

# On the user's part



**Example of the new application**  
OMFB Mag-tronic.

Domenico Bianchi, Marketing and Communications Director and joint proprietor of OMFB at Provaglio d'Iseo, has many reasons to be satisfied: «In 2005 the company had a turnover of more than 37 million euros with a growth of 17%, mainly assured by the launch of about 40 new products found in the catalogue. The innovative capability that characterises the company and which takes shape with a constant extension of the range of the twenty-or-so families in portfolio, became particularly important with the launch of Mag-tronic. Mag-tronic (figure 1) is an innovative electromagnetic device for the activation of power take-offs, original due to its functioning principle, the sophisticated electronic management and compactness».

He adds: «We have developed a reliable solution, which is easy to mount and user-friendly for light vehicles that are not equipped with compressed air. It is supplied with a management "brain" able to monitor several parameters for correct functioning, to inform the operator in the cab of engagement/disengagement, to inform the manufacturer of any malfunctioning and the amount of work carried out by the device». «Four months were required for the study, planning and development of Mag-tronic - states Engineer Alessandro Zoni, Director of the OMFB Technical Office - without counting the time required for static and dynamic experimentation in the field. Initial bench-top tests were carried out to identify the correct set-up of the main parameters which would guarantee the agreed optimum respect to the required specifications and project restraints.

OMFB presents an innovative electromagnetic device for the activation of the power take-offs.

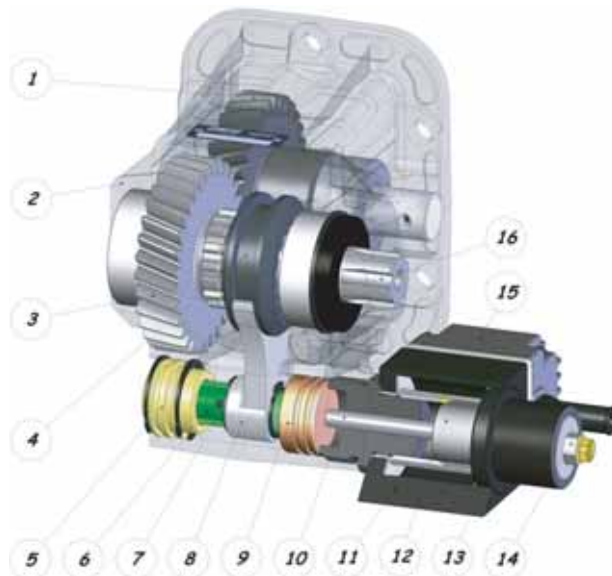
The novelty consists in the originality of the functioning principle, the sophisticated electronic management and compactness.

It is ideal for application on industrial vehicles used in heavy duty and difficult environmental conditions.



## 1. Mag-tronic, the innovative electromagnetic device

for activation of the power take-off developed by OMFB.



## 2. Power take-off section with Mag-tronic engagement.

Verifications were then made with respect to temperature restraints of the system. On setting of the set-up values, the system was installed on a gearbox and subjected to work cycles that were much heavier than the real applications. The engagement system was then subjected to extreme temperature conditions in a climatic chamber according to American Military Standard MIL-STD-810F. A pre-product was realised that underwent vibration tests in specialised laboratories according to MIL-STD-810F. The result is an engagement device that allows the elimination of all previous power take-off engagement methods and the specific problems linked to each of these: alterations of the adjustment of the mechanical cable engagement system, breakage and low engagement force of electric engagement systems, air loss and breakage of the pneumatic engagement system circuits, dirtying and alterations to the braking system of vehicles with the depression engagement system, low engagement force and

strength of electro-hydraulic systems, excessive heat development and/or large overall sizes typical of single or double solenoid engagements.

In particular, Mag-tronic allows the use of smaller electromagnets with respect to those in the passed and present solenoid-based engagement systems found on the market. With Magtronic the kinematic chain between the engagement device and gear is reduced to a minimum so reducing risks of fault due to breakage of components or assembly errors drastically».

But let's proceed in order.

