

Background information

Pilz GmbH & Co. KG
Felix-Wankel-Straße 2
73760 Ostfildern,
Germany
Deutschland/Germany
www.pilz.com

Automation technology for sustainably safe and flexible burner installations

Cool hot spot management!

Page 1 of 9

Ostfildern, April 2024 – **Manufacturers of firing and thermal plant and machinery – such as burner, steam boiler and thermoprocessing plants – must take into account a number of legal and normative requirements during the construction and design. Requirements for product and process safety are high.**

Modern burner controls for commercial and industrial gas and oil firing systems monitor and control all functions from ignition of the ignition burner to operation monitoring of the main burner – from pre-purge through to operation of the main burner.

Flame monitoring as a central safety function

Flame monitoring is an essential safety function on an industrial furnace. Where the risks on a machine primarily stem from hazardous movements, on industrial burners the risks are unburned fuel residues in the combustion chamber. These can lead to uncontrolled events and, in the worst case, to deflagrations and explosions. In order to prevent this hazardous situation, flame monitoring is prescribed as a central safety function. It prevents uncontrolled escape of fuel into the combustion chamber: If the safety function does not detect a flame with the fuel valve open, it closes the fuel valve. One of the basic functions of a burner is safely closing the fuel valve within one second after detecting a flame failure.

Special case with “invisible” flame

Generally speaking, optical flame detection principles based on cameras are responsible for the flame detection. This is true for

most fuels, but not for hydrogen: Here the spectrum of the hydrogen flame is markedly different from carbon-based combustion processes: Hydrogen burns with an invisible flame. Pilz has an innovative approach here: Because the goal of all industrial combustion processes is heat generation and every fuel used in exothermic combustion generates process heat, the temperature is used as such for a universal flame detection. The flame detection frequently used industrially, based on the ionisation principle or the so-called rectifier effect, only occurs with the combustion of carbon-based fuels – but not when hydrogen is burned. In future electronic, integrated and safe flame monitoring will be based on simple thermal sensors that can safely monitor this fuel.

Automatic, safe firing equipment management

Efficient solutions safeguard the entire furnace. Burner management systems are used here that are capable of fully automatic and safe control of the complete burner installation operation. Due to the high hazard potential, there are requirements to prevent safety-critical process conditions. Burner controllers must ensure safe flow and monitoring of the firing sequences on gas and oil burners in industrial thermoprocessing plants. Burner controls offer, for example, variable safety times for opening the fuel valves, enable the pre-purge time to be adapted to a freely selectable fan output and boiler room and use two main gas valve outputs to check the tightness in accordance with EN 1643. Their task is to reliably manage the following safety functions in the monitoring sequence: Pressure, temperature and flame monitoring, safe start-up – such as pre-flushing, ignition – and shutdown – for example afterburning or shutting down – of the entire burner installation are included. And naturally also the classic monitoring of the emergency stop chain and additional plant-specific

safety functions. Additional functions that are safely monitored are the fuel-air ratio, the control of valves, flaps and actuators, the starting up and shutting down of valves and the high-temperature plant. Automation also guarantees safe data exchange with the plant control and the visualisation of operating conditions and diagnostic messages.

Safety functions for boiler & co.

A modern control system sends all status and diagnostic data via fieldbuses or industrial Ethernet to other devices and provides these for local or remote display. This monitoring sequence is reflected in all thermal process applications, whether they involve single burners, burner groups or interlinked plants. One requirement is always the same: The automation solution must take care of the safety and automation technology functions while also being convenient and easy to operate. That's why manufacturers like Pilz supply systems which can be adapted to suit the different applications with regard to their complexity and whose hardware and software consider the specific requirements of burner management. This allows all functions along the gas control section as well as all additional plant-specific safety functions to be monitored, controlled and visualised on industrial gas and oil furnaces.

Safety all inclusive for thermal process applications

With simple thermoprocessing plants and those not extensively interlinked, safe small controllers are responsible for monitoring. The base unit PNOZ m B1 Burner of the configurable small controller PNOZmulti 2 from Pilz as a safety controller can not only monitor and control the burner itself with its safety functions, but

also the entire plant. The main advantage is that in addition to the complete burner safety, the machinery safety tasks can also be implemented with one system. Using predefined and certified function blocks, monitoring can be very easily adapted to the various burner applications: For example, master or slave burners, direct or indirect ignition, low or high-temperature mode. The controller also monitors safety valves of a burner in compliance with the standards – an expansion module has four safe, diverse relay outputs in accordance with EN 50156-1. Complex safety applications can also be implemented with this system – up to 12 burners can be monitored with one base unit. Diagnostics is integrated, the system itself can be connected in a wide range of automation environments via a number of communication systems.

Controllers from automation for burner management

Wherever long furnaces with dozens of burners are customary, such as in the metal, glass and ceramics industry, individual devices and small controllers reach their limits. These plants require a large number of inputs and outputs, which are spread over large physical areas. Control systems such as PSSuniversal PLC from the automation system PSS 4000 from Pilz, for example, enable safe management of all existing burners in one application. At the same time, there are complex interlinked plants in which control systems with the appropriate software for the burner management are responsible for the safety of the plant.

Diagnostics is integrated: It can be used, for example, to display the status of the burner. Because burners run through various sequences when starting up and shutting down, whereby certain conditions must be met, the visualisation must make sure that the operating personnel can read off the status at a glance at a local

display or HMI. The additional graphical display of the flame parameters for all burners in a plant, as well as a display of the sensor data in the plant display, are part of the expanded diagnostics scope. In particular with industrial plants that are very spread out, detailed on-site diagnostics and remote access to the diagnostic data are required to enable a faster response if there is an error state somewhere in the overall system.

