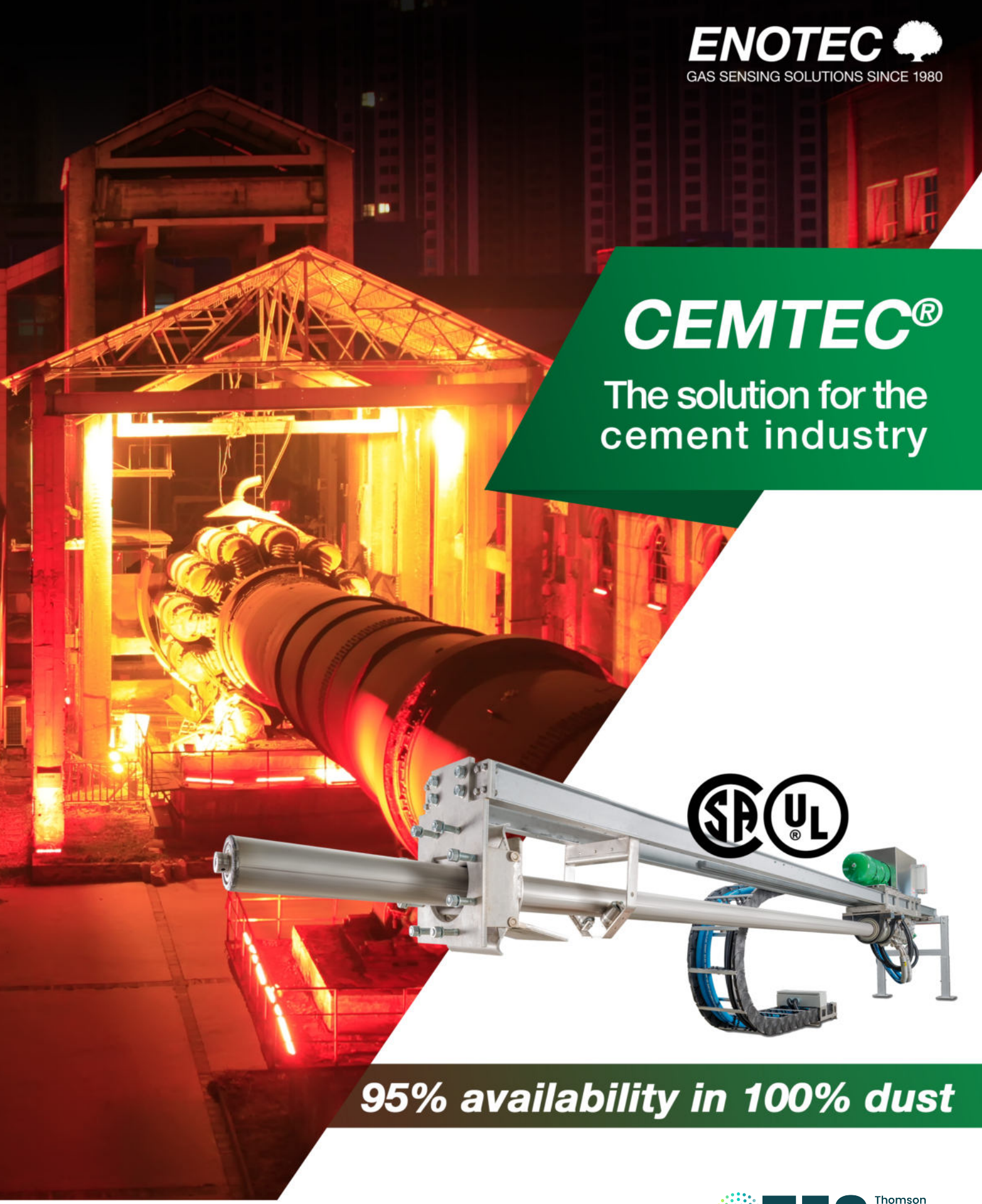
ENOTEC
GAS SENSING SOLUTIONS SINCE 1980

CEMTEC®

The solution for the cement industry



95% availability in 100% dust

TES Thomson Environmental Systems
www.thomsongroup.com.au

- Self-cleaning gas sampling probe
- Continuous measurement 24/7
- Designed for high dust and high temperature applications

CEMTEC has been developed for continuous flue gas analysis in cement kiln inlet chambers and in other extremely dusty high temperature applications.
Increasing the efficiency of pyro-processes and ecological sustainability are global requirements and can be achieved with *CEMTEC*.

Your benefits

- Decreased ammonia consumption due to improved SNCR efficiency
- Reduced fuel consumption due to higher combustion efficiency in the rotary kiln and in the calciner
- Lower emissions due to reduced fuel consumption and continuous emissions monitoring
- Longer preservation of the refractory lining due to lower CO emissions
- Lower maintenance of the cyclone and riser duct due to reduced material build-up
- 95 % availability of measurement data enables continuous process control and monitoring

CEMTEC®:

Solutions for gas analysis in cement plants

For extreme conditions

CEMTEC gas sampling probes are designed for the kind of extreme conditions found in rotary kilns: temperatures of up to 1400 °C, dust concentrations up to 2000 g/m³, highly aggressive, corrosive gases and sticky raw meal.

CEMTEC is correspondingly heavy-duty and features a rotating, water-cooled probe that automatically cleans itself of build-up in cyclic intervals. To measure beyond the kiln seal and to avoid false air measurements, the *CEMTEC* probe can extend up to 3350 mm into the process. Due to the high quality material and design of the probe, it can withstand the harsh conditions in the kiln inlet chamber.

As alternative fuels (RDF) are increasingly being used in cement kilns, controlling the main kiln burner has become ever more difficult. In addition, due to increasingly stringent emission abatement limits for gases such as nitrogen oxides, SNCR spraying systems are becoming indispensable. This potentially presents additional challenges such as ammonia slip and being able to reduce NO_x emissions below limits set by the relevant environmental agencies.

