FLSMIDTH CEMENT

CEMENT KILN INLET GAS ANALYSIS

KilnLoq™

GAS ANALYSIS FOR A COMPETITIVE EDGE

Kiln inlet gas analysis systems deliver essential data. Cement plants need reliable online analysis of the process gasses at the kiln inlet if they are to compete in a tough market. Use the data to optimise your safety, operating costs, production and emissions – and compete with the best in the cement industry.

Without kiln inlet gas analysis, your kiln will consume too much energy, pollute the environment and shut down more often. With production losses and unnecessary wear on expensive equipment, that's bad news for you; and great news for your competition. Installing a gas analysis system will put you back in the ballpark.

The payback of an on-line kiln inlet gas analysis system from FLSmidth is less than 200* days. After that, it is helping you extend your margins and overhaul the competition every day.

* depending on kiln size and design

BENEFITS OF GAS ANALYSIS COMPONENTS MEASURED AT THE KILN INLET

In general, gas analysis gives you the chance to deal with problems and issues as they arise at source – in the process itself. Below, are a few of the most immediate ways effective gas analysis can benefit your process and put your business in shape to compete.

Kiln pyro control

Maintaining optimal levels of O_2 (oxygen) in the process not only removes the risk of explosion, it also prevents a toxic build-up of CO (carbon monoxide).

Kiln stop prevention

Downtime costs – big time. And if O_2, CO or SO_2 (sulphuric acid) build up in your kiln, production has to be stopped for at least three hours. You will also have to heat up the process again – and that is not always a smooth, stable operation. Your through-put is bound to go down, and the quality of your clinker may be affected too. With gas analysis, you simply don't have to stop your kiln.

Optimal fuel consumption

Gas analysis helps you control your levels of O_2 so you can choose between burning fuel more slowly and efficiently for lower production costs, or burning it faster for a higher through-put and greater capacity. That gives you the flexibility to tailor your production strategy to the needs of the market – fast.

Emission reduction

The more complete the combustion in the process, the less pollution your plant will produce. Gas analysis lets you regulate the O_2 and CO produced by your processes at source, so you can optimise combustion and avoid using expensive anti-emissions equipment to remove pollutants at a late stage in the process.

Safety

If you are not in control of the levels of O_2, CO and CH_4 (methane) in your process, you are not in control of your pryro processes – and that can have disastrous consequences for the safety of your working environment.

Quality clinker

Normally, clinker is tested for quality in the lab, two hours after the process is complete. Analysing gas such as NO (nitric oxide) while the process is still in the kiln allows you to make fine adjustments, saving you handling time, and helping you avoid simple mistakes such as over burning the clinker.

Control of volatiles

The build-up of volatiles, such as SO_2 (sulphuric acid) in your process can cause two expensive problems. The first: any volatiles condensing on the cool raw materials as they are fed into the process will build up and cause blockages. The second: raw materials producing volatiles unchecked will get through the kiln's brick lining and corrode the steel structure. Both require shutdown; and the second can take days to fix. Gas analysis detects the volatiles at source so you can remove them before any damage is done.

RELIABLE & EFFICIENT – ON-LINE KILN INLET GAS ANALYSIS

No kiln operator would trust data from an unreliable inlet gas analysis system. The risks to safety and loss of production are too great. Not only have our kiln inlet gas analysis systems proven accurate and reliable, they are also easy to maintain, so you can cut down on time-consuming maintenance checks.

And, the accuracy of extractive gas analysis systems is well documented – and all the results point to one conclusion: they are much more accurate than non-extractive systems.

Minimising downtime

Even with the best probes, blockages occur. Unblocking your probe quickly and easily is essential to minimise expensive downtime. Other manufactures of extractive gas analysis systems have added mechanical devices, such as probe plungers or rotating probes, to a design that is already over-complex. But we take a different approach.

FLSmidth uses a patented One-Pipe design to handle the hot, highly corrosive, dust-filled process. It's simple. And, since its introduction in 2003, the FLSmidth KilnLoq gas analysis system has become the cement industry's probe system of choice.

