Ideas & Applications

By **Richard T. Schneider**

Consider the advantages of digital hydraulic valves

Analog hydraulic valves — both servo and proportional — have served industry well for several decades. Of course, for very precise applications, system designers had to learn to make allowances for their limitations. Among them:

● susceptibility to electromagnetic interference and transmission losses over long lengths of cable. Care had to be taken to ensure integrity of low-power analog signals.

● only modest diagnostic and monitoring capabilities. Typically, analog valves provide only an *all or nothing* digital fault signal. With this limited information, tracking down a root-cause problem can be a time-and-money-consuming task.

● inflexibility. Functionality is set at the factory. Analog valves need centralized control-system architecture with a powerful central controller, which must interface with each independent device on the machine.

Today, electronic technology and miniaturization can bypass these limitations of analog valves. At Moog's Industrial Controls Div., we believe that the time for digital valves has arrived. Our experience with this new product platform suggests that the future will focus on configurable, outer-loop motion and pressure closed-loop controls — directly at the valve.

Digital valves' integral microprocessors can close control loops and provide extensive device-monitoring, fault-detection, and communication capabilities. They offer the many benefits of open and decentralized system architecture — from reduced installation and wiring costs to greater functionality, increased flexibility, and simplified valve setup.

Today, sectors of the hydraulics industry are driving towards open-architecture components. Open architecture calls for such developments as standardized cables and connectors, clearly defined data-exchange mechanisms, and published device profiles. Open architecture interfaces protect machine builders' investments in the development of digital device communication software.

At the protocol layer, Moog's initial Digital Interface Valve (DIV)

Moog's Digital Interface Valve is based on integral 32-bit, floating-point microprocessor that closes all control loops. Extensive device monitoring and fault detection are built in. Valve supports CANbus interface, one analog input, and one analog output.
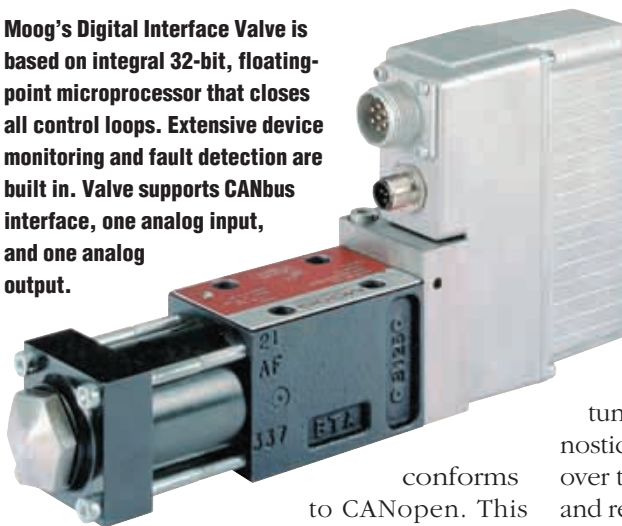
conforms to CANopen. This standard clearly defines the data-exchange mechanism so that the inter-operability between conforming devices is guaranteed. At the application layer, the DIV complies with the Proportional Valve Device Profile (first proposed by the VDMA organization of Germany). This standard specifies the functionality of all devices of the same family. Detailed knowledge of the fieldbus is unnecessary with a human/machine interface in place, so system designers can focus on the application.

The DIV fits well into both centralized and decentralized systems. One benefit of decentralized architecture is that serial wiring to each component replaces parallel wiring. Serial wiring reduces installation and connection costs. It also enhances flexibility because systems can be changed or extended easily. Tasks of subsystems are assigned to local devices, reducing the complexity and required processing power of the main controller.

The DIV's embedded digital microprocessor is the foundation for enhanced functionality and flexibility (as compared with its analog counterparts). Configurable valve functions enable users to define the valve's dynamic behavior and adapt its characteristics to particular application requirements. Field-programmable functions include four-quadrant demand ramp conditioning, dead band compensation, demand limits, direction dependent gains, and access to valve tuning parameters. Detailed diagnostic status information, available over the digital bus, improves safety and reliability and simplifies maintenance. This information includes programmable control deviation monitoring, vendor name, model numbers and the like. Elimination of external analog demand conditioning boards and simplified P/Q valve setup save cost.

Daniel Halloran, head of the Controls and Electronics Section at Moog's Industrial Controls Div., provided this discussion. Contact Moog at 800 / 272-6664 or visit www.moog.com/industrial.