Ensuring a low NO_x combustion while keeping the production of CO low can be achieved using the *CEMTEC* probe system. *CEMTEC* can be operated with 95 % of availability of process measurements, ensuring continuous emission measurements and efficient combustion control.

CEMTEC has continually received design and constructional upgrades, such as to its highly efficient cooling system and to its technically superior self-cleaning and self-monitoring systems.

World-beating performance when it comes to reliability.

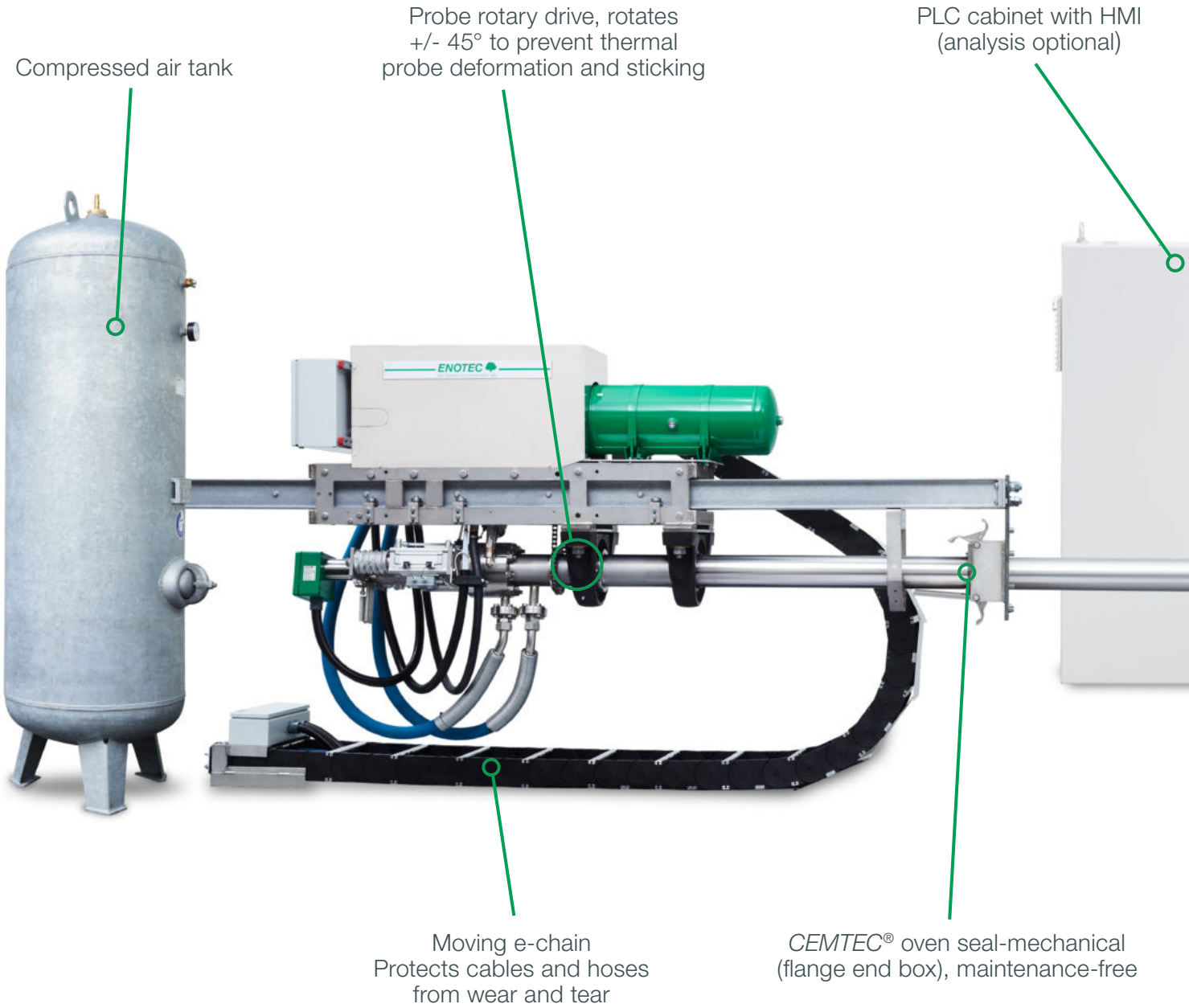
Applications

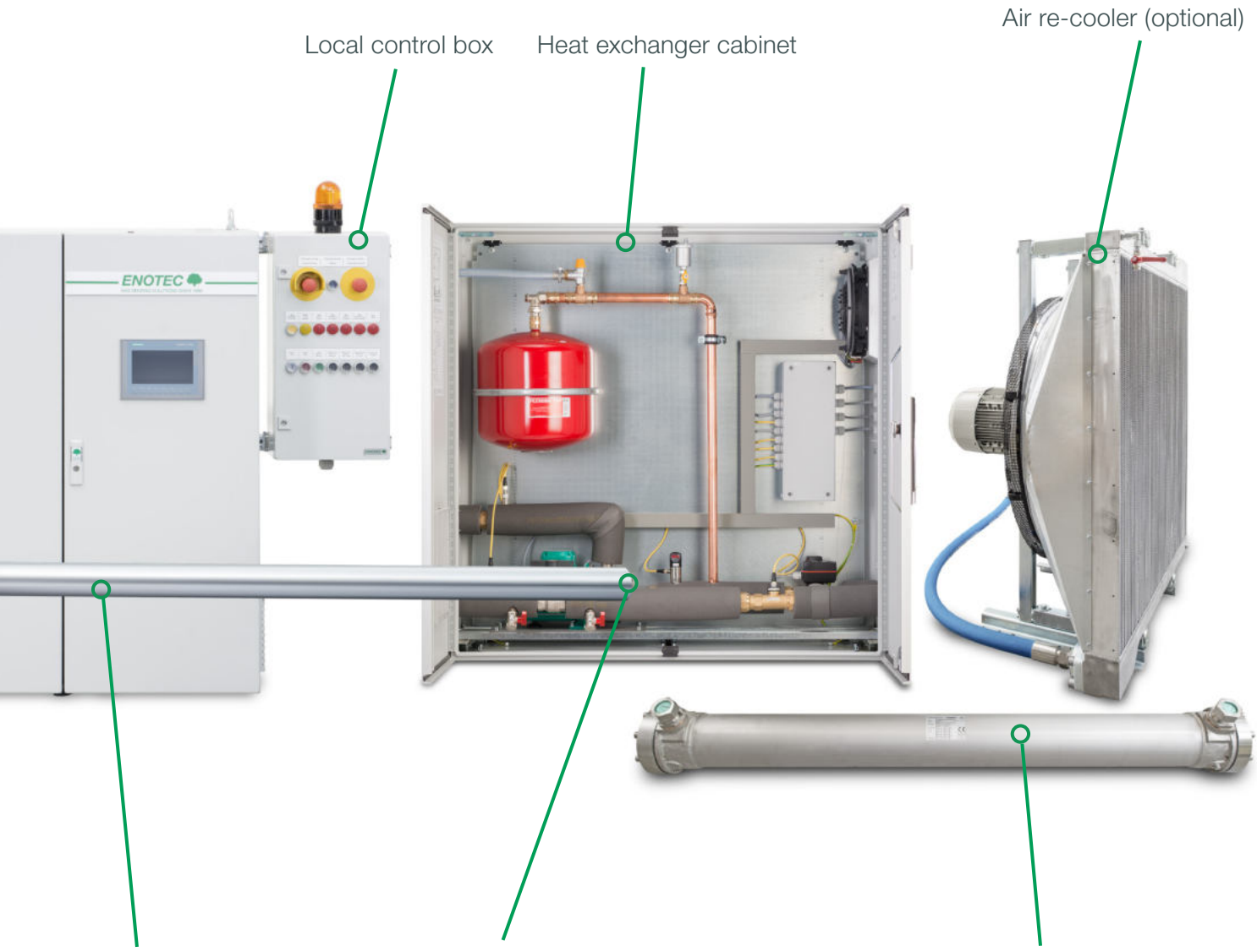
- Cement plants
- Lime kilns
- High temperature processes
- High dust processes

Features

- 95 % availability in 100 % dust
- Swivel drive
- Automatic self-cleaning
- Automatic emergency retraction (pneumatic)
- Air or water heat exchanger
- Emergency retraction

CEMTEC® overview




Local control box
Heat exchanger cabinet
Air re-cooler (optional)
ENOTEC
Water-cooled probe tube
Mechanical probe filter plunger, keeps the flue gas entrance free of blockages
Water re-cooler (optional)

How it works

The patented *CEMTEC* consists of a water-cooled gas sampling probe, which is mounted on a pneumatic propulsion device which enables the probe to be inserted and retracted from the combustion process. The process gas is sucked into the filter unit through the tip of the cooling tube, and then into the centrally positioned heated measuring chamber.

The extractive analyzer is supplied with sample gas through this tube for measurement of e.g. O_2, CO, NO_x and even SO_2.

Composition

- *CEMTEC* gas sampling probe
- Local control box
- PLC cabinet with / without analysis
- Heat exchanger cabinet
- Re-cooler (air or water)
- Compressed air tank

