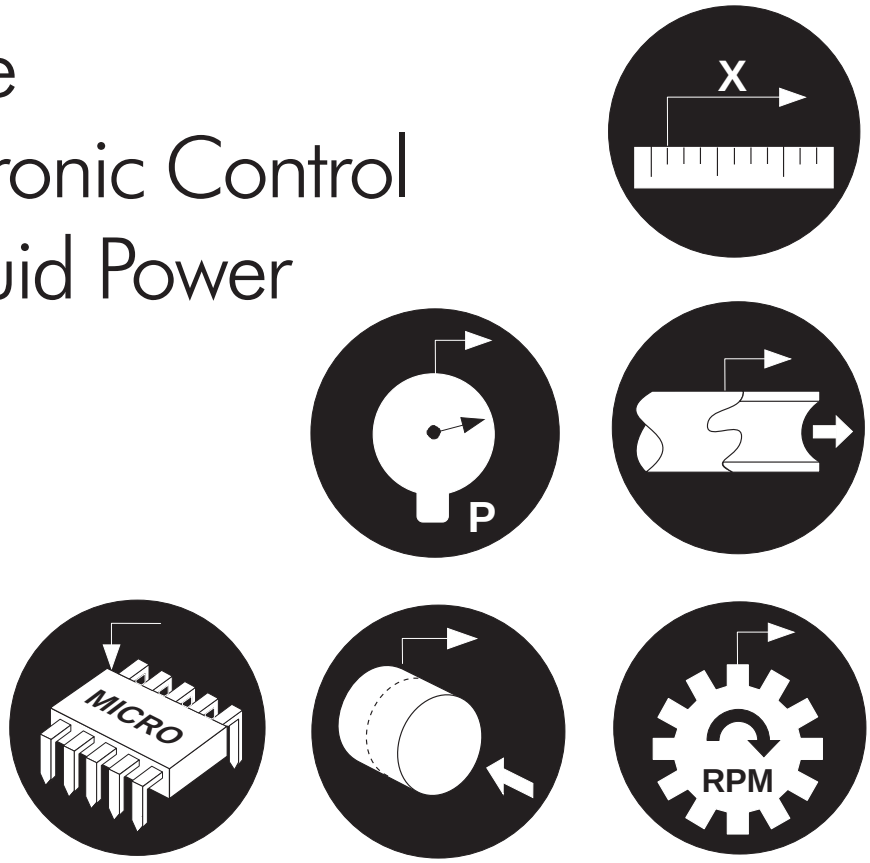
Your Guide to the Electronic Control of Fluid Power



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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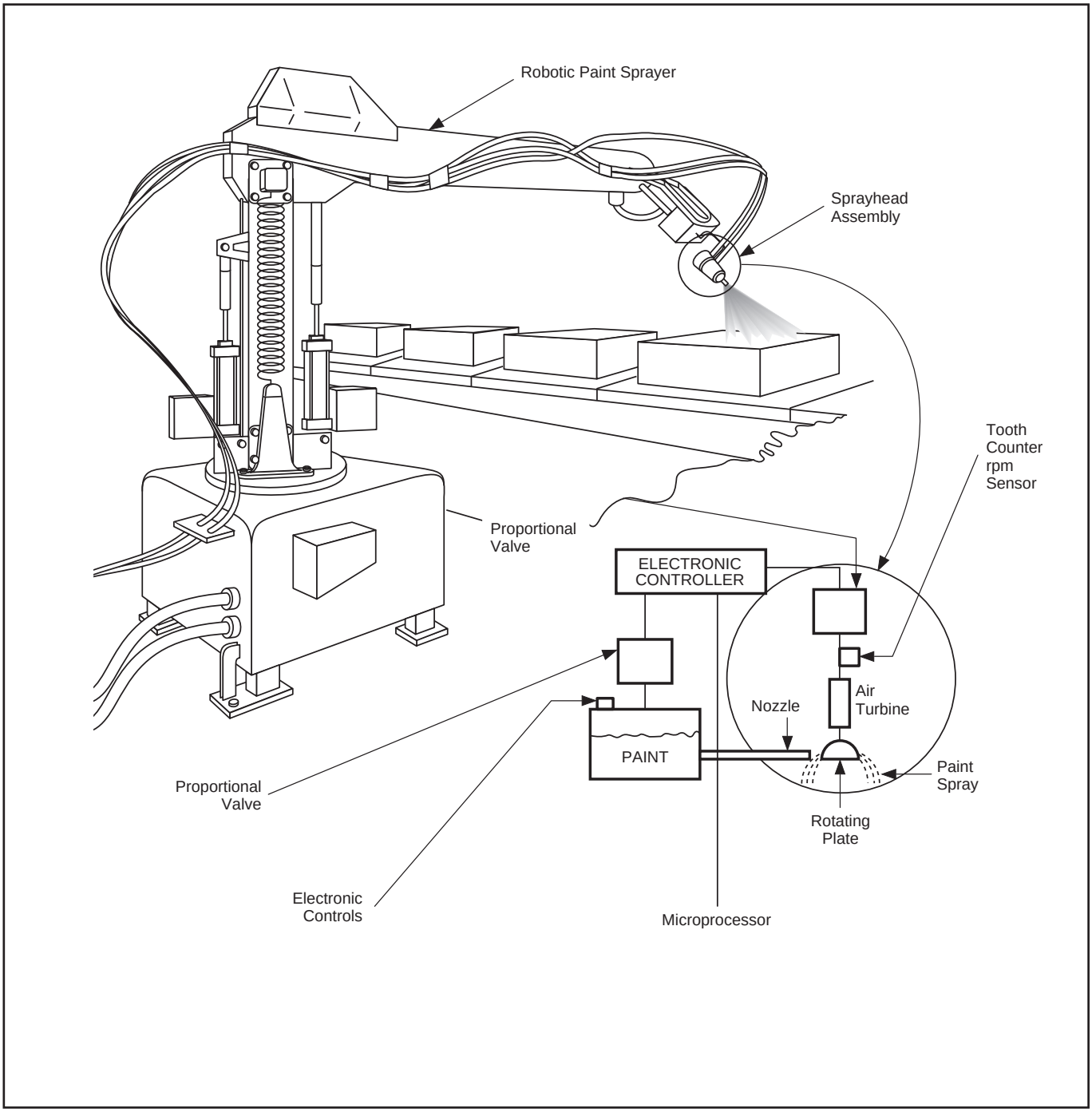
Electropneumatics at Work

