

**Internationally  
Approved**



**OPSIS®**

## Cement Industry

# Continuous Emissions Monitoring and Process Control in Cement Industry

The cement industry is making heavy investments in flue-gas cleaning equipment, primarily in order to reduce emission levels. With these, it has become clear that fast, accurate and cost-effective emissions monitoring is as important as the equipment itself. The cleaning systems must be operated at high levels of efficiency to be effective, and this requires the continuous monitoring of flue gases to indicate any need for adjustment during operation.

## The Opsis System

Opsis emissions monitoring systems are designed for environments such as those in cement production, fully meeting the high standards of performance and reliability the industry is now setting for itself. Using DOAS (Differential Optical Absorption Spectroscopy) an Opsis system provides an open path, non-contact system unaffected by gases, high temperatures and particulates. Being able to monitor a range of user-specified compounds continuously in real time with a single system, the Opsis instruments offer high levels of accuracy, reliability and data capture. They also offer the speed of response needed for process control.

A single Opsis system will monitor several compounds, including sulphur dioxide ( $\text{SO}_2$ ), nitric oxide ( $\text{NO}$ ), nitrogen dioxide ( $\text{NO}_2$ ) and ammonia ( $\text{NH}_3$ ). Opsis is therefore especially suitable for use with SCR and SNCR processes. The Opsis non-extractive sampling method is also a highly suitable solution in places with high particulate levels and high temperatures.

In addition, Opsis offers dilution extractive and heated extractive systems.

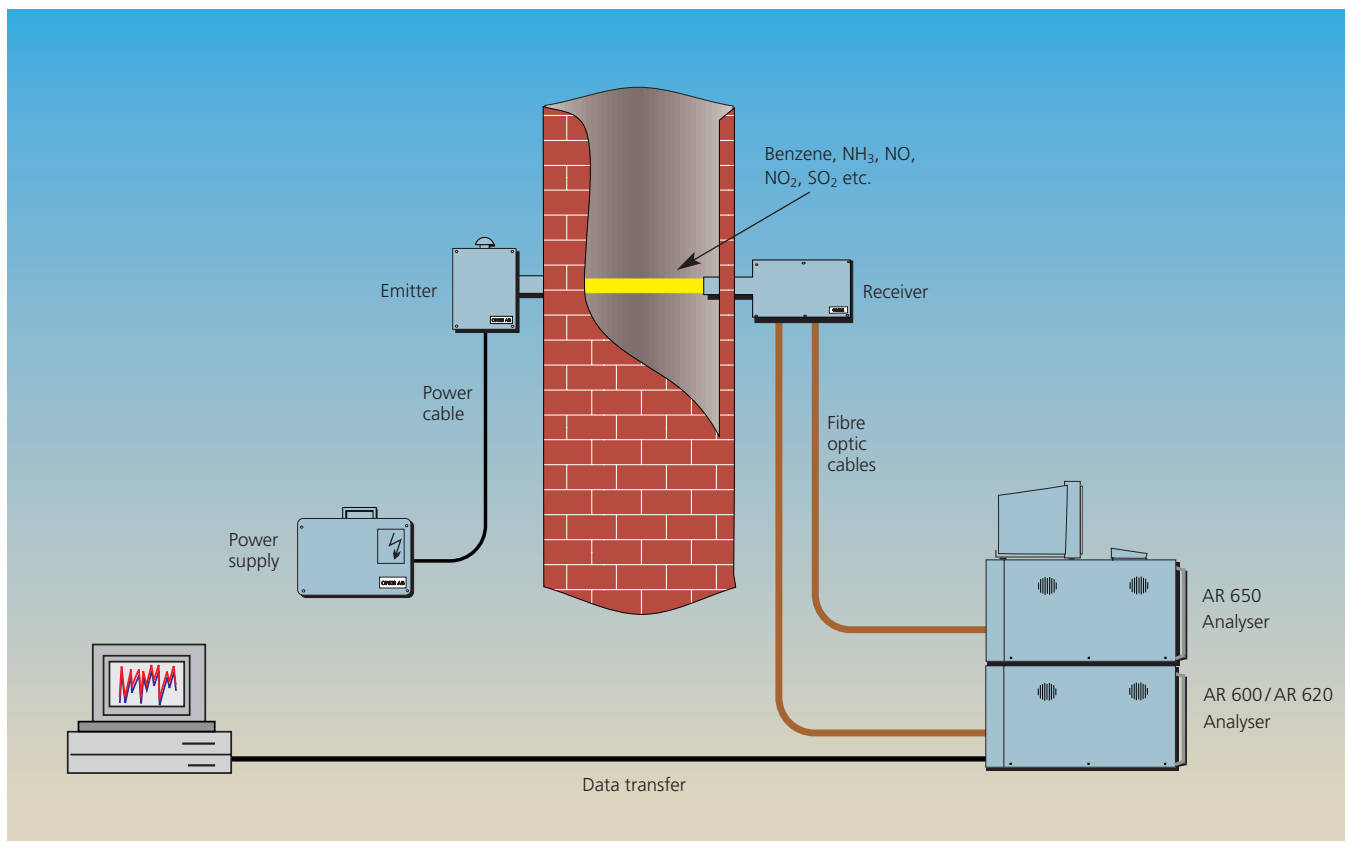
## The Opsis Technique

An Opsis system includes one or several light paths crossing the stacks or ducts. In each path, light is projected from an emitter to a receiver, it is then transferred to the Opsis analyser via a fibre optic cable. Using Beer Lambert's Law, the analyser detects and measures compounds specified in the system software and logs data to a hard disk, either in a local or remote PC. This computer may act as a real-time display or, when required, run an analytical or statistical software generating any desired report.