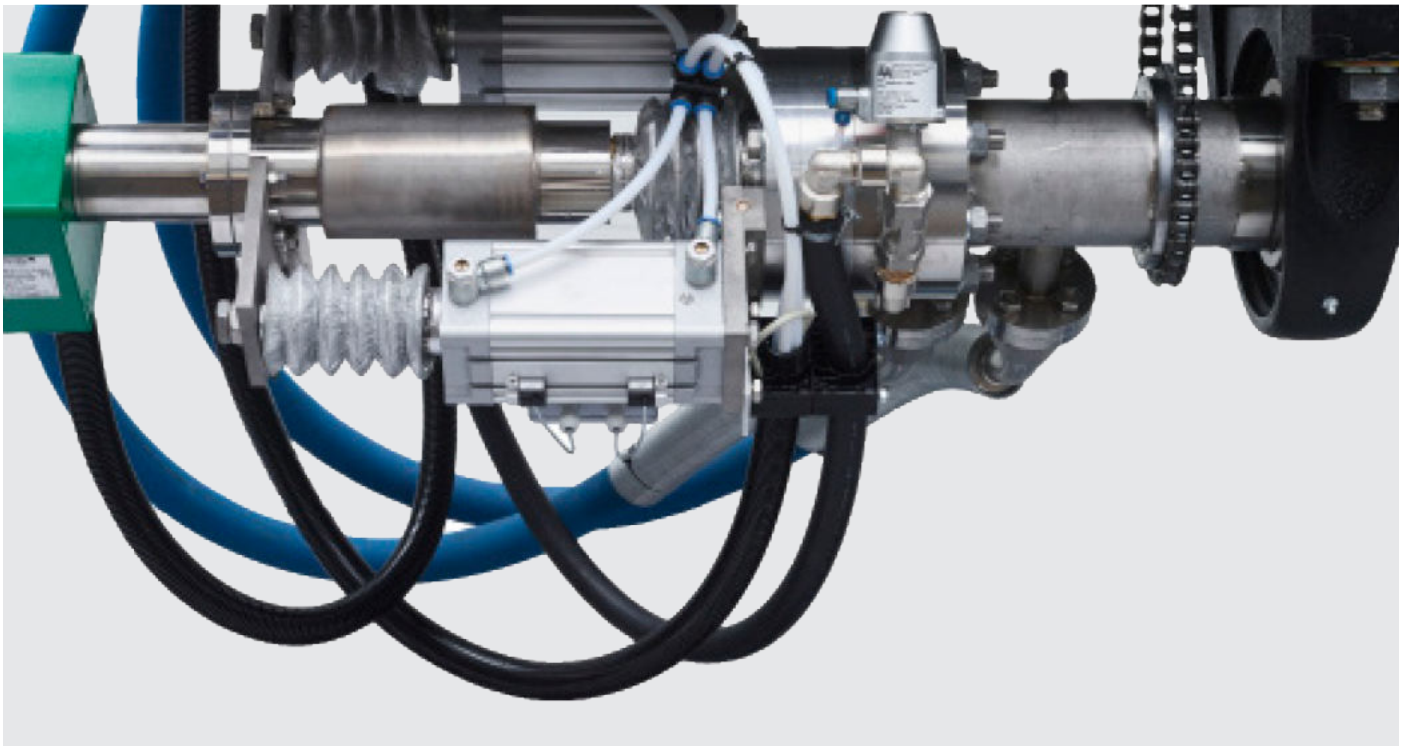


Figure: Pneumatic drives of the CEMTEC® probe.

Self-cleaning system

Process temperatures up to 1400 °C, dust concentrations of up to 2000 g/m³, high mechanical stress due to falling material and ambient temperatures up to 50 °C make extremely high demands on any technology in use.

Thanks to the mechanical cleaning, the continuous extraction and analysis of process gas is possible over a long period of time. The dust filter with its impact plate at the tip is coaxially mounted within the cooling tube and moves in programmable intervals out of the tip of the probe to remove any dust deposits.

The patented *CEMTEC* swivel drive prevents deformation of the probe from falling debris and the cementing of the gas sampling probe by continuously turning within the kiln inlet chamber.

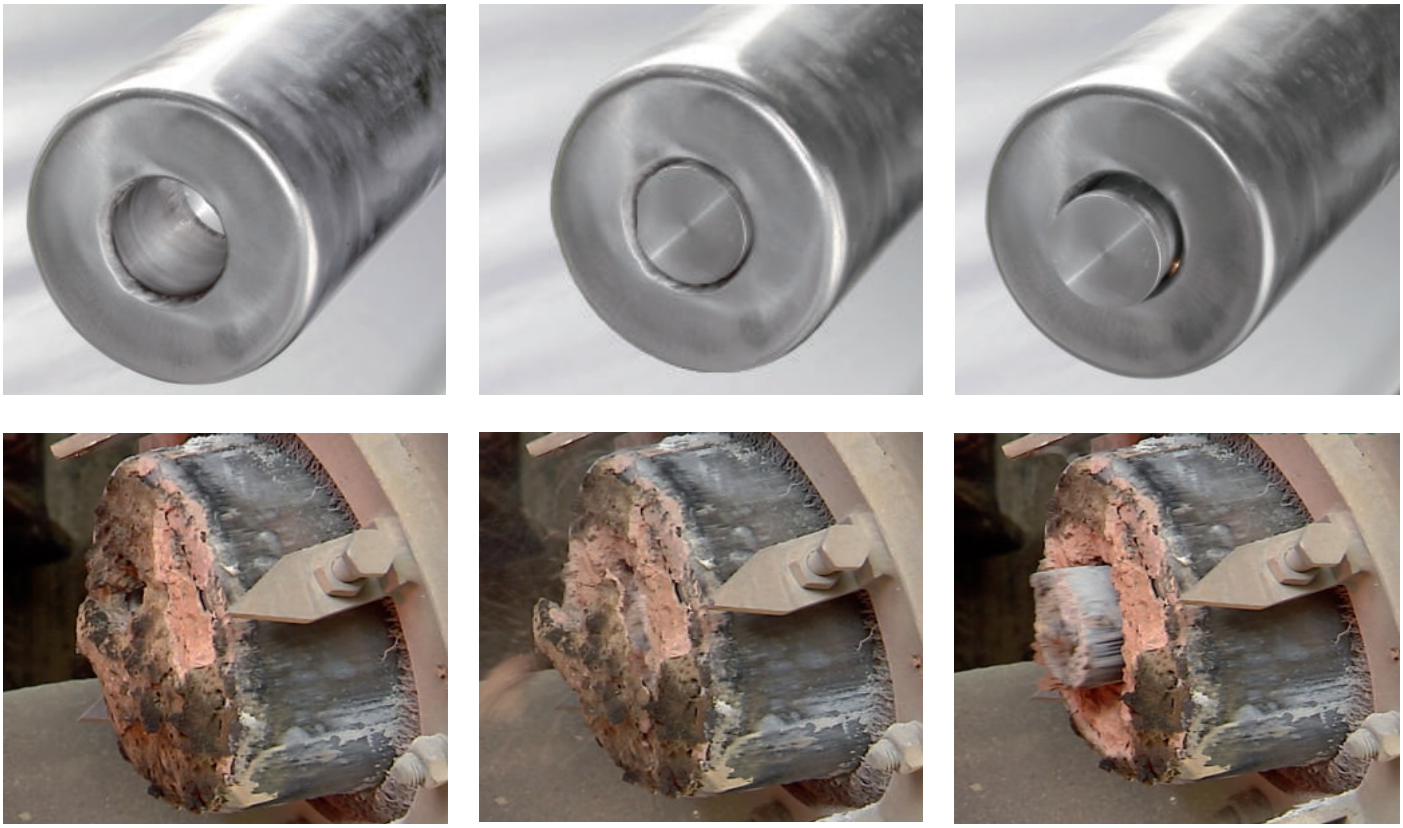


Figure: Automated plunger keeps the flue gas entrance free of blockages.

Permanent process control

CEMTEC was developed for continuous analysis of flue gas in rotary kilns and other pyro-processes with extremely high temperatures and high dust concentrations, with the goal of increasing product quality with a reduced fuel use while simultaneously reducing harmful emissions.

