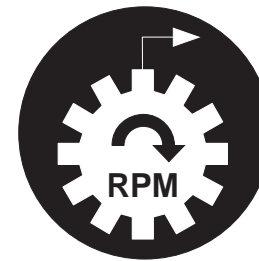
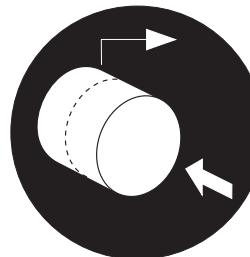
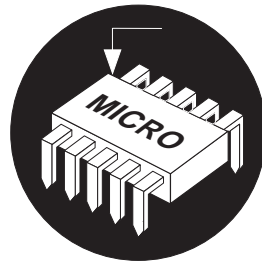
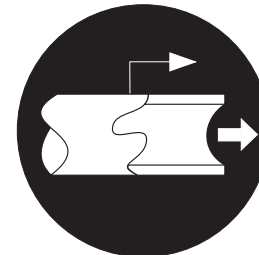
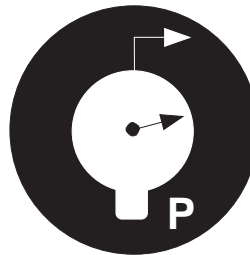
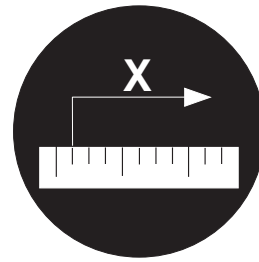


Your Guide to the Electronic Control of Fluid Power



The members of the National Fluid Power Association (NFPA) have prepared this application as an introduction to the electronic control of fluid power. The application and components described here are representative — electrohydraulics and electropneumatics can be effectively utilized in countless processes, and components are available in many different sizes and configurations.

NFPA's manufacturers invite you to contact them for additional information.

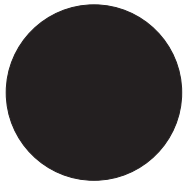
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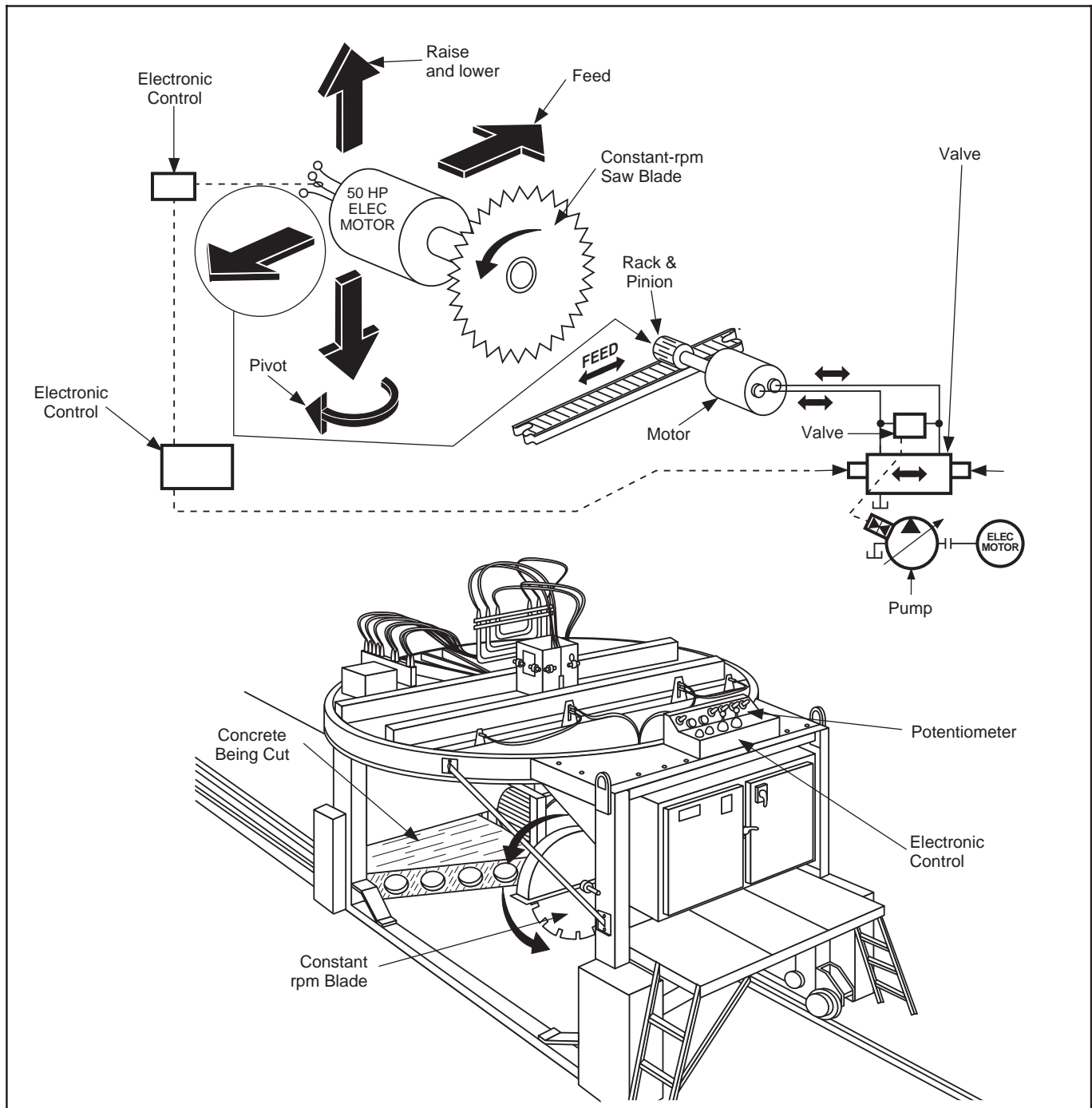
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Electrohydraulics at Work

