

**DOLD**



## Safety in fire-clay production



User Article :  
SAFEMASTER STS, SAFEMASTER W

Work safety plays a major role in practically all industries. The example of the Kandern Feuerfest GmbH shows how the safeguarding of work areas can be easily realized even in rough ambient conditions. A safety switch and key transfer system SAFEMASTER STS and a Wireless Safety System SAFEMASTER W provide more safety for the operating staff during the operation, service and maintenance of the plants.

Fire-clay is an artificial fire-resistant material used for the refractory lining of ovens. The raw material for production is a mix of clay, fire-clay already burnt and ground again, and different additives. One of the experts in this field is Kandern Feuerfest GmbH. The company looks back on a long history; refractory fire-clay has been manufactured here since its establishment in 1878. Today, the strength of the medium-sized company with 60 people at the location in Kandern primarily lies in the individual shaping even for small series. The product range includes shaped bricks for tiled stoves, chimneys and baking ovens, sprues for aluminium casting and fire-clay linings for ceramic furnaces in dental labs. The popular pizza stones for ovens or charcoal grills all originate from the plant of Kandern Feuerfest.

### The mix matters

During the production process the material is first extruded, shaped in hydraulic presses and then dried. After the end of the drying process that lasts between five days and three weeks, depending on the size and material of the stone, the fire-clay stones are burnt in big furnaces at temperatures between 1,000°C and 1,400°C. Extruding, shaping, drying and burning require a lot of experience and knowhow. The most important step, however, is the preparation of the clay body. The product features desired determine the mixing ratio of the components: ground fire-clay, clay, further additives, and water. The raw materials are automatically weighed from silos and after mixing transported into the so-called soaking house by a conveyor belt. Here, the material is stored for up to three weeks. This ageing process is also decisive for the product quality. Inside the soaking house a compact wheel loader transports the material from the input bay at the end of the conveyor belt into one of the three mass boxes where it is stored until processed.



A compact wheel loader conveys the material for the extrusion press through the material drop into the extruder.



Closeable floor opening with the dimensions 60 cm x 40 cm for material drop.

After ageing the wheel loader transports the material to a material drop - a closable floor opening with a size of 60 cm x 40 cm. On the level below the soaking house and directly under the opening the material is extruded. "Two years ago, an analysis of the potential hazards in this area, i.e. a risk assessment, has shown that we definitely have to realize a safeguard here", explains the master electrician Frank Szczurek who has been with Kandern Feuerfest for more than 25 years. The occupational safety specialist is also responsible for the complete measuring and control technology.

## Safeguarding of doors and material drop

In principle, there are two potential hazards for the employees in the soaking house. On the one hand, the wheel loader manoeuvring in the relatively narrow soaking house entails the risk of colliding with other employees. The second hazard is the open material drop as the opening in the floor is so large that a person can fall through. "As only the driver of the wheel loader has to be in this area we could simply eliminate the first hazard by safeguarding the room", explains F. Szczurek. In principle, however, the driver of the wheel loader is also in danger of falling through the material drop. The safeguarding is more complicated to realize here. "When it comes to safety it always gets complex", F. Szczurek knows. Thus, all in all it took two years to put a working solution into operation. The long period is also owed to the fact that all modifications had to be realized during ongoing operation.



Frank Szczurek demonstriert die Funktion der Türverriegelung.



Erst wenn alle Türen verriegelt sind, kann der Bediener den STS-Schlüssel mit dem Zündschlüssel entnehmen.

In the area of safety technology F. Szczurek opted for a system by Dold & Söhne. The latter also meets the required performance level e for safety components. The five sliding doors, four of which lead to the soaking house, are secured by the safety switch and key transfer system SAFEMASTER STS. The system combines the advantages of safety switch, guard lock, key transfer and command function and can be extended in a modular way. The keys can only be taken from the interlock of the sliding doors when these are securely locked. As this function is purely mechanical no additional electric installation is required at these places. The stainless steel components are very robust and thus an ideal solution for the rough ambient conditions in the soaking house. The driver has to insert the four keys into a further STS-system mounted at the wall. The electrically monitored locking ZRH at the fifth gate only releases the fifth key when the door is properly locked and the safety-PLC sends a release signal to the ZRH locking. The released fifth key can then be inserted into the STS-system at the wall. Only when all five STS keys are inserted a sixth STS key with the mechanically connected ignition key of the wheel loader can be taken out. In this way it is ensured that the wheel loader can only start operation when each access is locked. "Thus, we could perfectly prevent the danger to persons by colliding with the wheel loader", F. Szczurek states.

### Connection to the safety-PLC according to Performance Level e

The safeguarding of the area does not prevent the danger to the driver of the wheel loader. The material drop can be locked by a pneumatically activated flap. This flap is open while material is filled into the extruder. As the employee has to be in this area during the operation he or she might inadvertently fall through the material drop. "To integrate the flap control we also used a product from Dold", states F. Szczurek. For this purpose, the wheel loader had to be modified. A seat switch detects reliably that the driver actually sits in the wheel loader.



The connection to the safety-PLC accommodated in the control cabinet on the lower level next to the extruder is made via the stationary radio controlled safety module UH 6900. Furthermore, a mobile radio hand transmitter RE 5910 for the radio emergency stop safety module BI5910 is used. It has four additional freely configurable buttons for control tasks. F. Szczurek explains: "We implemented a configuration that requests the driver to press one of the buttons to open or close the flap once he sits in the wheel loader". This means that the pneumatically activated flap only opens when the operator sits in the wheel loader and additionally confirms this by pressing the button of the radio hand transmitter. The flap closes if the operator presses the "close button" of the radio hand transmitter. The flap also closes in case of a triggered emergency stop, a power failure or the emergency opening of the fifth sliding gate. The modularity of the STS-system makes the connection between the safeguarding of the access and the safety-PLC very simple. For this purpose, the additional locking unit ZRH was installed: its key can only be removed if activated via the safety-PLC. This ensures that the system can only be operated when all doors are locked, the driver sits on the wheel loader and the safety requirements have been fulfilled via the safety-PLC. Initially, F. Szczurek had to struggle with problems during installation: "The radio coverage by both radio modules within the angled architecture was a real challenge. Furthermore, the control cabinet with the radio modules and the antennae are not on the same level, requiring antenna extension lines. We tried out several antenna configurations before achieving a reliable connection. Furthermore, an area delimitation was realized by means of the hand transmitter for the emergency stop module BI 5910 . As it has to be worn at a belt on the body the flap immediately closes if the employee leaves the area."



Der Bediener bestätigt auf dem Handsender das Öffnen der Klappe des Massenabwurfs.



Die Sicherheits-Funkmodule von Dold sind im Schaltschrank in der unteren Etage bei der Strangpressanlage untergebracht.

## Tested safety

Both SAFEMASTER STS and SAFEMASTER W are type tested and suitable for use in safety applications up to cat. 4/ PL e acc. DIN EN ISO 13849-1. "Naturally, this helps us a lot when the total system is checked by the TÜV [Technical Inspection Authority] and approved by the Berufsgenossenschaft [Employer's Liability Insurance Association]", F. Szczurek points out the major advantage. During inspection the certification for each component used is checked. Now that the complete installation is finished the system has been running faultlessly for a couple of weeks. "First, we had to make clear to our employees that the emergency release at the fifth sliding gate to open the doors from outside are only meant for real emergencies", F. Szczurek explains with a smile: "But after the phase of familiarization it is going well now". All in all, the master electrician is highly satisfied with the project: "The systems from Dold have made a major contribution to significantly increase the work safety in this area."