Particularly in view of the increasing usage of alternative fuels in rotary kilns and large combustion chambers, the on-site gas analysis has become more important than ever.

With its exclusive technical highlights, *CEMTEC* provides an optimal solution for permanent measurement under these challenging conditions.

Features

- 95 % availability in 100 % dust
- Continuous fast and reliable measurements in the cement kiln
- Fully automatic probe operation and cleaning
- Achieve emission abatement targets
- Efficient control of SNCR
- Reduce costs with lower maintenance and longer plant life
- Yearly inspection cycle only

Figure: The powerful probe rotation device prevents thermal bending and sticking.

Technical details

Max. flue gas temperature	Max. 1400 °C	**Swivel drive**	+/- 45 °
Max. dust load	Up to 2000 g/m3	**Gas analysis**	Extractive: O_2, CO, NO_x and even SO_2
Probe insertion depth	Up to 3350 mm	**Measuring ranges**	To be defined
Probe diameter	114 mm		
Re-cooler method	Water or air	**Air pressure**	7-9.5 bar quality [5:3:3]
Probe propulsion	Pneumatic	**Emergency retraction**	Pneumatic
		Customer signals	Hardwired and Modbus TCP Profinet incl. others on request

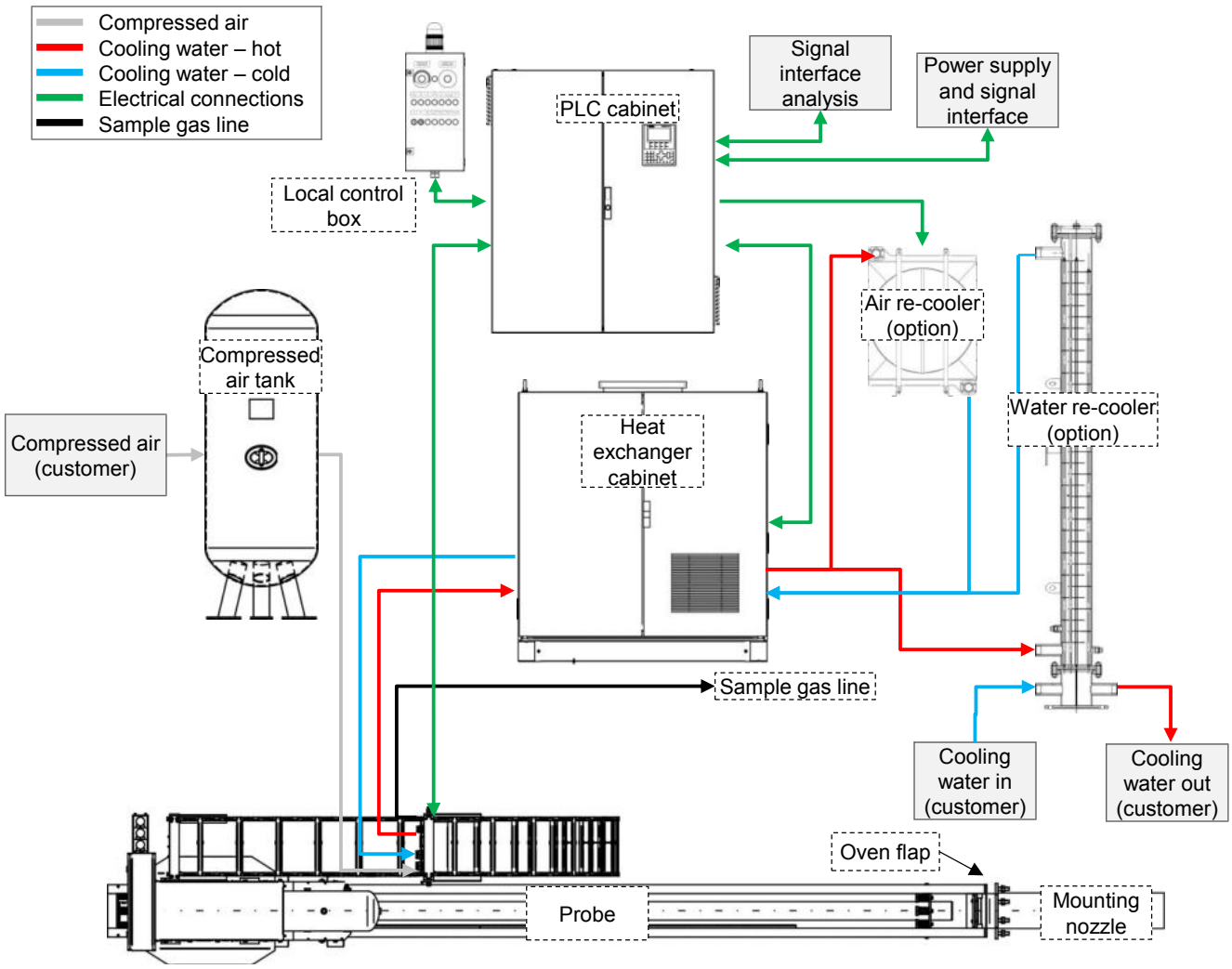


Figure: CEMTEC® system overview.

