



Hall ?? Stand ??

Keep your motor running...

WITH ANTICAVITATION VALVES, HIGH-PRESSURE SEALS, AND SUPPORT BEARINGS, THESE MOTORS WILL HELP YOU HEAD OUT OFF THE HIGHWAY – SAFE AND SOUND

RIGHT: Motors with bearing support from Marzocchi Pompe

▶ Marzocchi Pompe can count on a very innovative, qualified and professional partner in Germany. Having worked with Marzocchi since the early 1990s, Krefeld-based Fluitronics GmbH is one of the country's leading engineering companies for integrated hydraulic system solutions. Many well-known German industrial vehicle manufacturers rely on the trusted, customer-specific and imaginative hydraulic controls it produces.

The main focus is the engineering and serial production of tailor-made ready-to-install solutions in a quantity range of between 100-5,000 pieces per year. The product range comprises integrated hydraulic manifolds, compact power units, electrohydraulic subsystems, customer-specific hydraulic systems, hydraulic motors and pumps. The company currently has about 80 employees and a turnover of €17 million with seven sales engineers in Germany and Benelux.

Experienced in agriculture

Fluitronics considers the Marzocchi motors, with their high-pressure seals, anticavitation valves and support bearings, as an especially appropriate solution for applications that are connected to the hydraulic supply of a

RIGHT: Applications of gear motors with bearing support



tractor or similar vehicle. In applications such as these, it is quite possible that the connections between the pump on the tractor and the hydraulic motor circuit may be wrongly connected, or that the tank line is not properly connected, meaning that the back side of the motor will see full system pressure. In a case such as this, the consequences of the use of a motor that is not capable of withstanding this level of pressure can be quite unpleasant.

In a seeding machine, a motor of this type is typically mounted directly to the fan, meaning the loss of oil or, even worse, the bursting of the motor could spread the hydraulic oil all over the expensive seed and into all machine elements, creating a long machine downtime and a high degree of follow-up costs.

That is why Fluitronics has, after tough prototype tests, introduced these motors to several projects in the agriculture business and other applications, where high static or dynamic back pressures are given or may occur. Aside from seeding machines, this may include a variety of mowing equipment.

The integration of the anticavitation valve is an interesting feature, which saves space as well as cost. The technical features of this product, together with the possibility of Marzocchi and Fluitronics providing customer-specific solutions, make this new product an interesting alternative.

Coping with stress

The range of monodirectional and bi-directional motors produced by Marzocchi Pompe are divided into three families (1,2,3) covering a range of displacements between 2.8-87cc/rev (0.17/53.1 in³/rev). The motors' maximum working pressures are similar to those established for the pumps, while they can deliver torque up to 250Nm and power up to 60kW.

Some of the motors used by Fluitronics are able to work with radial and axial forces applied to the motor shaft, thereby making possible the transmission of motion via pulleys, belts, chains, sprockets, or the direct fitting of a large and heavy fan.

The use of the bearing support is essential for these applications because it

supports external stresses, leaving the internal bushings free to move, following the movement of the gear without other constraints. The shaft is supported by a double-row angular contact ballbearing that can withstand heavy radial and axial loads. This is permanently lubricated by the hydraulic oil circuit, thereby ensuring optimal lubrication and efficient heat exchange.

The outer shaft and the drive gear are connected by an internal splined joint which guarantees an excellent torsional strength as part of a highly compact design, which allows it to be used in applications where space-saving solutions are needed. The cast iron flange guarantees a secure and robust load transmission to the support structure.

Bearing support option is available in all versions of pumps and motors AL and GH groups 2 and 3 in a range of displacements between 4.5-87cc/rev. All these products can be equipped with integrated valves: cavitation valves, electroproportional or relief valves can be integrated in the cover. The use of cavitation valves prevents, in the transient circuit condition, the motor reversing the direction of rotation, offering protection in the event of it being mounted incorrectly. Relief or electroproportional valves are useful to control the rotation speed or to limit the available shaft torque.

It is also possible to equip the hydraulic motor with a system of radial sealing at the shaft that can bear internal overpressures or high shaft rotation without damages. This is particularly useful in single-direction hydraulic motors when, in certain conditions of use, high overpressures will be generated at the motor output. With bi-directional motors, the area adjacent to the seal ring of the driveshaft is maintained at atmospheric pressure by the drainage circuit.

Reliability and performance

After leaving the Marzocchi factory, all products are subject to a specific run-in and testing. The run-in is the last stage of the manufacturing process and is one of the most important operations because it allows for the optimisation and checking of the product's efficiencies. During run-in tests, increasingly higher pressure levels are created; the gears, inflected by the hydraulic load, act as tools machining the pump body and creating the best tolerances among the parts.

This process is performed under computer control, as the definition of the steady increase of the pressure is particularly important as it establishes the machining speed of the material by the gears and thereby the dimension of the particles. These must be small enough so that they do not cause any trouble during the run-in phase of the product – and especially in its future regular behaviour. Each pump or motor of each group has a personalised pressure ramp to ensure no contaminating material remains in the circuit and that the pump is immediately able to attain maximum performance levels. Reversible motors and pumps are subject to the run-in procedure on both rotations.

After this process, the volumetric and mechanical efficiencies are measured at fixed parameters. The testing data is automatically acquired and recorded to provide updated statistics on product performances; this data can be retrieved and supplied on customer request at a later stage.

As far as motors are concerned, another specific test on a dedicated test-bench follows the run-in, where the relative operating conditions must be reproduced:

- Under braking, when the energy of the fluid is transferred to the shaft to overcome the resisting torque;
- Under counterpressure, when the fluid passes through the motor, with the shaft free to turn without load;
- Under braking, where the stress distribution is similar to that which exists on the pumps. If maximum pressure exists at the inlet and discharge pressure exists at the outlet, compensation seals and rotating parts are subjected to the maximum stress according to resisting torque;
- Under counterpressure, the inlet and outlet are under the same conditions: at maximum pressure, the stress on the rotating parts is zero, while the flanges, body and external seals are subjected to the maximum stress. Typical motor working conditions fall between these two situations: part of the energy is transferred to the shaft and part is used, for example, by another motor connected in series.

Therefore, on the motor test bench, the final control is divided into three phases:

- Braking phase: at an established rotation speed, a resisting torque is applied to the



TOP: The Fluitronics factory
ABOVE: Three-gear motor with bearing support, and double relief and anti-cavitation valve integrated on the cover

motor shaft. The application of this torque creates a variation in the fluid's inlet speed and pressure; the test-bench control system stabilises the motor in fixed conditions in which running parameters are acquired, such as volumetric and mechanical performances and draining flow rate.

- Counterpressure phase: a fixed amount of oil goes through the motor without any resisting torque applied to the shaft; the outlet line is kept closed and therefore a bilateral pressure is established. The drain flow rate is measured at these conditions.
- Start-up phase: without any resisting torque applied on the shaft, the start-up torque is determined by measuring the minimum inlet pressure at which the motor starts running. In the case of bi-directional motors, the three phases are performed for both rotations.

After this test, the motor is delivered to the customer perfectly run-in and tested: its extreme reliability makes it suitable for use even under extreme conditions. **IVT**

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