For complex projects, you can rely on us.

Extraordinary challenges have always been our driving force. We’ve got what it takes to meet tough requirements, which is why we’re the world’s number 1 manufacturer of lime kilns. Our customers’ demanding requirements motivate us to always go the extra mile. It’s all about passion for our work. www.maerz.com
UNICALCE S.P.A., ITALY

Unicalce S.p.A. signed a contract with Maerz for the supply of an additional wood dust firing system to be installed on its existing 400 tpd natural gas fired R2P Maerz PFR Lime Kiln at the Narni plant. Within the scope of this contract Maerz will supply engineering, license, know-how, equipment and technical assistance during erection and commissioning of the new firing plant.

The kiln will be operated using either a mix of wood dust and natural gas, or petcoke and natural gas, or 100 % of any of the three mentioned fuels, producing between 380 and 400 tons of lime per day. The new firing system is scheduled for commissioning by the end of this year.

CALERAS BERTRAN S.A DE C.V., MEXICO

Caleras Bertrán S.A de C.V. signed a contract with Maerz for the supply of design, engineering, key equipment and technical assistance during erection and commissioning of a R4S type Maerz Parallel Flow Regenerative Lime Kiln. The kiln will be fired with natural gas, producing 600 tons of lime per day with a limestone grading of 50 to 100 mm or 450 tons of lime per day with a limestone grading of 25 to 50 mm.

Kiln operation is planned to start in the middle of 2016.

CHEMEMAN CO., LTD., THAILAND

Chememan Co., Ltd. signed two contracts with Maerz for the supply of design, engineering, key equipment as well as technical assistance during erection and commissioning of two Maerz Lime Kilns at their Saraburi lime plant. Contract no. 1 refers to a Maerz E5 type PFR Lime Kiln, contract no. 2 to a Maerz H4 type HPS Lime Kiln for hard burnt lime.

The E5 type kiln will be operated using coal dust or lignite dust as fuels and will produce max. 300 tons of lime per day, processing limestone with a grading of 40 to 80 mm. Alternatively, the kiln can be oper-
ated with limestone gradings of 20 to 40 mm, 20 to 80 mm or 60 to 120 mm, thereby slightly reducing the daily production capacity.

The H4 type kiln will be operated using lignite or coal dust and will produce 200 tons of lime per day with a limestone grading of 20 to 40 mm.

Both kilns are scheduled to go into operation by the middle of 2016.

**CALTEK S.A.S., COLOMBIA**

Caltek S.A.S., a member of the Mexican market leader in the lime industry, Grupo CALIDRA, signed a contract with Maerz for the supply of design, engineering, key equipment and technical assistance during erection and commissioning of a Maerz E4 type Parallel Flow Regenerative Lime Kiln. The kiln will be operated using coal dust or wood dust as fuel and will produce 250 tons of lime per day, processing limestone with a grading of 50 to 100 mm.

The kiln will be installed in the surroundings of Medellin, Colombia, as part of a green field project. Commissioning of the new kiln plant is scheduled for the middle of 2016.

**SAUDI LIME INDUSTRIES, SAUDI ARABIA**

SAUDI LIME INDUSTRIES signed a contract with Maerz for the supply of an additional natural gas firing system on its existing 150 tpd Maerz HPS - high performance single shaft - lime kiln. Under this contract Maerz supplies engineering, license, know-how, equipment and technical assistance during erection and commissioning of the new firing plant.

The kiln will eventually be operated using either natural gas or heavy fuel oil as fuel, producing between 120 and 150 tons of lime per day with a limestone grading of 30 to 60 mm. The new firing system is planned to enter into operation in the second half of 2016.

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**ILA GENERAL ASSEMBLY AND INFORMATION EXCHANGE FORUM 2015**

Maerz will participate in the upcoming International Lime Association (ILA) General Assembly and Information Exchange Forum 2015. The Forum will take place from October 7 to 9, 2015, in Istanbul, Turkey at the Hilton Istanbul Bosphorus & Convention Centre.

Maerz will host its own exhibition stand and will be represented by members of the management board, sales, technical and service departments. Maerz will furthermore present a paper on October 8 on “Key Factors to Minimise Emissions from PFR Lime Kilns”.

