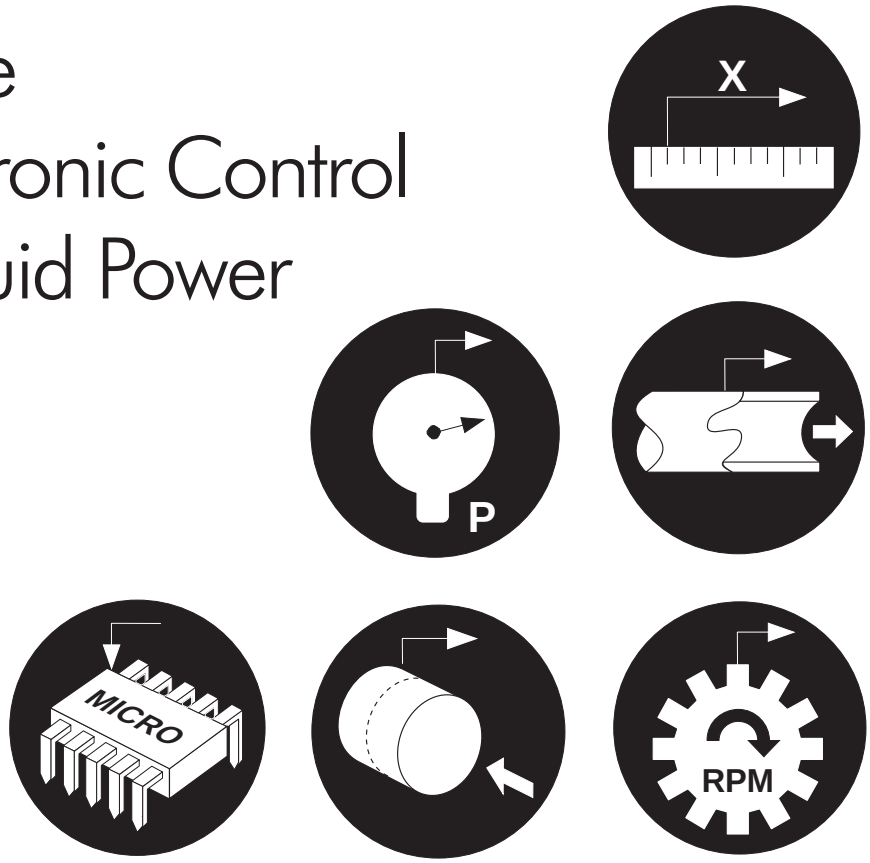
Your Guide to the Electronic Control of Fluid Power



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.