100 times faster to clean

No matter what kiln inlet gas analysis system you use, it's not a question of if but when it will get blocked. And, any company claiming maintenance-free gas analysis needs a reality check. For conventional gas analysis systems, it can take anywhere between 30 and 120 minutes to clean the length of a probe. The KilnLoq probe requires just 1 to 3 minutes. No other probe system on the market comes close.The patented On-Pipe design of the KilnLoq probe was inspired by the successful Air Blaster cleaning equipment. Just like an Air Blaster, One-Pipe has no bends, no kinks, no bulges: just a length of smooth, straight pipe. The probe runs the entire length of the pipe before connecting to a solenoid valve and an oversize air tank. Maintenance-friendly and capable of tackling any kiln inlet process, the air blaster-like design makes cleaning the probe quick and easy.

How it works

It's simple. The KilnLoq One Pipe system samples gas in a straight pipe. There are no bends, obstacles or deposits to get in the way of your sample. Opening the access port at the end of the KilnLoq allows you to look along the length of the probe at the processes in the kiln. So now you can carry out real-time visual inspections of the probe.

The process gas enters the filter housing through the centre of the pipe, where it passes through a coaxial filter for collection and analysis. The filter itself is built into a section of the One-Pipe sample line. The entire sampling system is heated to 180°C to avoid condensation.

KilnLoq One-Pipe Automatic cleaning

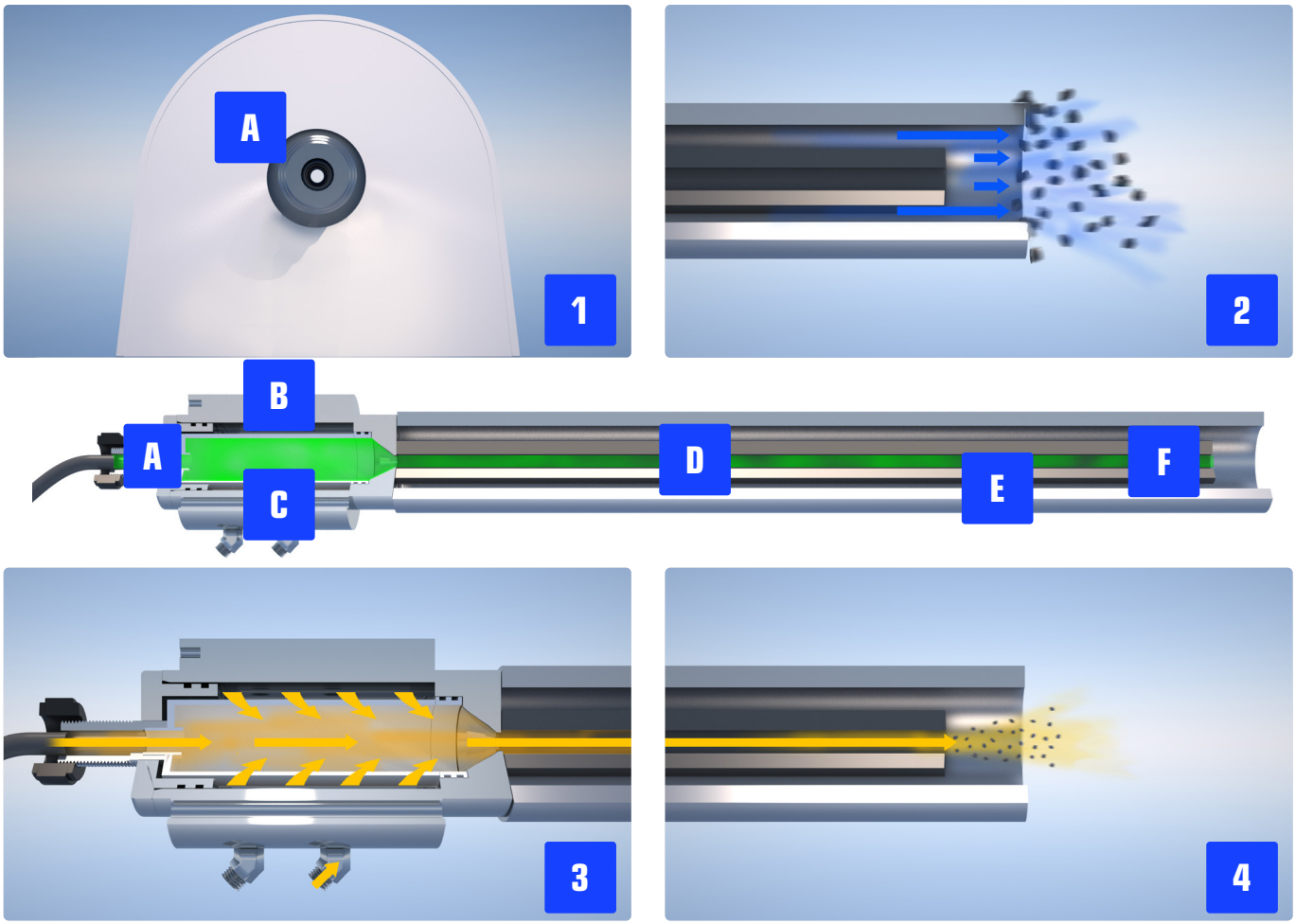
The KilnLoq One-Pipe system has three cleaning systems that work in harmony to clean the sample path thoroughly from end to end. Firstly, the probe tip is cleaned to remove any deposits that could reduce the effectiveness of the main One-Pipe cleaning process. **2**. A jet of compressed air is then blasted through the entire length of the One-Pipe probe. **3+4**. At the same time, air is blown backward through the filter, **3**. lifting dust deposits off the filter filaments. This dust is swept up by the blasts of compressed air in the main body of the pipe and blown back into the kiln.