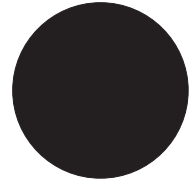
Concrete Saw



The Problem

Those who use prefabricated hollow core concrete slabs in place of I-beams, or other structural building members, often are faced with the awesome task of sawing through these monolithic structures which can range from 4 to 16 inches thick.

Large-scale saws are used; they can cut straight across or at any angle. Because of the heavy weight of the slabs, automatic conveying systems are required to move the slabs into position so that the saw blade, up to 40 inches in diameter, can do its work. However, the saw's feed



rate has to be limited so as not to overload the electric motor or damage the blade. That's not easy because, if the speed rate is set low enough to meet safety standards for thick sections, it will be far too slow for thin sections.

Its Solution

To increase the efficiency of the cutting process, one manufacturer devised a variable-rate saw-feed mechanism. Hydraulics was chosen for the saw feed drive.

A 5-hp hydraulic motor is attached to a rack-and-pinion transfer system, shown schematically in the illustration. As the operator starts the saw, a joy-stick type potentiometer is moved to set the desired power level of the electric motor. This activates a variable-displacement, pressure-compensated hydraulic pump which drives the hydraulic feed motor, moves the rack, and causes the saw to cut the concrete slab. Current draw of the electric motor is sensed by an inductive transducer looped around the saw's power cord. Transducer output is converted to a proportional zero to 5 volt signal.

As the saw blade begins to cut into the work piece, current draw increases. When the current reaches a predetermined value, the proportional electronic signal tells the electrohydraulic proportional four-way flow control valve to limit flow to the hydraulic feed motor. Simultaneously, the variable-displacement pump adjusts its flow and pressure automatically to correspond with the needs of the hydraulic feed motor.

As the saw nears the end of its cut, the load on the saw decreases, and consequently electric motor current decreases. The proportional valve automatically allows more hydraulic fluid to flow to the motor, speeding up the feed rate until a position sensor indicates that the feed table has reached its end position. Then, the hydraulic motor is stopped, and the saw is lifted and moved to its pre-cutting position. Then the process begins again.

The mechanism is designed to maintain the saw's constant-speed electric drive motor at its full power (say 50 hp) no matter how thick or thin the slab might be. This requires constant measurement of the motor's current draw, which increases when it encounters thick concrete slabs and lessens when the slab is thinner. By automatically adjusting the feed rate across the slab, the motor

can be held at full power thus allowing the saw to move along as fast as possible at all times.

Related Applications

Any situation in which items are automatically fed into an electric motor-driven mechanism, whose motor current varies with the driven load, can benefit from the approach here. Examples include large power tools such as sanders, shapers, planers and steel cut-off saws. An application similar to the concrete saw is a shredding machine where the hydraulic pump-drive combination controls the feed rate of the material being introduced by conveyor to the shredder blades. As the motor current increases to the maximum, the conveyor speed is automatically decreased to hold motor power constant.

How Electronics Improved This Application

- Faster operation
- Efficient use of motor power
- Automation
- Flexible placement of control
- Monitoring and diagnostics
- Standard components
- Upgradability

Components Used in Industrial Hydraulic Systems*

Accumulators	Motors
Controls (electronic) and Software	Power Units
Cylinders	Pumps
Filters	Pump Drives
Fittings	Reservoirs
Flanges	Rotary Actuators
Fluids	Seals
Gauges	Shaft Couplings
Heat Exchangers	Shock Absorbers
Hose	Switches
Hydrostatic Drives	Tubing
Manifolds	Valves

*Click here to access the NFPA Fluid Power Product Locator, which includes information about and links to NFPA member companies.