Software blocks for burners as the heart of the solution

All safety functions relevant for burner management are available in approved and encapsulated blocks via software. The existing process signals and the input/output modules decide how many monitoring and control functions can ultimately be used. The function blocks can also be used several times within the hardware limits and thus offer completely new opportunities for optimisation of the plant – beyond the individual burners for interconnected burners or even for the entire plant.

The base unit “Burner” from the small controller PNOZmulti 2 offers up to 12 burner function blocks – several burners can thus be monitored with one device. This software block emulates the advanced functionality of an electronic automatic burner control system with flexible configuration. It is available for configuration of the base unit PNOZ m B1 Burner and is certified in accordance with the corresponding European standards, including in accordance with EN 298 and EN 50156, and for the highest safety requirements.

The software in control systems such as PAS4000 in the automation system PSS 4000, on the other hand, can be characterised by its hardware-independent programming. This software can implement projects more efficiently and display particular advantages with regard to the modularisation of plant and machinery. This software can be used to configure function blocks that emulate specific application scenarios of a burner application. And with the burner management software package, programs for controlling various burner types can be implemented, while at the same time plant-side safety functions such as safety gates, emergency stops and access permissions can be monitored. As the function blocks for burner

management are TÜV-certified, they enable simple use and validation.

Burner control must comply with current standards

There have only been EU directives for furnaces since 2004. Up to that point, national standards applied that were only established at the European level little by little. For example, industrial thermoprocessing equipment is classified as machinery under the Machinery Directive, falling under the scope of EN 746 as the standard for “industrial thermoprocessing equipment”. Furnaces do not belong under industrial thermoprocessing equipment, nor are they used to heat process liquids and gases in the chemical industry, so they fall under the scope of the European standard EN 50156-1 as the general standard for electrical equipment.

For Europe, as well as for export to countries outside of Europe, the design of the burner controls must correspond to the following standards in accordance with the safety classification by TÜV: The international standard EN IEC 62061, the specific burner management standard EN 50156, which is based on EN IEC 62061, or the familiar European engineering standard EN ISO 13849. PNOZmulti 2 Burner, for example, has TÜV certification in accordance with the European standards EN 298, EN 50156-1 and EN 50156-2.

International certifications for global use

For burner installations, there are also a number of international standards around the world that apply for thermal processes, steam boiler plants, automatic burner control systems and burners that

must be met. Underwriters Laboratories (UL) 60730-1 and UL 60730-2-5 valid in the USA and Canada deal with automatic burner controls which are used for automatic control of burners with oil, gas, coal or other flammable substances. In addition, UL 60730-1 and UL 60730-2-5 specify how automatic burner controls should be used for automatic control of burners with oil, gas, coal or other flammable substances. The requirements in accordance with the US National Fire Protection Association (NFPA) also apply: For NFPA 85, NFPA 86 and NFPA 87. NFPA 85 focuses on increasing the operational safety of boilers, NFPA 86 on minimising fire and explosion hazards on ovens, and NFPA 87 provides safety guidance for fluid heaters and related equipment. In Australia as well, the Australian Gas Association (AGA) and in particular the standard EN 298-2012 are relevant for certification of burner management systems.

Burner control systems that have UL or other common international certifications allow companies or users access to these markets. This benefits users on site, as it allows faster commissioning of firing plants.

Automation provides support on various levels

Automation lightens the load of users in burner management: Changes to the safety functions on a freely programmable safety controller can be performed completely independently and with the lowest possible effort. External support, namely from the controller manufacturer, is not necessary. The user is also aided with regard to safety: The correct safety-related function of the devices is the clear responsibility of the manufacturer. Plus: Users in the world of burner management always receive clear and easily understandable implementation steps and are aware of their own responsibilities:

The safety manuals provide clear instructions. The documentation on the device is also always part of the safety-related approval. With this, the manufacturer and the certifying body do the groundwork and work together to ensure that the user is operating a burner application that is safe all round.

Burner management systems can thus ensure safe and productive processes in various industries: in metalworking as well as in the food and confectionery industry, in sugar cane or ethyl alcohol production, in the paper industry or the automotive sector.

Especially also for petrochemicals or gas processing, in these times it is all the more important not to waste energy, nor for it to present any further hazard – and safe automation with its specific solutions can do its part here.

((Characters: 14,256))

Pilz – The Spirit of Safety

Pilz is a global supplier of products, systems and services for automation technology. As a pioneer of safe automation, Pilz creates safety for human, machine and environment. Founded in 1948, today the family business with its head office in Ostfildern is represented worldwide with 2500 employees in 42 subsidiaries and branches.

The technology leader offers complete automation solutions for Safety and Industrial Security on the machine. These include sensor, control and drive technology – as well as systems for industrial communication, diagnostics and visualisation. An international range of services with consulting, engineering and training completes the portfolio. Pilz solutions are used in many industries beyond mechanical engineering, such as intralogistics, packaging, railway technology, or the robotics sector for example.

www.pilz.com



THE SPIRIT OF SAFETY

Page 10 of 10

Press contact:

Martin Kurth

Corporate and Technical
Press
Tel.: +49 711 3409-158
m.kurth@pilz.de

Sabine Karrer

Technical and Corporate
Press
Tel.: +49 711 3409-7009
s.skaletz-karrer@pilz.de

Eva Rößle

Technical Press
Tel.: +49 711 3409-7147
e.roessle@pilz.de

**Hansjörg Sperling-
Wohlgemuth**

Conference and
Presentation
Management
Tel.: +49 711 3409-239
h.sperling@pilz.de