OMFB MAKES HEADWAY IN CLUTCH SYSTEMS FOR POWER TAKEOFFS, WITH AN INNOVATIVE ELECTROMAGNETIC DEVICE CALLED "MAG-TRONIC"

Mag-tronic PTO CONTROL SISTEM

Most readers of this technical magazine, who work in the sector, will know what a power takeoff is and what it does. Everyone will probably know that power takeoffs are a wide range of mechanical gears with one shared aim: to transfer power from a motor's gearbox to an external device, such as an oleodynamic pump, that can convert mechanical power into hydraulic power for a variety of applications. A main component of the power takeoff is the clutch signal that warns the driver when the power takeoff is engaged by activating an indicator light on the dashboard or an acoustic signal. When power takeoff is engaged, power is transferred to the external device *(usually a pump)*.

The power takeoff has several types of clutch system:

- Mechanical clutch;
- Vacuum clutch;
- Hydraulich clutch;
- Pneumatic clutch;
- Electrical clutch;
- Electro-hydraulic clutch;
- Single control clutch;
- Double control solenoid clutch.

All the devices can be activated in the driver's cab by the following means:

- a lever connected to the power takeoff with a coated metal cable;
- a pneumatic piston in the power takeoff controlled by pressure of the vehicle's auxiliary services;
- a special auxiliary compressor;
- or by using the difference between the ambient pressure and pressure of the vehicle's servo-brake circuit, with a switch for the electro-valves.

These systems all have weak points

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that limit their functionality and whose many different causes include poor resistance to vibrations, poor engaging power and the need for high electrical current, entailing high energy consumtion and consequent overheating.

MAG-TRONIC by OMFB *(the power takeoff with clutch is shown in the photo of the previous page)* is a power takeoff engaging device activated by a solenoid that can obviate the limits and inconveniences so typical of these and other devices.

MAG-TRONIC's electronics

MAG-TRONIC comprises an electronic control device based on a microprocessor integrated directly with the electro-magnet. The microprocessor's smart and able calculation provides MAG-TRONIC with considerable power for engaging and 100% ED *(continuous excitation of the electromagnet)* with extremely reduced size. The value of the current in the electro-magnet's coil issent as feedback to the microprocessor. The voltage value of the electro-magnet's power supply is also sent as feedback to the microprocessor. The control device is also programmed to detect, without the need for additional sensors, limit switches or dedicated coupling indicator, the actual position of the power takeoff's shifting gear.

MAG-TRONIC's control device continuously monitors the temperature of the electro-magnet and the actual control: the control disconnects the electro-magnet's coil from the power supply whenever the temperature exceeds a pre-set limit. In this case, the control sends a signal/alarm to the user *(man or machine)*. As illustrated in the diagram, power takeoff send a command to MAG-TRONIC to engage/disengage *(referred to in the diagram as "Inn PTO")* a signal enabling operations for the power takeoff to engage or disengage *("Enable" in the diagram)*, which depends upon pressure of the clutch pedal, handbrake or any other condition or conditions required for carrying out such operations. MAG-TRONIC's control logic allows it to interface via CAN-BUS with electronic power centres on the vehicles and gearboxes. Each MAG-TRONIC version can be powered between 10 and 30V for both 12V and 24V vehicles.

MAG-TRONIC's control system has EEPROM memory that can record information on an individual product's "operation history" in the field *(number of cycles, hours of operation, etc.)* useful for correctly scheduling preventive maintenance and performing checks for feedback on life of the product. MAG-TRONIC can also collect other information, such as the hydraulic system's maximum working pressure, if a pressure transduced is available.

Test on MAG-TRONIC

Constant tests were carried out at each step during development of MAG-TRONIC. An initial test was carried out on correct set-up of the main settings, to ensure optimal compromise for any required specifications and project constraints.

The system's temperature settings were then checked. Once the set-up values were determined, the system was installed on a gearbox and subjected to more heavy duty work cycles than those of the actual, more critical application. The engaging unit was therefore subjected to extreme temperature conditions in a climatic test chamber complying with American Mimitary Standard MIL-STD-810F. Pre-production and a vibration test complying with the MIL-STD-810F was carried out in specialized laboratories.

Conclusions

MAG-TRONIC does not involve any of the former power takeoff engaging methods or any of their related problems: Adjustments to mechanical cable clutches; breakage and poor engaging power of electric clutches; air loss and breakage of pneumatic circuits of the same clutches; dirt and alterations to the braking system of typical vacuum clutch vehicles; poor engaging power and poor durability of electro-hydraulic clutches; excessive heat and/or bulk, typical of single or double control solenoid clutches. In particular, MAG-TRONIC can be used with an extremely small electro-magnet compared to that of both past and present solenoid-based clutches on the market. MAG-TRONIC's kinetic chain, connecting the engaging device with the gear, is of minimum size, considerably helping to prevent risks of failure due to breakage of components or errors of assembly.

Smart micro-processor-based control can continuously self-diagnose on the basis of main operation settings, automatically disengaging when one or more settings exceed pre-determined critical limits and can also interact with the engaging system's user, facilitating use and any maintenance. Smart micro-processor-based control can process information on some of the electro-magnet's settings, to automatically detect whether the power takeoff is engaged or disengaged without the need for other sensors or limit switch. MAG-TRONIC was developed and tested to be an ideal product able to withstand the harshest work and environmental conditions of applications on industrial vehicles.

MAG-TRONIC was devised to guarantee maximum reliability, with three separate feedback levels: the first in the "System" level, that is, the feedback loop that controls the electro-magnet; the second is the "User" level, with continuous self-diagnosis and the system's ability to communicate its state of operation and any type of problem to the user or other systems; the third is the "Producer" feedback loop and comprises information stored in EEPROM by MAG-TRONIC during its working life in the field.

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