For more information on the event please visit http://www.internationallime.org/events/
SAFETY FIRST – IT’S THE LAW

INTRODUCTION

Safety of personnel and equipment is receiving increased attention from lime plant operators worldwide. In many countries strict legal regulations ensure an adequate safety standard of equipment and processes, such as the Machinery Directive 2006/42/EG or the standard EN 746-2:2010 regarding “Industrial thermoprocessing equipment – safety requirements for combustion and fuel supply systems” of the European Union.

This paper focuses on the regulatory framework of the European Union. It is well possible, however, to apply similar considerations to the system design of lime kilns to achieve high safety standards independent from the location of the lime plant, e.g. for the US standard NFPA 86. Maerz Ofenbau AG with its more than 600 lime kilns world-wide takes advantage of its rich experience in the design of such systems. We have further developed a method on how to mitigate safety risks, which we would like to share with you in this article.

LEGAL REQUIREMENTS IN THE EUROPEAN UNION

Any equipment being sold or operated within the European Union (including Turkey and Switzerland) has to fully comply with the EU directives. Not adhering to these principles implies a punishable offence before the law. In the event of accidents resulting from non-compliance with the EU directives, the operator’s or supplier’s personnel responsible for such non-compliance may be punished by the relevant courts.

The Machinery Directive 2006/42/EG covers regulations for the essential health and safety requirements for machinery and industrial plant construction. In its Attachment 1, chapter 23, it is stated that “the manufacturer or his authorised representative should also ensure that a risk assessment is
carried out for the machinery which he wishes to place on the market. For this purpose, he should determine which are the essential health and safety requirements applicable to his machinery and in respect of which he must take measures.”

The standard EN 746-2:2010 covering safety requirements for combustion and fuel supply systems for industrial thermoprocessing equipment provides precise instructions for planning thermal processing plants. This standard introduces the concept of Safety Integrity Levels (SIL), which precisely define the type of safeguards (only SIL-certified instruments are permitted) to be applied to measure/monitor critical process parameters with SIL 1 being the lowest class and SIL 4 having the most stringent regulations. EN 746-2:2010 requires SIL 3 as the highest class and NFPA 86 SIL 2. The risk classification foresees class “B” as the top level, which is applied e.g. in nuclear power plants. We will come back to a method on how to determine such risk levels later in this article.

EN 746-2:2010 offers several different ways to supervise functional safety, beginning with the simplest design of hardwired systems using listed components only. Due to the complexity of a lime kiln the optimal hardware configuration for the control system is in accordance with article 5.7.2 c, in which we have underlined the text passages having an immediate impact on the design of our plants:

"PLC based system with a combination of components complying with the relevant product standards as specified in 5.2 to 5.6 and of components complying with defined SIL/PL;

- guarding functions (e.g. gas pressure, temperature) performed by components for which no relevant product standards are existing shall comply at least with SIL 2/PL d;

- functions which will lead to immediate hazard in case of failure (e.g. flame supervision, ratio control) performed by components for which no relevant standards are existing shall comply at least with SIL 3/PL e;

- software for safety functions shall be separate from other functions (e.g. control functions). The software for safety functions shall be designed in accordance with the requirements of EN ISO 13849 or EN 62061:

- a PLC used for safety functions shall comply with EN ISO 13849-1 or EN 62061.”

In addition to the above-mentioned standards various other industrial standards have to be adhered to (such as 94/9/EC Explosion Protection Directive, 97/23/EC Pressure Equipment Directive, etc.) permitting Maerz to issue an EC Declaration of Conformity for the systems supplied.

**METHODOLOGY FOR THE DETERMINATION OF SAFETY REQUIREMENTS IN THE DESIGN PHASE**

Figure 1 gives an overview of the components in the workflow during the execution of a lime kiln project, which have to be considered in order to ensure the conformity with EU directives.

In the design phase Maerz applies various tools to ensure that Maerz kilns are safe to operate and fully comply with local regulations/directives.
When developing a new product or modifying a kiln component, the first step is always a Failure Mode and Effect Analysis (FMEA) according to EN ISO 12100:2011. In this process all possible failures/malfunctions of mechanical or electrical components on the kiln are systematically compiled and their effects on kiln operation/safety are analysed.

