Building a safe reliable Burner Management System

Take the guesswork out of burner management design
A new era is dawning for burner management systems (BMS). Thanks to changing and broadening regulatory standards, the door has opened to embrace the Safety-PLC based BMS solution—an approach that not only allows a manufacturing plant to include safety in one complete, integrated automation solution but also reap a multitude of benefits ranging from reduced costs and design time to improved safety and performance.

Responding to the evolving regulatory landscape, vendors have begun making available single-source systems to meet virtually every plant need, from simple basic burner management to high-end equipment. Among them, in particular, is a series of solutions from Siemens Industry intended to help operating personnel monitor, operate, diagnose, and maintain all aspects (startup, steady-states, and shutdown) of plant combustion assets safely and reliably—while achieving compliance with all applicable standards.

So what factors have influenced these developments and brought about the adoption of the Safety-PLC based system? And more importantly, what benefits are these products offering? To better understand this new approach, appreciate more fully its benefits, and see where it might be going, let’s first take a brief look at where it’s been by examining the regulatory history of the BMS.

How did we get here?
Design of a BMS has always required consideration of a variety of standards and regulations. Up until about a decade ago, National Fire Protection Association (NFPA) standards (primarily NFPA 85 and 86) frowned on the use of a Safety PLC-based BMS. Building a compliant system was difficult and complicated. The governing prescriptive-based codes spelled out detailed design practices, but did not explain how to ensure BMS performance. Further, compliance typically meant adding external devices to ensure safety and achieve required diagnostics.

Within the past few years, however, standards and guidelines have emerged embracing a more performance-oriented philosophy. Foremost among them was ANSI/ISA 84.00.01: Functional Safety: Safety Instrumented Systems for the Process Industry Sector, a document from the International Society for Automation (ISA) designed to help facilitate the use of new technologies and ensure their safe application. An outgrowth of that standard is ISA-TR84.00.05-2010—Guidance on the Identification of Safety Instrumented Functions (SIF) in BMS, a recently approved technical report that applies performance-based practices to the BMS and includes guidance on how to identify safety functions within a system. Although the technical report contains only recommendations and has no regulatory power, it effectively explains how to design a safety system by quantifying the performance of the system, risk reduction levels, and device failure rates.
Today, with its recent updates, even NFPA 85:2011—Boiler and Combustion Systems Hazards Code and NFPA 86:2011—Standard for Ovens and Furnaces have moved toward acknowledging the performance-based approach, incorporating at least some of the guidelines of the ISA technical report into the standards. Taken together, these revised standards and practices have facilitated the design of the BMS and enabled the development of a Safety PLC-based BMS that complies with all relevant codes and standards.

The benefits of a Safety-PLC based BMS design
These developments, in large part, have paved the way for the introduction of Safety-PLC based BMS, such as those recently introduced by Siemens Industry. Such systems make use of the added latitude and flexibility of performance-based standards and guidelines to meet the needs of large and small installations alike. Benefits and features of this approach include:

- **Reduced complexity.** The BMS design can be optimally scaled to meet the process. Design is based on a TÜV-certified Safety PLC and related fail-safe I/O (and can include the TÜV-certified burner blocks). Sample configurations give the manufacturer a defined starting point, right from a sample Bill of Material (for e.g. for a single burner, single fuel system) on the hardware side and the basic programming, including templates and sample screens, and providing easy access for modification on the software side. These systems comply with all updated standards and recommendations including NFPA 85 and 86, ANSI/ISA TR84, IEC 61506, and IEC 61511.

- **Improved operations and maintenance.** Availability of a local HMI to provide a combination of operation and maintenance capabilities, such a design also includes extensive diagnostics. Advanced security mechanisms help prevent inadvertent and unauthorized access.

- **Increased safety and availability.** The Safety-PLC based BMS solutions offer up to SIL 3 compliance without the need to add any external diagnostic devices to improve safety or meet performance standards. For larger BMS systems Siemens also offers a DCS type (PCS 7) solution offering flexible redundancy schemes and which also support safety critical communications.

Better technology, best practices
Use of a Safety-PLC based BMS solution offers significant improvements, among them the ability to save weeks of design and programming time. Siemens offers this flexibility that allows the application of the Safety-PLC approach to a near-infinite variety of process safety applications from chemical to petrochemical to oil and gas. They can be used on furnaces, kilns, ovens, boilers, thermal oxidizers, process heaters, among others.

Advanced features include a TÜV-certified BMS block library for those who wish to implement their own BMS program based on conventional function block designs. The logic blocks consider all current, relevant regulatory requirements and compliance standards, easing the certification burden for the designer, who simply assigns parameters to the blocks to achieve desired functionality. All diagnostics are integrated into the integrated display for easy accessibility.

Finally, being able to incorporate a safety PLC for control into the BMS gives the user the flexibility to connect, monitor, and control the BMS using any brand of field sensors. Only the control system needs to be changed out, making a retrofit as cost-effective an option as a new installation. Overall, the the Safety-PLC approach moves BMS design a step into the future by achieving compliance with industry standards in a modular and flexible system. It is an innovative concept that harnesses dynamic, state-of-the-art technology to help users customize their BMS to meet specific requirements and maintain regulatory compliance while reducing life cycle costs—and, most importantly, ensuring safety.