Network Appliance Flow Meter Design

Case Study

Background

- Company required new Flow Meter to replace 2 existing products
- Could not use their existing R&D resources

Challenge

- Program Management
- Firmware
- Communications Interfaces
- Web Interface
- Digital Signal Processing
- Maintain conformance to industry standards

Solution

- Linux/PowerPC embedded system design
- Ethernet/SPI/I2C/Serial Port interfaces
- New signal processing and error correction algorithms

"Working with TSE allowed us to leverage projects with very highly experienced technical personnel as our needs require, without having to either train or carry these resources as permanent employees of our relatively small company. In financial terms, this partnership with TSE has shown itself as an excellent investment for us long term. It also allows us to avoid other costs as well, including recruiting and relocation costs while simultaneously accelerating new product release timing."

Spirax/EMCO General Manager

Background:

Spirax's Sarco™/EMCO™ Division has been involved in the steam business for over 75 years and is a worldwide leader in steam measurement and steam distribution. EMCO sought to revitalize their existing industrial flow meter product line with a new and much-advanced series of flow meter products based upon a common high performance Flow Meter Controller. EMCO was not able to launch this project with their existing R&D resources, so they looked for an engineering partner that could design and develop this advanced "next generation" of flow meters.

Challenge:

The principle challenge was in combining 2 products into one: the meter and the flow computer in the same package as the existing meter, while maintaining compatibility with existing industry standards. This integration was sought to save time, tooling costs and recertification resources. Further, the new flow meter needed a simplified user interface, new improved accuracy flow algorithms and a web interface that would allow for new user applications such as data logging. The device also had to maintain compatibility with a variety of vortex and turbine sensor configurations, and required very high "down-hole" reliability in a caustic, heavy-industrial environment. Finally, the meter required reliable remote access using various networking technologies and protocols, and architectures.

Solution:

After the award, TSE formed a multidisciplinary team of hardware and software engineers who defined the architecture, design and layout, as well as the hardware and embedded software requirements.

One major difficulty in the design work was the advanced signal processing and error correction required to achieve highly accurate flow, pressure, temperature and mass measurements. These measurements were required over a very wide dynamic range and over a wide spectrum of liquids and gases having varying properties.

In the end, the TSE team chose an embedded Linux/PowerPC architecture that performed flow calculations in real time using TSE-designed custom drivers and applications. The flow meter included Ethernet/SPI/I2C/Serial Port interfaces and protocols (e.g. Modbus, RS-485, TCPIP/HTTP), which allowed it to communicate I virtually any networked environment. All of this was controlled through a new user-friendly web appliance user interface.

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