KilnLoq One-Pipe maintenance

The One-Pipe sample path is easy to service and keep clear. The access port at the end of the One-Pipe length can be open in seconds, providing full access to the sample path's entire length. If aggressive kiln operation blocks the probe, One-Pipe allows you to clean out the entire length of the probe in a couple of minutes. As a result, you will rarely have to open the filter housing during operation because you can carry out all maintenance through the rear access port. **A**. And when the access port is open, the sample path can be visually inspected in seconds. **1**. This system is so effective that some of the first KilnLoq probe systems installed in 2003 are still operating with their original filters.

KilnLoq One-Pipe layout

- **A** REAR END ACCESS PART
- **B** FILTER HOUSE BODY WITH HEATER
- **C** COAXIAL FILTER
- **D** ONE-PIPE SAMPLE SYSTEM (GREEN)
- **E** WATER CODED COOLING JACKET
- **F** ELECTRICAL HEATED SAMPLE PROBE



THE BENEFITS OF ONE-PIPE'S UNIQUE DESIGN

The KilnLoq One-Pipe design is simplicity itself. Backed by FLSmidth's 100+ years of process knowledge and site experience it will not let you down.

And now, a KilnLoq probe has been successfully installed in the world's largest kiln.

The One-Pipe probe design is simple. And, since its introduction in 2003, One-Pipe has proved how effective it is over and again:

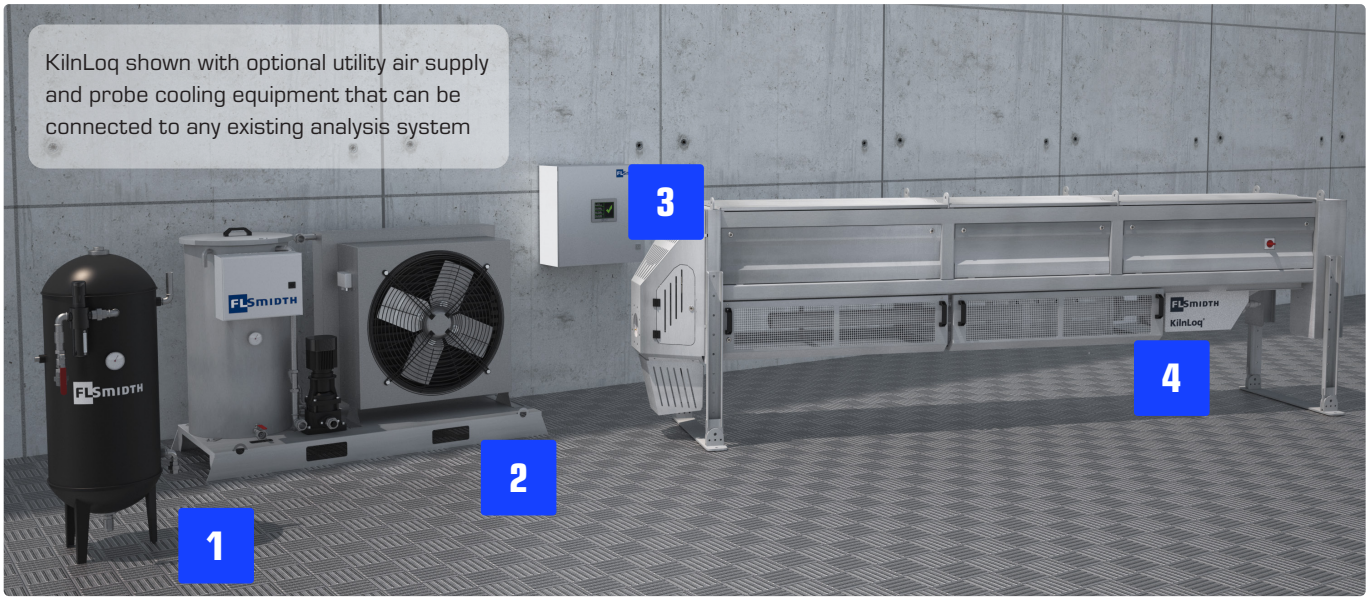
- Jets of compressed air blast all the dust and residue out of the sample path in one go
- The probe stays clean for longer because there are no bends or filters in the sample path to trap dust
- A new cleaning process makes sure the probe's tip stays free from blockage during cleaning
- No need to dismantle any machinery for cleaning or maintenance
- Maintenance and cleaning takes less than 3 minutes – up to 120 times faster than anything else on the market
- In seconds, you can view the entire length of the probe's sample path – and carry out the industry's fastest visual inspection
- Adaptable cleaning sequence setup to process conditions