Based on this risk analysis in a next step an intensive investigation regarding safety issues is performed. This is done by means of a HAZOP study (Hazard and Operability study) according to IEC 61882. This method was invented in the 1970ies by the chemical industry (ICI in Great Britain) and since then has become a world-wide used and well received tool for such studies. The experts evaluate the operation of the lime kiln with all possible deviations, their causes and consequences.

One may imagine that this is a tedious and time-consuming task which cannot be performed by one single person. Hence Maerz formed cross-functional teams of experts, who create these risk analyses in several well documented team sessions. For each and every lime kiln project executed by Maerz – independent of whether it is located in the European Union or elsewhere – a specific risk analysis is made, as this forms the base for all subsequent design and engineering steps.

The key document of a HAZOP study is a so called risk matrix as shown in Figure 2. On the x-axis the likelihood of an incident is classified in 4 categories with increasing severity as follows:

(1) not expected during plant operational life
(2) once during plant operational life
(3) several times during plant operational life
(4) annual event or more often

The y-axis describes the severity of an incident – also in 4 classes – with increasing impact:

(1) no injuries or health impairments
(2) minor injuries or health impairments
(3) injuries or moderate accident
(4) death or serious accident

The matrix indicates a ranking for each examined risk from (1) lowest risk to (16) highest possible risk. The colour codes indicate the required action:

Green: acceptable shortcomings – no risk mitigation required
Blue: acceptable risk – mitigation has to be sufficiently executed
Orange: undesirable risk – mitigation required within a defined time frame
Red: unacceptable – risk has to be eliminated

In these HAZOP risk evaluation sessions, recommendations on how to mitigate such risks are also discussed and documented. For a lime kiln system several hundred recommendations may result therefrom, which all have to be taken care of during the design and engineering phase of the project. In order to consistently document and track these recommendations Maerz uses a tailor-made database tool.

For all risks in connection with equipment and processes subject to the regulations of EN 746-2:2010 a specific examination is required to determine the Safety Integrity Level (SIL) to be applied to the specific case. The SIL determination according to EN 50156-1 is similar to a HAZOP study: a cross-functional team defines in various sessions the required SIL classification according to the schedule as shown in Figure 3.
The letter codes on the left side of the diagram above represent a decision path to determine the appropriate SIL class as follows:

“C” – severity of disturbance:
- C1 minor injuries
- C2 serious, permanent injuries of one or more persons or a single fatality
- C3 more than one fatality
- C4 several fatalities

“F” – likelihood and duration of a disturbance:
- F1 rare to occasionally
- F2 regularly to permanently

“P” – opportunities to avoid disturbances:
- P1 possible under specific conditions
- P2 nearly possible

“W” – probability of occurrence:
- W1 very low probability
- W2 low probability
- W3 relatively high probability

As normal kiln process control has to be separated from the safety system, all safety functions are implemented in a fully independent Safety Instrumented System (SIS). It is thereby ensured that critical conditions in the course of a process are detected and handled appropriately.

Maerz decided to use one single failsafe PLC for kiln control, implementing the two control layers by software: one for the safety integrated system and one for the basic process control system as shown in Figure 4. All safety relevant signals are transmitted by fail-safe input/output devices, whereas all other signals are transmitted by standard hardware components.

Let’s get more practical now. Figure 5 shows a typical excerpt from a HAZOP/SIL study for the main firing system using natural gas when shutting down the kiln from normal production mode with possibly drastic consequences.
It describes a possible failure in reversal trap operation. After applying the required SIL class (in this case SIL 3) and the recommendations of the HAZOP study, the risk rating is lowered from 12 (entirely unacceptable) to a moderate value of 4.

The ultimate target of both studies and the recommendations/actions derived from these is to completely eliminate occurrences of unacceptable risks as demonstrated in Figure 6.
WHAT HAPPENS DURING COMMISSIONING?

Commissioning is a very important phase in the course of a kiln project. Not only do we ensure that the kiln performs as guaranteed in the contract, in the background we also take care that all safety requirements are met and all safety interlocks are properly checked. Our commissioning engineers verify, revise and adapt the operating and maintenance manuals wherever required.

In addition, they explicitly check and document with the help of checklists the functionality of all safety relevant interlocks. We need your support here to allow us to perform this task. Remember, it’s the law to do so. The main reason, however, is to ensure that you take over a verified and safe kiln plant.

