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A machine of the future which comes from the past

The company Controls has always worked closely with universities and research centers in sharing ideas and developing technologies that can be industrialized in the field of stringent quality control, which is now well recognized as the basis for successful development by operators in the construction industry. Today's construction materials have increased performance characteristics, examples being high strength concretes and the use of additives to improve the performance of concrete. This was fostered by a market ever more aware on the issues of safety and quality of construction. Safety is of particular importance in today's market thus promoting production control so as to fully comply with International Standards. The need to develop new technologies and procedures for quality control in construction is perhaps more appropriate today than ever in the past. Controls understands this need and has made it its own in the field of concrete compression machines by proposing high technological solutions which provide accuracy, high productivity and energy savings.

The new range of Pilot 4 compression machines include "Energy Saving" technology (ES technology), which was first introduced some 10 years ago on the Automax 5 series, and which is today substantially improved.

Compression machines use a small quantity of oil of about 0.5 l/min at high pressures around 650 bar. The flow of oil must be accurately controlled so as to provide a linear distribution throughout the test without sharp fluctuations. International Standards prescribe that load gradients should be maintained constant within a maximum fluctuation of +/- 10% and the flow control device must therefore be very precise. Servo-valves for flow control are continually positioned via output from the solenoid and provide linear flow. This way of working allows controlling not only the direction of the flow but also the flow quantity and the outlet pressure, whereby the loss of load caused by the opening in the valve is considered. With proportional valves the quantity is ideally proportional to the input electrical signal, and any differences created by the system as a whole can be accounted for by an ad hoc calibration of the system.

In concept both proportional valves and servo-valves operate in a similar way by continuously controlling the flow of oil and offer easy programming and great flexibility to the system. Servo-valves offer higher performance but are more expensive and, more importantly, cannot be used at the high pressures normally associated with concrete compression machines. Manual flow control valves or stepping motors guarantee an adequate control of a uniform load rate but react badly to small variations that should ideally be corrected instantaneously.

Controls decided to produce a dual stage pump with variable flow, which overcomes these problems and provides three fundamental characteristics: accuracy of load control, productivity and energy saving. The new Pilot 4 compression machines guarantee high productivity, up to 30 samples per hour and low energy consumption with savings up to 30%, compared to traditional machines. The hydraulic unit is driven by an efficient dual stage volumetric pump, which in turn is driven by a dc motor with variable speed controlled by a high resolution closed circuit microprocessor. This solution allows on the one hand the limitation of "costly" waiting times between tests and on the other hand to control the oil flow drop by drop so as to use only the amount necessary to perform the test. The use of cold oil and a pump that does not heat up eliminate the need for a cooling fan whilst perfect mechanical coupling ensures near silent operation at the high pressures required.

On the electronics side a big step forward has been made with a new control board which reads and converts the load on a scale with more than 131,000 points for each channel. A second test frame can be controlled by fitting a pressure transducer or load cell to the second channel and a distribution block to the hydraulic circuit. The operator interface consists of a touch screen with icons for easy and immediate use.

Rigidity is the characteristic of the robust welded frame certified for stability according to EN 12390-4. A solid cross head distributes the absorbed forces to four welded columns, which are spaced symmetrically and at equal distance from the load axis. The load, free from unwanted moments, is transmitted to the sample via a robust self-locking ball seat, which is characterized by high hardness and non-deformability. The load test chamber is large enough to house rectangular load platens for block testing. The compression machine can be furnished with a wide range of optional accessories allowing tests on cement samples, indirect tensile tests on cubes, cylinders and pavers.



Fig. 1: The Pilot 4 compression machine

FURTHER INFORMATION

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