These benefits are unique. No other gas analysis system on the market can touch the One-Pipe system for speed and ease of maintenance. That means you can carry out all the gas analysis you need to produce high quality clinker more efficiently than your competitors.

System configuration

1. UTILITY SUPPLY
2. PROBE COOLING
3. FIELD CONTROLLER CABINET
4. KILNLOQ PROBE ON EXTRACTION DEVICE
5. GASLOQ GAS CONDITIONING PANEL WITH INTEGRATED CONTROLLER

Basic configuration of a KilnLoq probe and extraction device housing. The control panel is shown on the wall to the left



KilnLoq shown with optional utility air supply and probe cooling equipment that can be connected to any existing analysis system

A complete system configuration showing gas analysers and a gas conditioning system installed in a GASloq configuration with utility air supply and probe cooling equipment

SIMPLICITY BY DESIGN

Simplicity lies at the core of our approach to design... Why?

Complex solutions are prone to break down – and they can be tricky to service in a hurry.

Simple equals reliable and easy to fix.

Probe

The KilnLoq probe has a steel cooling jacket so it can resist the high temperatures in cement plants. Cold water circulates in the jacket to keep the probe cool – conventional technology that is safe, easy and cheap to maintain or replace.

The central pipe where the gas is sampled, and the filter housing, are electrically heated to 180°C, so water or acid cannot condense. The probe is ready for analysis just minutes after power-up, and does not rely on heat from the kiln – so it works even in a cold kiln during start-up or shutdown.

Cooling the steel probe prevents bending and distortion along its length. No matter what cooling media is used, the probe will be a cold spot inside a kiln that can reach temperatures in excess of 1,200°C. This will cause volatiles in the process gas to condense on the cold surface and bond with the raw materials in the kiln to form a hard coating. But at FLSmidth, we have proven that the KilnLoq probe's cool surface makes the condensation so brittle that it is relatively easy to remove.

The KilnLoq's cold water cooling system means its probe is 20 percent stronger than probes that use hot water or oil cooling systems. The KilnLoq probe can also estimate the amount of residue building up in the kiln inlet. Before the build-up can become large enough to cause a blockage or interfere with sample collection, the system sends a message to maintenance.

This results in efficient kiln cleaning, less downtime and better analysis.

Water Cooling

The probe's closed-loop water circuit is controlled by the probe cooling panel. Because the probe operates best when it is cold, the cooling panel operates at a high cooling capacity without any regulation of flow or temperature by default. Many cement plants have a water supply with a high lime content, and this can affect the performance of the water cooling system. However, the closed-loop water circuit re-circulates water at a low temperature, so lime deposits are minimal, resulting in less maintenance and less need for a regular de-scaling.

And, of course, simplicity is at the core of the design. Installation and operation are kept as simple as possible. This reduces the need for maintenance, and removes the need for constant long-term adjustments that plague more complex designs. If the cold water supply to the cooling system fails, the extraction device responds by retracting the probe from the kiln, so there is no risk of damaging the probe. And, because the probe itself monitors the flow and temperature of the water in the cooling system, if your plant has an existing water cooling system, you can save the cost of installing a probe cooling panel.