National FLUID POWER Association®

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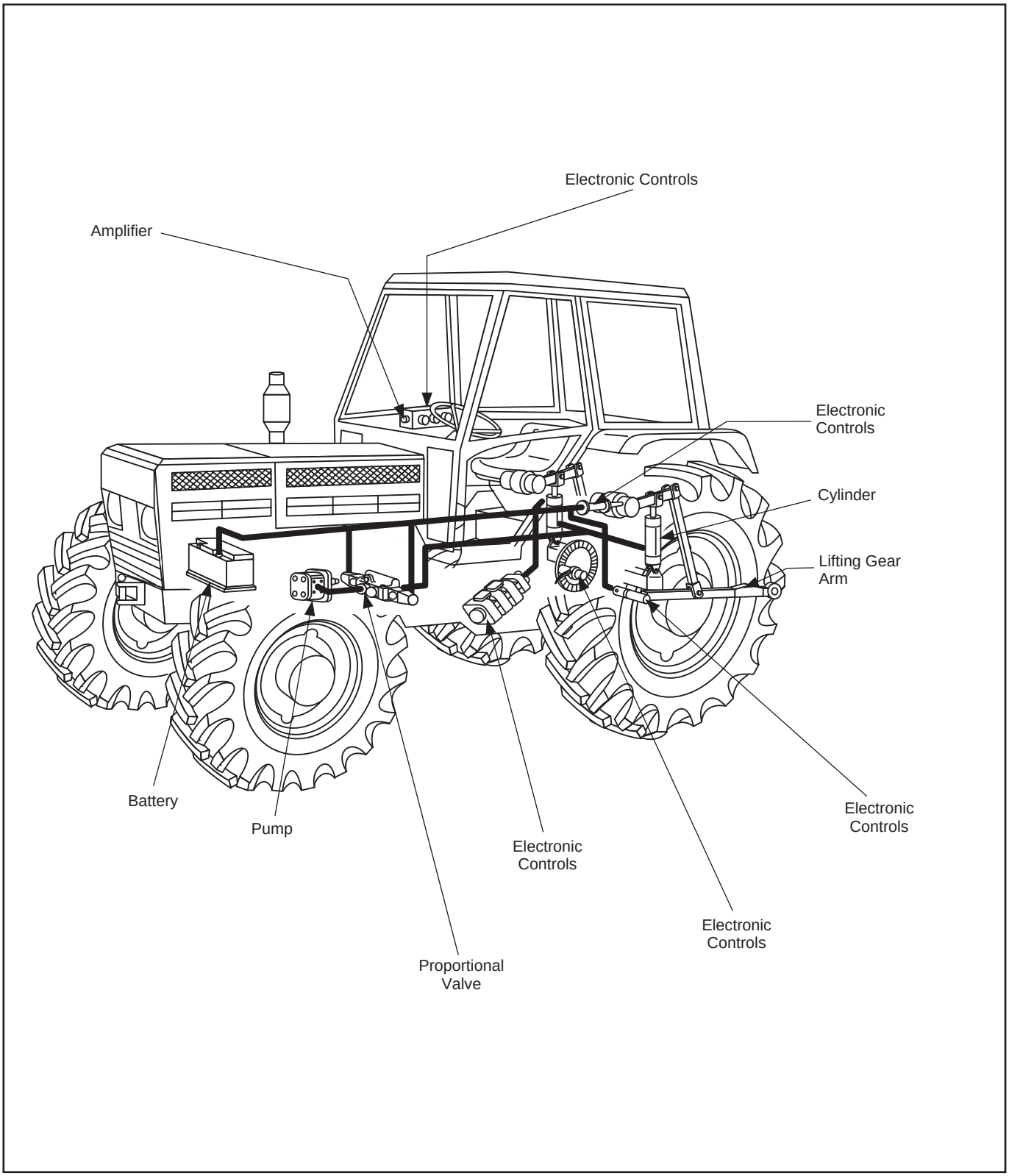
Electrohydraulics at Work

Hitch Control for a Tractor



Force and Position Control

The Problem

Dragging plows, spreaders and cultivators through rough terrain is tough work for a tractor, and every performance enhancement is desirable.

Design engineers of a special line of high performance tractors wanted to maintain the optimum position of the implement lifting gear and protect it from unbalanced forces and damaging overloads. They needed a lifting gear that would always be at the correct height to match the hitch, regardless of the condition of the field.

Furthermore, the pulling forces against the horizontal lower suspension arm had to be reasonably constant, and not exceed the maximum design loading.

Its Solution

Electronic sensors and electrohydraulic power could accomplish all this with the speed, power and reliability required. The designers succeeded, and even managed to combine several options into one system:

- Lifting gear height is sensed with a position transducer on the rotating joint for the upper horizontal arm.
- Pulling force (called *draft force*) is sensed with a draft-control sensor, roughly in the shape of a large bolt, that measures shear force created by the pull from the lower horizontal arm.
- Electronic output signals from the position transducer and the draft sensor are transmitted to the electronic operating console in the driver's cab. Here, they are interpreted by the integral microprocessors, and converted into amplified input signals to the proportional pressure control valve, and likewise to the speed-control throttle system.

Automatically, the hydraulic pressure to the lifting gear cylinder is varied precisely to raise or lower the gear to the new position; the tractor's forward velocity is reduced or increased to maintain the optimum pull force.

The illustration also shows an optional radar sensor that measures ground speed and compares it with wheel speed. If wheel speed is higher than it should be, then the tires are assumed to be slipping along the ground, and the lifting gear is automatically raised to remove part of the dragging force.

Related Applications

The concept of electrohydraulic control of lifting gear will apply equally as well to bulldozer blades, tailgate lifts, or to any vehicle or machine that has platforms or other appendages that must be precisely positioned with strong force in response to feedback signals of height, angle and tension.

How Electronics Improved This Application

- Improved operation over rough ground
- Automatic stall prevention
- Precise control of implement position
- Protection of equipment from damage
- More efficient power utilization
- Flexible placement of control

Components Used in Mobile Hydraulic Systems*

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

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

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