### Innovative solution

«The power-take-off - explains Zoni - is a mechanical gear device, which connected to the gearbox of industrial vehicles withdraws power from the gearbox itself transferring it for external use, in particular, a rotary hydraulic pump that

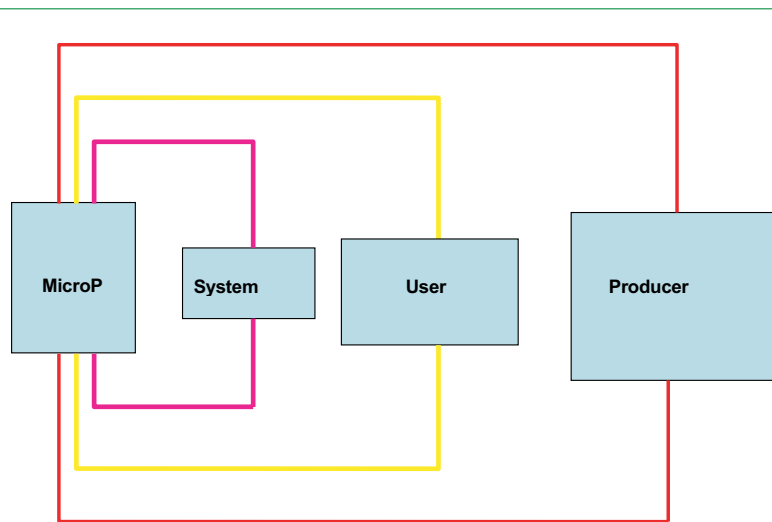
transforms the mechanical power into hydraulic power in order to supply a hydraulic plant for many applications. Mag-tronic is an engagement device for power take-offs. Its functioning is based on a small electro-magnet thanks to the differentiation of the intensity of the current in the engagement phase and the maintenance phase of the engagement system itself. The control system monitors fundamental parameters such as current and voltage of the electro-magnet without the aid of external sensors. From these parameters the system is able to detect the engagement or disengagement position of the power take-off». Figure 2 represents a section of the power take-off with the Mag-tronic engagement system.

## Quality and flexibility Of the offer

OMFB Spa Hydraulic Components was established in the early 1950's thanks to the strength and the entrepreneurial courage of 3 brothers: Nicola, Umberto and Sandro Bianchi. Initially the work consisted in the garaging of original mechanical components mounted on war vehicles and the successive production of several spare parts for national and foreign lorries. Market requirements then pushed the brothers into extending their product range to include hydraulic components. Today, the company boasts a wide range of products, which are divided into 15 families. If other marketed products are added to the list the families become 20. There are actually 170 people employed and production only takes place at the Provaglio d'Iseo establishment.



This comprises: a body or main box, usually in cast iron or aluminium (2), which makes up the external container of all of the other mechanical elements and which is used as the fixed connection to the gearbox; a main gear, known as "constant mesh" (1) that is combined with the gear inside the gearbox and which transfers movement from the gearbox gear to the other gears inside the power take-off; one or more driven or auxiliary gears (3) of the power take-off, which combine with the main gear (1); an exit shaft (16) for transmission of movement of gears (1) and (3) inside the external mesh device (usually a pump).



**3. The three distinct levels of**

Mag-tronic feedback guarantee maximum reliability.

The turnover for 2005 was 37,124,000 €. The sales organisation in Italy envisions a network of 8 sole agents for the Centre, the South and the Islands. The North is covered directly by the company and the branch in Modena. There are 3 representatives for Italy, who are employees. The foreign market is served directly by the company for some ministerial customers and for other



cases regarding independent dealers. The foreign turnover for a while now has been around 50% of the total; the most important markets being Europe, Oceania and South Africa.

OMFB's strong points are quality and flexibility of the offer: following the production process in all of its phases, from design to sale. The company is not bound by possible delays by sub-suppliers and can therefore plan and/or modify product preparation programmes on the basis of market requirements.

OMFB is also acknowledged by the market for the fact that its catalogue contains 90% of the products that the customer requests. In this way it becomes a unique interlocutor for all of the customer's requirements.

