

Multi-Protocol Gateway Solves Automotive Stamping Machine Upgrade Communication Issues

An automotive manufacturer has a number of outer body parts stamping and forming machines, controlled primarily by an Allen-Bradley PLC-5/80. A machine upgrade was required, due to new OSHA safety regulations and the desire to enhance the machine performance. Due to the complexity of the machine, the PLC-5 is near its limits in I/O capacity. The PLC-5 also has existing connections to other PLC-5's via Data Highway Plus, serial HMI communications, and 22 remote I/O racks on multiple channels. An obsolete Ethernet sidecar module provided communications to an obsolete Mitsubishi PLC Ethernet interface module.

The new design required the addition of a number of Siemens Safety PLC's, providing a non-obsolete ethernet connection to the Mitsubishi PLC, and implementing a high-speed serial interface to an upgraded OmniLink Press Controller. It was decided that replacing the PLC-5 was beyond the scope of this upgrade. So, the design team evaluated and tested a number of protocol gateway solutions. Many of the gateway products supported only 2 protocols at a time or had limited data capacity, which would mean that multiple gateways would be required for a complete application solution. They also found that most of the tested gateways' communication rate throughput could not meet their requirements.

The team was extremely pleased to find that a single SoftPLC Smart Gateway provided a way to interface all the different vendor products and protocols, without data limitations and at the communication speeds required. The Smart Gateway includes as standard an embedded 4-port Ethernet switch/router and 6 serial ports. Serial and Ethernet protocols can be configured through software. For this application, the Smart Gateway provides the following communications:

- ModbusTCP to/from Mitsubishi PLC, HMI and Siemens safety PLC's
- Modbus serial to/from Press Controller for low priority data (*120 words read, 1 word write*)
- Custom serial from Press Controller for the high speed data (*12 words read*)
- A-B RIO (remote I/O) Slave to PLC-5

Another challenge in this application was the lack of available I/O memory and communication limits of the PLC-5. All of the Gateway data needed to be available to the PLC-5, some of it critical data that would need to be acted upon by the PLC-5 logic within a single program scan. Peer-to-Peer messaging to a PLC-5 (*which is supported by the Smart Gateway*) was not an option as it would have been too slow. Remote I/O was the other option. However, using Block Transfers would also have been too slow, due to limitations of the A-B RIO protocol.

So the Smart Gateway was configured to look like digital I/O to the PLC-5 - but since there were only 2 available I/O rack memory areas available, a scheme to multiplex the sending of the data was developed. In the Smart Gateway, ladder logic is used to packetize the incoming data from the Mitsubishi PLC and Press Controller into "payloads" of data to be sent to the PLC-5 over a series of I/O scans, with the critical data being sent every scan. The throughput between the Smart Gateway and the PLC-5 for all 10 payloads is under 2 seconds, even despite the slow speed of the heavily loaded PLC-5. On systems where the PLC-5 had more I/O memory available, the Safety PLC data was brought into the Smart Gateway via ModbusTCP. For this application, the Safety PLC's communicated via the HMI.