Extraction Device

The kiln inlet can be a dangerous place, especially under off-set kiln conditions. But gas analysis equipment is essential under off-set kiln conditions, so continuous, safe operation is crucial. That is why we install the KilnLoq probe in an extraction device. During off-set conditions, when pressure in the kiln is high, anybody standing too close to any opening in the process will be hit by a jet of super-heated dust. The extraction device is equipped with an automatic process shutter and besides that the system allows the probe to be operated from a safe distance so there is no risk of exposure.

If the kiln operation is out of balance, material can build up around the probe. Under routine operation, most of these deposits are easily removed by the probe's back-and-forth movements. The quick cleaning procedure – and the optional air-blaster operation – are sufficient to remove the rest. Any failure like power failure or weak flow of cooling water triggers the extraction device's gear motor, extracting the probe before it gets too hot. This fail safe system works by using the optional UPS or a UPS supplied by the customer. The gear motor is very powerful – and it is also simple in design, so troubleshooting and repair is very easy, and rarely needed.

Probe Cleaning

The probe has its own cleaning system to remove the residue that builds up during analysis. Three integrated cleaning devices work in harmony, making sure the probe can do its job even under the most extreme conditions. During cleaning, specially designed, fast-responding solenoid valves control the high-pressure jets of air that blast deposits out of the One-Pipe probe and back into the body of the kiln. Installed in the extraction device, the valves are arranged for short hose runs and powerful cleaning throughout the length of the pipe.

Gas Conditioning

Process gas generated by a cement kiln is very aggressive and corrosive. That is why FLSmidth's extractive gas conditioning system has been developed for maximum safety. Not only have all the components in the gas conditioning system been through extensive testing, they have also proven their reliability and durability in action since 2003.

Designed with simplicity in mind, the components are easy to service and maintain. And it comes with either a peroxide dosing system, or an optional super-chiller gas to keep maintenance to a minimum.

The gas conditioning system is integrated into the GASloq cabinet.

Control Panel

The Control Panel allows the operator to Communicate with the KilnLoq system. A color touch screen gives the operator access to a large range of functions, including alarms, event lists and trend curves. A large symbol on the screen gives your maintenance people a one-glance summary of the equipment's status.

The control panel comes integrated into GASloq cabinet or as a field cabinet.

Communication to the control room is available as hardwire or as an optional serial connections standards, such as Modbus, Profibus, Ethernet TCP/IP, and they are all supported by a fibre-optic uplink.

New options for system configuration

The new KilnLoq probe is modular by design, so you can configure the KilnLoq™ solution that best meets the needs of your plant.

We deliver the basic KilnLoq probe complete with an extraction device and control panel. So, if you have existing plant, you can invest in a new KilnLoq gas analysis system without having to purchase all the auxiliary equipment such as a utility air supply, of systems for water cooling and gas conditioning.

- **Placement:** Kiln inlet side, from centre line and 1m above; able to install on either side of the kiln inlet chamber due to One-Pipe cleaning
- **Maximum process temperature:** 1,400°C
- **Normal process temperature:** 900-1,200°C
- **Maximum dust load:** 2,000 g/Nm3
- **Minimum pressure:** -20 kPa
- **Normal process flow:** 20 m/s
- **Instrument air:** needed at 6-7 bar, 3m3/h
- **Quality of instrument air:** dew point -20°C, according to ISO 8573-1 class 2
- **Power requirements:** 3phx380/440V 50/60Hz or 3phx460/460V 60Hz
- **Approval according to:** CE or UL

Be a competitive cement producer

It's simple. Optimising your kiln operation means installing a kiln inlet gas analysis system. Kiln inlet gas analysis gives you fundamental data to implement your production strategy, be it lowest production cost, highest through-put, lowest emission, best clinker quality or any combination of these.

Without an effective, reliable gas analysis system, your kiln operation won't achieve its full potential. With its maintenance-friendly One-Pipe design, our patented KilnLoq probe system gives you the market-leading system for kiln inlet gas analysis – one that has been proven to pay back in less than 200 days.

Please contact one of our local sales representatives in your area to find out more about how FLSmidth KilnLoq can help your operation compete in the tough world of cement.

The KilnLoq probe is available in the following standard configurations							
Field controller cabinet	Integrated controller	KilnLoq probe	Extraction device	Utility air supply	Water cooling	Gas conditioning panel	Analysers
X		X	X	(X)	(X)	**(X)**	**(X)**
	X	X	X	(X)	(X)	**X**	**(X)**
(x) Is optional equipment							

FLSMIDTH CEMENT

C 08-24 3000-01-ENG

www.flsmidth-cement.com