The technical office comprises two engineers, a technical director and an Electronics sector R&D manager, 6 technical draughtsmen and an after-sales manager. The calculation programmes used are: SOLID WORKS, KISS SOFT for gear, shaft and bearing calculations, COSMOS for finished elements, FLOW WORKS for the dimensioning of hydraulic components. The economical performance in 2006 is confirming itself very positive with a trend of firm and constant growth of the turnover, envisioned at around 40,000,000 €.

The engagement unit includes an engagement piston (9) that can be moved between a retracted inactive position and an advanced active position, a return element (7) joined to the engagement piston (9) and a moveable gear (4) working with the return element (7) between an inactive and active position that allows engagement of the exit shaft (16) with the driven or auxiliary gears (3).

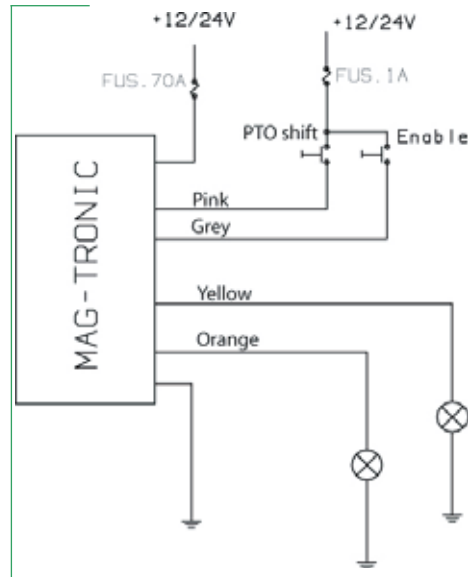
The engagement unit includes an electro-magnet (11) with a single coil adapt for moving, when excited, a mobile anchor (12) to which an activation rod is fixed (10) that acts on the piston (9). The electro-magnet (11) is positioned co-axially and in continuation of the piston running seat (9). In more detail, the electro-magnet (11) is fixed to the body (2) by means of a front bush that projects from the cylinder to be fastened in the seat inlet. Moreover the front bush acts as a guide and running element for the actuation rod (10). The engagement unit also includes a device (14) that allows manual engagement of the power take-off in case of system malfunctioning, preventing unwanted machine standstill.

The piston (9) is stimulated by an elastic element (6) (return spring) that takes the piston back to the retracted inactive position following failure to excite the electro-magnet (11) or unscrewing of the manual activation screws (14).

# THE MARKET

## Reliability guaranteed

Mag-tronic includes an electronic control device based on a micro-processor integrated directly into the electro-magnet (figure 3). «The intelligence and the calculation capacity of the micro-processor - explains Engineer Davide Zanotti, OMF R&D Manager - allows to obtain a noteworthy engagement force and continual excitement of the electro-magnet for Mag-tronic, while containing overall size. The current value that runs through the coil of the electro-magnet is fed back to the micro-processor. The micro-processor is also fed-back with the value of the power supply and is also programmed to detect the real position of the power take-off moveable gear without the aid of other sensors or limit switches». As indicated in figure 4, Mag-tronic receives the power take-off input engagement/disengagement command, an enabling signal for power take-off engagement/disengagement (in figure 4 'Enable') conditioned by pressure on the clutch pedal, the status of the handbrake or the status of any other condition or group of conditions that must be envisioned for the execution of these operations.



4. Mag-tronic connection layout.

Mag-tronic control logic makes it ready to be interfaced with the electronic control units of the vehicles and the gearboxes. Mag-tronic can be powered by voltages between 10 V and 30 V, in a way that they can be used in the same version both in vehicles with 12V power supply and in vehicles powered by 24V. The Mag-tronic control system has an Eeprom memory

where information relative to the functional history of the individual product in the field is recorded. Other information can also be input to Mag-tronic e.g. the maximum working pressure of the hydraulic plant whenever a pressure transducer is available.

«Mag-tronic has been developed to guarantee maximum reliability by introducing 3 distinct feedback levels: the first at 'System level, i.e. the feedback ring that controls the electro-magnet; the second at 'User' level made up from the continual self-diagnosis and capacity of the system to inform the user or other systems of its functioning status and any types of problems; the third feedback ring is at the 'Producer' level and is made up from the information that Mag-tronic stores in the Eeprom during its working life».

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