Paint Spray System



The Problem

In principle, the design shown here is a high velocity jet of paint impinging on a spinning plate, resulting in a wide-angle spray pattern—an ideal way to automate an activity which in former times was intensely manual. But, to the engineers who created it, several problems were immediately apparent. One was safety, suggesting the use of compressed air to perform as many of the functions as possible. Another, this one of design, was to pressurize the paint precisely in order to create the proper flow velocity through the flow nozzle. Equally important was velocity control of the spinning plate against which the paint jet impinged.

Controls were complicated by the fact that each type of paint had its own viscosity and flow characteristics. Finally, the level of paint remaining in the pressurized reservoir had to be continuously monitored so that the operation could be automatically halted for refill.

Its Solution

When you think about all these criteria, you realize that paint-spray systems not only USE fluid power, they ARE fluid power. It also becomes evident that only electronic control, kept safe by good design of insulation and inherently safe because of low voltages, would solve the problems in this application.

The answers are seen in the illustration—a robotic sprayer* for a short-run assembly operation where specialty metal enclosures must be run through the painting process quickly. Each job has its own special requirements for an application method and paint consistency.

In charge of the sprayer system is a specially constructed electronic controller which has two chief roles. One, it tells an electronic proportional pressure control valve to preset paint reservoir pressure. The controller contains a series of such pressures in memory, each corresponding to a particular viscosity of paint.

An electronic proportional flow control valve, instructed by the electronic controller, tells an air turbine to spin the impingement plate at a certain predetermined velocity, thus creating the ideal paint droplet size and spray pattern. A speed sensor on the turbine shaft sends a feedback signal to the controller so that the electropneumatic proportional flow control valve can feed the right flow.

The paint reservoir level is monitored with a capacitive-type electronic system. It includes a probe at the top of the tank which emits a signal that passes through the paint to a conductive patch on the tank's bottom. The signal level is in inverse proportion to the level of paint in the reservoir.

Related Applications

Not just paints, but any fluid of any viscosity can be sprayed or manipulated under command of this kind of electropneumatic system. Transfer systems for volatile chemicals, humidifiers for greenhouses, atomizers for lubricants or liquid fertilizers, and rigs for building-painting are among the possibilities.

How Electronics Improved This Application

- Allowed use of compressed air
- Automation
- Adjustable for any paint
- Monitoring and diagnostics
- Standard components

Components Used in Pneumatic Systems*

Actuators
After Coolers
Air Compressors
Air Dryers
Air Line Lubricators
Controls (electronic) and Software
Cylinders
Filters
Filter/Regulators
FRLs
Fittings
Gauges
Grippers
Hose
Manifolds
Motors
Mufflers
Regulators
Rotary Actuators
Seals
Shock Absorbers
Slides
Switches
Tubing
Vacuum Products
Valves

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

*NOTE: This story is not about the robotic system, which by itself is a broad topic, but is only about electropneumatic control of the paint spray elements. Therefore, we will not describe how the robotic system incorporates velocity control of the conveyor which, of course, was required so that the enclosure being painted would move at optimum speed.

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