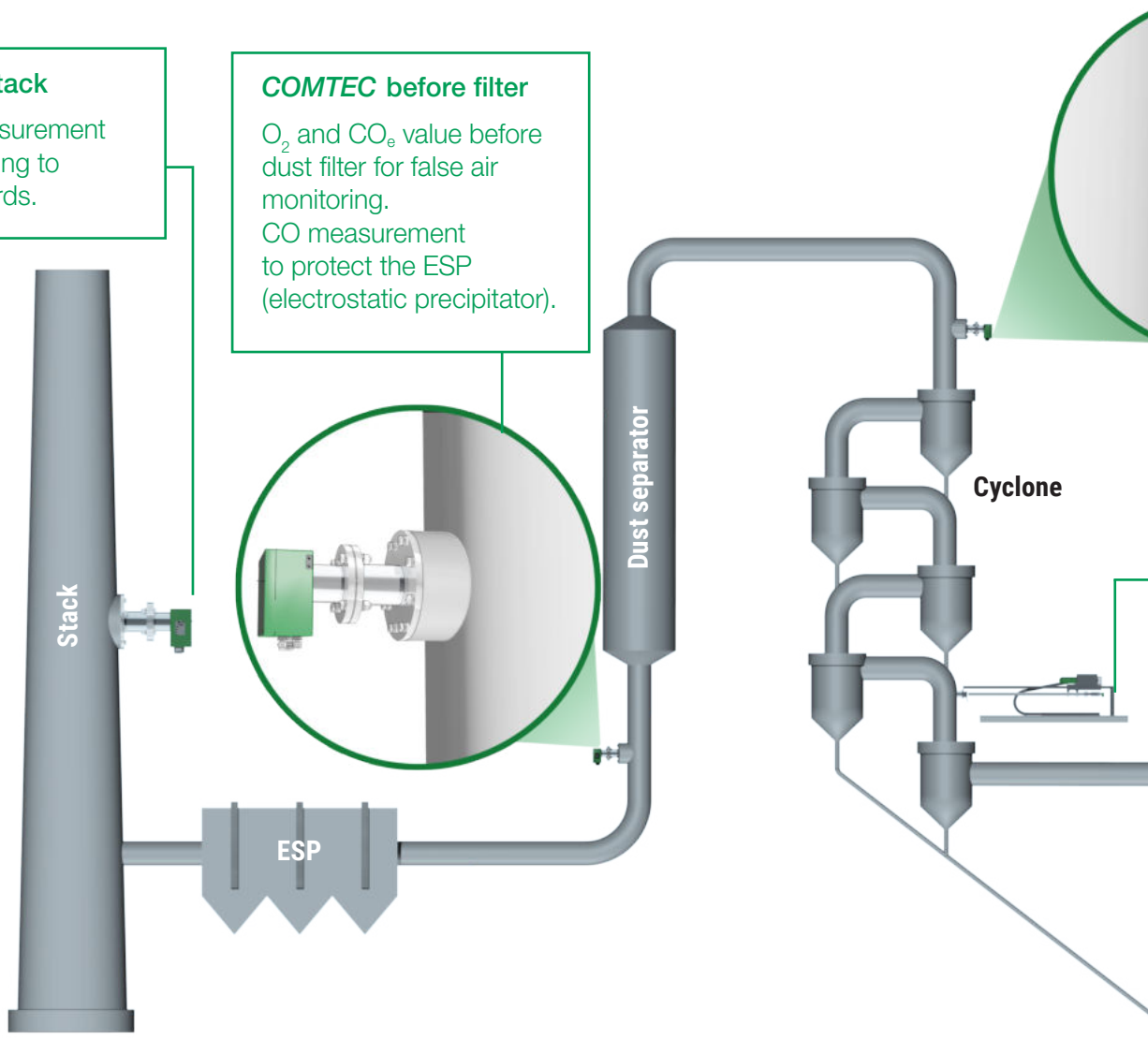
ENOTEC measuring points in a cement plant

OXITEC at the stack

O_2 reference measurement for CEMS according to European standards.

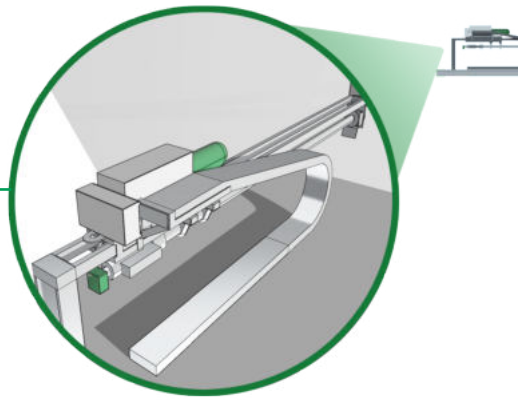
COMTEC before filter

O_2 and CO_e value before dust filter for false air monitoring.
CO measurement to protect the ESP (electrostatic precipitator).



CEMTEC kiln inlet chamber

Gas sampling for process monitoring and control (O_2, CO, NO_x, SO_2).



The process of cement production is characterized mainly by the extreme conditions: Extremely high temperatures and high dust loads.

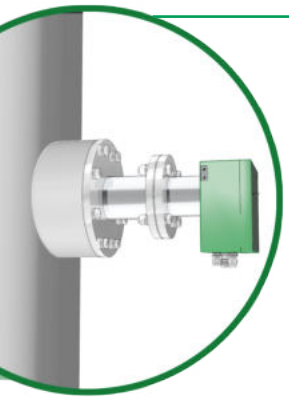
In order to operate the process efficiently and with a minimum of emissions, quick and reliable measurements are essential.

Especially the measurement in the kiln inlet chamber at the end of the rotary kiln is impotant since the excess O_2 content in the flue gas can be measured as close as possible behind the burner (approx. 2000 g/m³ dust).

The water-cooled sampling probe *CEMTEC* is installed at the kiln inlet where sample gas is constantly extracted from the pyro-process of the rotary kiln (availability of measurement of 95 %).

COMTEC after cyclone

Process monitoring and control by measuring the O_2 and CO_e values, as fuel (alternative fuels) can be added at the precalciner.

