

The background of the entire page is a night-time photograph of an industrial facility, likely a refinery or chemical plant. It features tall distillation columns, complex piping, and various storage tanks, all illuminated by bright artificial lights. Overlaid on this scene is a large, semi-transparent digital interface. This interface displays a process flow diagram with various symbols for pumps, valves, and tanks. It also includes numerical data points, such as '-12345.67' and '-12345.67', and a prominent yellow warning icon of a hand with a flame. In the upper left corner, the Siemens logo is displayed in white text on a dark rectangular background. The overall theme is the integration of industrial operations with digital technology for process safety.

SIEMENS

Ingenuity for life

Maximum Process Safety through Burner Management

[siemens.com/process-safety](https://www.siemens.com/process-safety)

The key requirements for advanced industrial Burner Management Systems (BMS) are to achieve maximum safety, high availability, low maintenance and, seamless integration into the existing regulatory control performed in the DCS or, in functional safety terminology, the Basic Process Control System (BPCS).

Siemens is a key partner with more than 25 years of experience, know-how and commitment in the field of safety instrumented systems and burner management systems.

What is a BMS?

A BMS is an automated safety instrumented system comprising sensors, logic solvers and final control elements. It ensures the safe operation of combustion equipment used in boilers, furnaces, incinerators etc. It is designed for starting, monitoring and shutting down the combustion process in a safe manner.

BMS applications are found in many different processes like power generation, thermal power plants, district heating, pulp and paper, heat treatment, chemical, petrochemical and oil & gas processes, using energy obtained from the combustion of some kind of fuel e.g. natural gas, diesel oil, pulverized coal and heavy fuel oil. Typical applications for the BMS are power boilers, process heaters, thermal oxidisers, heat recovery steam generators, incinerators, furnaces and driers.

How does it work?

BMS safely puts burners and igniters into service, monitors its flame conditions during service, and, if required, removes them in a controlled manner. The BMS monitors and controls the purging of the combustion chamber, the fuel supply, the flame and all the burner field devices.

The BMS not only prevents the startup of burners until certain preconditions, such as successful purging, have been met but also monitors various safety interlocks during the startup and operation ensuring safety by bringing the process in critical situations to a safe state shutting down the burners and informing the operator accordingly.

BMS Challenges

Meeting standard requirements

There are many application specific standards relating to BMS and their applicability is determined by the nature and location of the fired equipment. These application standards are generally prescriptive in nature and examples include US standards such as NFPA 85, NFPA 86, NFPA 87, API 556 and also European standards such as EN 230, EN 298, EN 746, EN 50156 and EN 12952-8.

The BMS is a Safety Instrumented System, based on the definitions included in IEC 61511:2016 because it performs safety instrumented functions as defined in the standard. So, in addition to compliance with the relevant application standards, there is a growing trend for BMS to also adopt the more performance based functional safety standards based on IEC 61508, such as IEC 61511 and ISA S84.

The Siemens Offering

For more than 25 years now, Siemens has been a reliable industrial partner implementing first-class automation and safety solutions in a wide range of sectors offering significant benefits to end users and also to system integrators.

Compliance with Standards

The Siemens SIMATIC family of failsafe PLCs is designed in a way that it can be engineered to comply with the relevant application standards related to BMS. They are certified to IEC 61508:2010 and capable of being used in applications up to SIL 3. Thus the trend towards an increased use of IEC 61511 and ISA S84 SIL concepts in combination with the prescriptive approach can be easily accommodated.



Power generation, thermal power plants, district heating, pulp and paper, heat treatment, chemical, petrochemical and oil & gas processes are using BMS applications



Security

BMS systems help ensure safety and often play a part in critical infrastructure – especially in power generation – so it is particularly important that those systems are adequately protected against security threat.

In order to protect plants containing the SIMATIC PCS 7 process control system, Siemens has developed an extremely effective holistic security concept which links a wide range of security measures that are continuously upgraded. This defense-in-depth concept operates on three levels:

- Plant security prevents unauthorized persons from gaining physical access to critical components
- Network security protects production against unauthorized access from office environments and the Internet
- System integrity prevents unauthorized modifications to process automation

Individual components such as the S7-400 CPUs are hardened against cyberthreats. The Siemens SIMATIC PCS 7 process control system is certified by TÜV Süd conforming to security standards IEC 62443-4-1 and IEC 62443-3-3 and also to IEC 62443-4-1 for the general development process for automation and drive technology products.

Siemens Safety Concepts

Siemens' BMS offering comprises safety certified controllers, bus systems, I/O and instrumentation. With Safety Integrated, Siemens can offer first-class, comprehensive and uniform products and solutions for the process industries and can complement these with lifecycle services for all phases of the safety instrumented system lifecycle.

Flexible Modular Redundancy

With Flexible Modular Redundancy (FMR), Siemens offers an innovative concept for implementing cost-effective, scalable, safety solutions. Optimal hardware fault-tolerance levels can be implemented to meet the exact requirements for the BMS application in terms of both safety and availability.