OPERATING AND MAINTAINING THE KILN PLANT

Needless to say, operating and maintaining a lime plant without safe operating and maintenance instructions is irresponsible. The tool to evaluate all possible risks during operation and maintenance is called Job Safety Analysis (JSA). The pattern to determine these risks may sound familiar to you after having learned what happens in the design and engineering phase. Here is a short list of what we do to accomplish this task:

1. prepare a list of typical tasks during operation and maintenance
2. analyse the hazards
3. give recommendations on how to perform a task

The tasks mentioned under item (1) above range from purely mechanical maintenance tasks such as “greasing the skip cables”, or quality control tasks such as “taking lime samples at the discharge tables” to complex maintenance work such as “refractory repair”.

The tools we at Maerz use for the JSA are identical to the tools we use for the HAZOP/SIL analysis. Figure 7 shows an example of the analysis of how to replace a damaged seal on reversal, filter or relief traps. The appropriate measures/recommendations proposed by Maerz mitigate the inherent risk of such work to safe levels.

We want to make sure that your lime kiln plant is safe to operate and have therefore invested a lot of diligence and energy into this task. We also don’t want you to have to worry about safety during kiln operation – it’s inherent in a Maerz kiln. No problem.

Figure 7: Excerpt of a Job Safety Analysis regarding the task of replacing seals on the reversal/filter/relief traps
Maerz Ofenbau’s website has come of age. When we launched our new website back in 2008, we made use of all the then-exciting technologies such as Adobe Flash® to create slick animations and we went really multilingual – offering our website in seven different languages. In retrospect, it was a bit difficult to navigate through the various pages and an important functionality to improve user-friendliness was missing too: the search function. It really was high time to overhaul our internet presentation and we take great pleasure in launching our completely re-designed website under the well-known address www.maerz.com.

Our new design focuses on a smooth and consistent user experience. Nearly the entire website is built up as a single page so that you can get an overview by just scrolling up or down to the desired information. Of course it is well possible to jump to a page section directly from the navigation menu. This one-page-design is specifically comfortable to use on tablets and other portable devices. The new design is also responsive: the layout adapts to the screen size of your device. Naturally, we entirely banned Adobe Flash® and stick to pure HTML5 so that – independent from the operating system and device used – the full experience can be enjoyed.

We tried to focus on the contents that matter: the Maerz lime kiln portfolio and our services. Therefore we deprecated some sections you found on the previous website such as the download page. On the other hand we added some features such as a searchable archive of all previous issues of our Maerz newsletter.

Our new contact section enables you to directly contact the Maerz sales engineer, who is responsible for your country. A clickable map also gives you direct access to the local representatives or sister companies, who take care of the lime industry in their specific country.
We are fully aware that there may still be some flaws or usability issues in the redesigned website. If you miss a language, for example, do not worry as we will have all seven languages (English, German, French, Italian, Spanish, Russian and Chinese) available step by step in the near future. If you miss anything else or detect an error, however, please feel free to drop us a line on info@maerz.com so that we can correct or adapt the site accordingly. Thank you for your support on this.

And now, enjoy scrolling!
CO₂-neutral renewable energy in the form of wood dust for Maerz PFR lime kilns is state of the art. Up to now, however, it was not possible to use wood with larger grain size and higher water content, as the exact distribution to the different burner lances and the pneumatic conveying of such material was very problematic.

With the innovative design of Maerz’s new waste wood firing system it is now possible to use waste wood with a water content of 20% and a grain size of only 50% < 1 mm. Hence the investment costs for the waste wood preparation are significantly reduced because a dryer is no longer required.

The operational costs for the milling of the waste wood are also significantly reduced. Up to now it was necessary to mill 80% of the wood to less than 1 mm. This not only saves electric energy at the wood mill, it also reduces the maintenance costs of the mill.

The innovation of the new Maerz waste wood firing system comprises:

- Flat bottom of the dosing vessel with very short connections to the rotary valves
- Pressurising of the dosing vessel through the bottom section
- Permanent fluidisation of the bottom section during operation
- Aerodynamic design of the rotary valves
- Special agitator inside the dosing vessel to avoid bridging of wood dust above the rotary valves

The 400 tpd MAERZ kiln in Narni is now fired with waste wood only and produces quicklime with a residual CO₂ content of less than 1%.