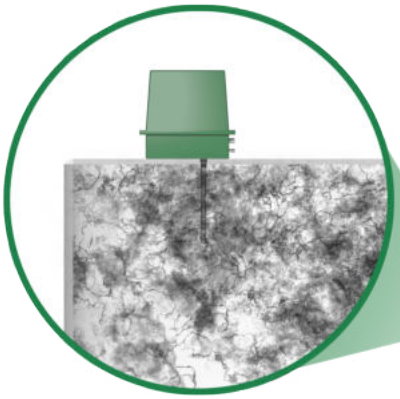


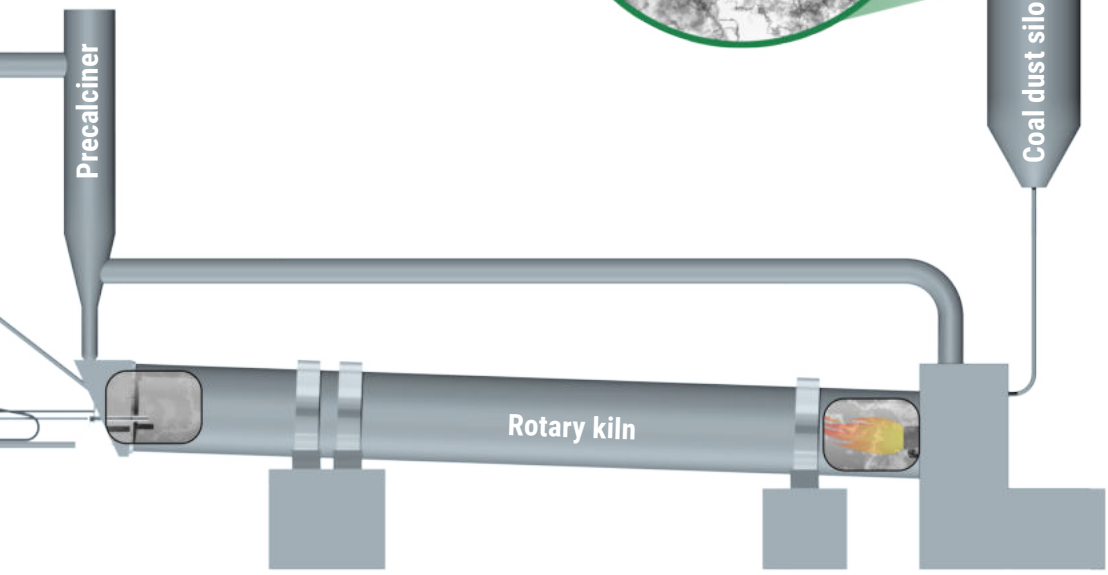
OXITEC / *COMTEC* DustEx in coal grinding plant

Monitoring of inert operation to prevent a spontaneous combustion/ explosion of coal dust. The O_2 value must be kept low to maintain the process inert. The optional CO_e sensor provides added security and reliability (additional information can be found in our Application Note: “Solutions for coal grinding plants”).

CEMTEC behind calciner

Gas sampling for process monitoring and SNCR control (O_2, CO, NO_x and even SO_2). Monitoring and control as further fuel and air are added in the calciner.





SILOTEC in the coal dust silo

Since air is in the silo, there is a constant possibility of smouldering fires, possibly leading to the risk of explosion. If the CO_e value exceeds a limit, an alarm is triggered. The O_2 value determines the inertness of the silo.

Downstream of the precalciner, at somewhat lower temperatures but with similarly high dust loads and higher flue gas velocity, *CEMTEC* is used for measurement.
At the measuring points for thermal fuel preparation, flue gas cleaning and chimney, *OXITEC* 5000 (O_2 InSitu measurement) and *COMTEC* 6000 (O_2/CO_e InSitu measurement), are used in order to obtain reliable and fast measurements for process control and monitoring.

Process stages in the cement plant:

- Rotary kiln: clinker formation (sintering)
- Precalciner: completion of calcination
- Cyclone: drying, preheating and a limited calcination of the raw meal

SILOTEC® 8000, safe analysis in silos

SILOTEC allows fast, reliable and safe analysis of oxygen and carbon monoxide for ATEX Zone 20 in silos.

The measurement of O_2 and CO_e allows a fast detection of smoldering fires and can trigger an inertization. The system is completely maintenance-free and has the necessary IP rating class 65 for easy installation on silo roofs.

The quick InSitu measurement outperforms a slow, maintenance-intensive extractive analyzer system.

Applications

- Coal silos and other potentially explosive dust atmospheres

Features

- Plug-&-Play
- Simultaneous O_2 and CO_e measurement
- Self-monitoring
- ATEX Zone 20 compliant
- Fast responding
- Smoldering fire detection
- SIL2 (1oo1)

COMTEC® 6000, two are better than one

ENOTEC produces precise, reliable and robust O_2 InSItu analyzers (OXITEC) for many different industries since 1980. Although these type of analyzers are also required in a cement plant (e.g. at the stack, as an oxygen measurement for CEMS), we would like to introduce you the next generation of InSItu analyzers for combustion control and security measurement: COMTEC.

The COMTEC product range is unique in the market: Our devices not only measure the oxygen concentration InSitu, but also the CO_e value at the same time. This is the collective name for unburned molecules such as carbon monoxide (CO), methane (CH_4) and hydrogen (H_2). The higher their concentration, the more incomplete (inefficient) the combustion - and the shorter the life expectancy of your facility. If the proportion of unburnt molecules rises, certain risks increase too. This can rapidly lead to deflagrations.

Measuring points

***COMTEC®* 6000**

COMTEC after cyclone

- Process monitoring and control by measuring the O_2 and CO_e values, as fuel (alternative fuels) can be added at the precalciner.

COMTEC before filter

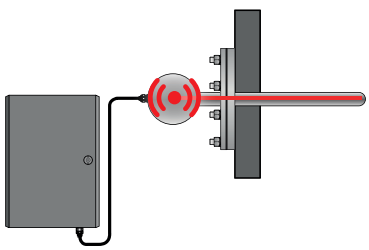
- O_2 and CO_e value before dust filter for false air monitoring.
- CO measurement to protect the ESP (electrostatic precipitator).