Advanced HMI

The SIMATIC PCS 7 HMI is user-friendly and helps ensure a safe and secure operation of the BMS. Operators can monitor all aspects of BMS performance and have complete control

through startup, normal operation and shutdown using various views, such as the SIMATIC Safety Matrix Viewer, to supervise and intervene as necessary. Comprehensive alarm handling helps the operator manage unusual situations and the in-built diagnostic capability helps ensure maximum availability.

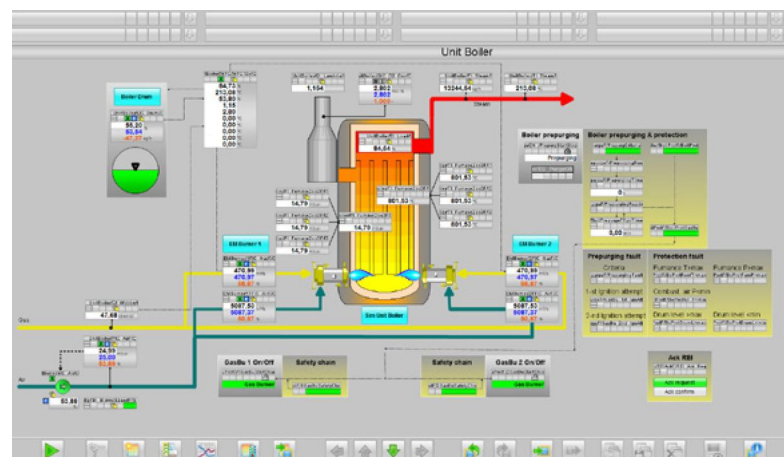
Integrated Control and Safety

The innovative Siemens safety concept allows the user to choose the appropriate level of integration between the BMS and the Basic Process Control System (BPCS). If physical separation of BPCS and BMS is not dictated by the applicable BMS standard then a common architecture, where the functionality of both BPCS and BMS can co-exist in the same controller, may be beneficial. This common approach is now allowable in NFPA 85:2015 (5.4.6 Interlock system) for single burner boilers under certain conditions. This can bring a reduction in space requirements, scope of hardware and wiring, and assembly, installation and engineering overheads and can therefore result in significant cost savings over the entire life-cycle of the plant. This common architecture still achieves the necessary logical separation to meet the requirements of functional safety standards like IEC 61511.

Safety Integrated Fieldbus Technology

The PROFIsafe application profile allows secure safety-related communication between the automation system and the process I/O via both PROFIBUS and PROFINET. PROFIsafe complies with functional safety standards and requirements up to SIL 3.

Example of a burner management system realized with SIMATIC PCS 7



Configuring the BMS application

Library Block approach

Siemens provides the option of a tried and tested BMS application example which is configured using blocks from the TÜV certified F-block library in S7 F systems.

Safety Matrix Approach

As an alternative the SIMATIC Safety Matrix is a TÜV-certified Safety Lifecycle Management tool for safety applications up to SIL 3 in accordance with IEC 61508. SIMATIC Safety Matrix can be used in all phases of the safety lifecycle. If a cause and effects approach is preferred for documenting, programming and monitoring then the Safety Matrix can be used to configure the complete BMS Application or can be used to provide interlocks and trip logic in combination with other tools to handle the sequencing aspect.



The new Safety Controller
for the process industry
CPU 410SIS

Solution Delivery

Where appropriate Siemens can provide a fully engineered solution using in-house expertise and resources but it is also possible to use Solution Partners to meet the growing demand in the area of safety engineering. Our PCS 7 Safety Specialist Solution Partners offer professional services for all relevant safety aspects including:

- Know-how concerning the safety lifecycle of IEC 61511
- Knowledge of safety engineering with S7 F Systems and SIMATIC Safety Matrix
- Comprehensive experience in projects with safety applications in the process industry

Safety Lifecycle Services

With Safety Lifecycle Services, Siemens provides the necessary expertise for safety verification and validation providing tools and methods that exclude systematic errors in all project phases. This is all the more important since errors in an early project phase are often costly and time-consuming to correct at a later date.

The following service modules are available:

- Process Hazard Analysis and safety assessment
- Management, evaluation of “functional safety” and audits
- Configuration and planning of the SLC (Safety Plan)
- Assignment of the safety functions to the protection levels
- Safety Requirement Specification (SRS)
- Verification and validation (e.g. SIL verification, hardware/software audit)
- Modification
- Security in all phases of the lifecycle
- Training

Benefits

Increased Safety and System Availability

- Safety certified equipment for high availability and safety
- Higher system availability achieved without the need for external diagnostic devices
- Easier troubleshooting
- Integrated safety lifecycle tools available
- Flexible redundancy schemes to meet your safety and availability targets

Improved Operations and Maintenance

- Advanced local HMI options provide a safer environment during all operational states
- Greater operational flexibility
- Extensive system diagnostics provide efficient maintenance
- Embedded alarm management
- Reduced maintenance costs
- Consistent start-up and operation
- Integrated historian

Reduced Risk and Complexity

- Scalable to fit all of your fired equipment processes
- Pre-configured BMS engineering templates
- Easier compliance with standards and codes
- Integrated security features

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Security information

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions only form one element of such a concept. For more information about industrial security, please visit <http://siemens.com/industrialsecurity>.