been carried out into the internal mechanical and hydraulic conditions of the pumps and motors; for this purpose, the R&D department has been equipped with new experimental test benches for mechanical, hydraulic, acoustic and

vibration performance analysis and durability test benches able to simulate the toughest working conditions. This new test equipment has led to the optimisation of the compensation geometry (used to balance the dynamic thrust caused by pressure in gear vanes), gear profiles and the undercrown drain on the bushings in order to increase product reliability and reduce noise levels. These innovations were transferred to production department by a wide-scale renewal of the run-in and test benches.

All the new pumps developed by Marzocchi are designed using state-of-the-art FEM and CFD numerical simulation software, which provides the flexibility to perform most of the design and verification work on a 3D numerical model, saving the time associated with unnecessary testing, and suggesting the best solution before any real prototype is actually produced.

This kind of approach reduces some costs and time typically associated with the development of new products and gives the possibility to offer the market top-class solutions at very competitive prices. In addition to this, all the innovations for a cost-effective assembly, testing and run-in are constantly improved in the R&D dept. The know-how is regularly transferred to the production line in terms of new process, tools and test benches for a continuous improvement of the product's quality.

A reliable partner

Thanks to the trust and the respect accumulated over many years, Marzocchi Pompe is considered a very reliable partner on the market, able to provide customers with specific know-how, high-quality products, and excellent service for all hydraulic applications.

The current production range varies between 0.19-200.3 cc/rev (0.0104-12.223in³/rev) and is divided into 8 groups according to gear size (0.25, 0.5, 1P, 1, 2, 3, 3.5 and 4). Within each group, different displacements are obtained by changing the gear width.

A wide range of flange, shaft and coupling configurations is available; these components can also be manufactured according to customer specifications. Cast iron versions are available in groups 1, 2 and 3.

Maximum operating pressure depends on pump displacement and



type; it varies on average between 230 bar (3,300psi) on aluminum models and 280 bar (4,100psi) for cast iron versions. All products can also be supplied with Viton seals and special versions are available for temperatures between -40° to +120°C (-40° to +248°F). Monodirectional and bidirectional motors are divided into three families (1,2,3) covering a range of displacements between 2.8-87cc/rev (0.17-53.1in³/rev). The maximum working pressures for the motors are similar to those established for the pumps and they can deliver torque up to 250Nm and power up to 60kW. **IVT**

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