COMTEC® 6000 DustEx

OXITEC/COMTEC DustEx in coal grinding plant

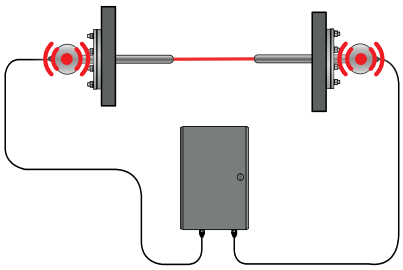
- Monitoring of inert operation to prevent a spontaneous combustion/explosion of coal dust. The O_2 value must be kept low to maintain the process inert. The optional CO_e sensor provides added security and reliability (additional information can be found in our Application Note: “Solutions for coal grinding plants”).

Alternative measurement methods



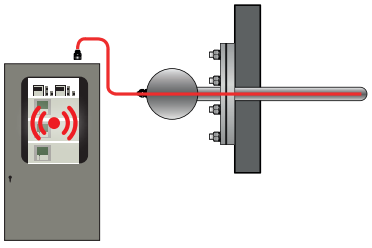
Close-coupled/Quasi-InSitu

- Problems with high dust concentration
- Sluggish to process changes
- High maintenance efforts



Laser

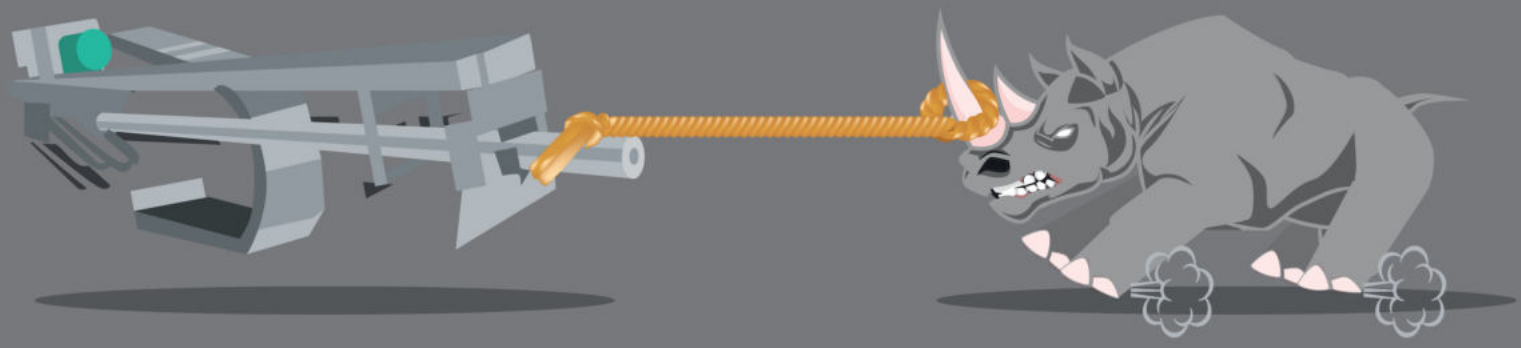
- Problems with high dust concentrations
- Measures only one component
- High acquisition and operating costs



Classical extractive

- Measures CO only
- Sluggish to process changes
- High maintenance effort

Guess who is stronger, *CEMTEC*® or a Rhino?



CEMTEC® can pull back the weight of a rhinoceros...

...and the probe will never stick in the process

95%

Availability of Measurement

Reduce No_x to its limits
Improve product quality
Less energy input

CEMTEC® - Designed for the process

- Heated filter surface 2000 cm²
- Dust-free filter surface above the dew point
- Impulse shock blower
- Automated plunger
- Gas sampling before kiln seal
- Pneumatic retraction with up to 2 t force
- Probe turning with 700 Nm
- Probe tube wall thickness of 5,4 mm
- Yearly maintenance cycle only

ENOTEC product overview

The oxygen concentration is the most important parameter in assessing whether a combustion process is operated efficiently. The simultaneous CO_e measurement enables the plant operator to immediately assess whether his process is safe.
ENOTEC is dedicated to producing the best measuring instrument in the world for each process, which measures InSitu, i.e. directly in the process. In addition, *ENOTEC* offers TÜV suitability-tested (QAL1 / MCERTS) as well as SIL2 with a 1oo1 selection and ATEX certified products, all built for a long service life, requiring very little maintenance for continuous years-long use.

CEMTEC®
- High temperature gas sampling system
- 95% availability

AQUATEC® 1000
- Controls and reduces drying time by fast O_2 and H_2O measurement

OXITEC® 5000
- Always measure oxygen accurately
- Robust, fast and maintenance-free

COMTEC® 6000
- Redundant O_2/CO_e measurement
- Safely optimize combustion processes

ENSITU® 7000
- Plug & Play O_2 transmitter probe
- No instrument air necessary

SILOTEC® 8000
- Zone 20 CO_e / O_2 silo monitoring
- Process monitoring in real time

About ENOTEC

The family owned company *ENOTEC* has been offering products and systems for gas analysis since 1980.

We use our own patented processes and produce all components at our Marienheide site in Germany's Bergisches Land region, close to Cologne.

Our sensor system is a spin-off from the Apollo space program of the 1960s, originally manufactured by Westinghouse in the United States; *ENOTEC* has further developed and continuously improved the zirconium dioxide sensor system, uncompromisingly adapting the design and materials to our customers' needs.
No other company on the market is so profoundly involved in the entire production process.

Basic research, product development, assembly and quality management, even our worldwide sales and customer service – we do all of it in-house. In this way, we have built up our singularly deep expertise, and can respond immediately and competently to any challenge.

Every day, we take another step along our path of innovation.

ENOTEC has been offering products and systems for gas analysis since 1980

With a high degree of accuracy, quality and durability, completely developed and manufactured by *ENOTEC* in Germany.

Our flexibility also makes it possible to react quickly to customer requests - worldwide.

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