The Opsis analyser will also accept continuous data from sensors monitoring process variables such as temperature, pressure and flow (4 to 20 mA or digital input). This, combined with the system's ability to provide alarm outputs and/or interface with process control systems via serial communication, makes Opsis a fully integrated part of automatic plant management. Integrating sensor and light path data in Opsis software also allows the automatic calculation and generation of reports meeting legislative requirements.

## Tests and Approvals

Opsis has been tested and approved by a number of internationally recognized institutes and authorities. The system meets the U.S. EPA requirements, 40 CFR Parts 60 and 75, with the ER 070 and ER 080 units. Furthermore, it meets the German TÜV requirements, with the ER 060 unit. Full details are available on request.



An Opsis system layout for a cement factory

#### Performance Data (additional compounds can be monitored)

Compound	Max. measurement range (1 m path) <sup>(1)</sup>	Lowest TÜV approved measurement range	Min. detectable quantities (monitoring path 1 m, measurement time 30 sec.)	Zero drift (1 m path, max. per month) <sup>(6)</sup>	Span drift (per month, better than)	Linearity error (of measurement range, better than)	Max. length of fibre optic cable (when monitoring individual compounds) <sup>(5)</sup>	Hardware requirement
<b>AR 600/AR 620 Analyser</b>								
NO <sup>(2)</sup>	0–2000 mg/m <sup>3</sup>	0–150 mg/m <sup>3</sup>	1 mg/m <sup>3</sup>	±2 mg/m <sup>3</sup>	±2%	±1%	10 m	AR 600/620
NO <sub>2</sub>	0–2000 mg/m <sup>3</sup>	0–20 mg/m <sup>3</sup>	1 mg/m <sup>3</sup>	±2 mg/m <sup>3</sup>	±2%	±1%	200 m	AR 600/620
SO <sub>2</sub>	0–5000 mg/m <sup>3</sup>	0–80 mg/m <sup>3</sup>	1 mg/m <sup>3</sup>	±2 mg/m <sup>3</sup>	±2%	±1%	100 m	AR 600/620
NH <sub>3</sub> <sup>(3)</sup>	0–1000 mg/m <sup>3</sup>	0–10 mg/m <sup>3</sup>	0.5 mg/m <sup>3</sup>	±1 mg/m <sup>3</sup>	±2%	±1%	10 m	AR 600/620
Hg <sup>(2)</sup>	0–1000 µg/m <sup>3</sup>	0–150 µg/m <sup>3</sup>	3 µg/m <sup>3</sup>	±6 µg/m <sup>3</sup>	±2%	±1%	50 m	AR 600/620
H <sub>2</sub> O	0–100% Vol.	0–30% Vol.	0.5% Vol.	±1% Vol.	±2%	±1%	100 m	AR 620
HCl	0–10000 mg/m <sup>3</sup>	—	10 mg/m <sup>3</sup> <sup>(4)</sup>	±20 mg/m <sup>3</sup> <sup>(4)</sup>	±2%	±1%	50 m	AR 620
HF	0–1000 mg/m <sup>3</sup>	—	5 mg/m <sup>3</sup>	±10 mg/m <sup>3</sup>	±2%	±1%	200 m	AR 620
CO <sub>2</sub>	0–100% Vol.	—	0.5% Vol.	±1% Vol.	±2%	±1%	50 m	AR 620
Benzene	0–1000 mg/m <sup>3</sup>	—	1 mg/m <sup>3</sup>	2 mg/m <sup>3</sup>	±2%	±1%	25 m	AR 600/620
<b>AR 650 Analyser</b>								
HCl	0–5000 mg/m <sup>3</sup>	0–15 mg/m <sup>3</sup>	1 mg/m <sup>3</sup>	±2 mg/m <sup>3</sup>	±2%	±1%	50 m	AR 650
CO	0–10000 mg/m <sup>3</sup>	0–75 mg/m <sup>3</sup>	3 mg/m <sup>3</sup>	±6 mg/m <sup>3</sup>	±2%	±1%	10 m	AR 650
H <sub>2</sub> O	0–100% Vol.	0–30% Vol.	0.1% Vol.	±0.2% Vol.	±2%	±1%	100 m	AR 650
HF	0–1000 mg/m <sup>3</sup>	—	0.2 mg/m <sup>3</sup>	±0.4 mg/m <sup>3</sup>	±2%	±1%	200 m	AR 650
NH <sub>3</sub>	0–1000 mg/m <sup>3</sup>	—	2 mg/m <sup>3</sup>	±4 mg/m <sup>3</sup>	±2%	±1%	200 m	AR 650
N <sub>2</sub> O	0–10000 mg/m <sup>3</sup>	—	10 mg/m <sup>3</sup>	±20 mg/m <sup>3</sup>	±2%	±1%	50 m	AR 650
CH <sub>4</sub>	0–10000 mg/m <sup>3</sup>	—	5 mg/m <sup>3</sup>	±10 mg/m <sup>3</sup>	±2%	±1%	100 m	AR 650
CO <sub>2</sub>	0–100% Vol.	—	0.1% Vol.	±0.2% Vol.	±2%	±1%	50 m	AR 650

<sup>(1)</sup> This data refers to a light path of one metre. For longer paths the maximum range is proportionally smaller. Products are available to create shorter paths in very wide stacks.

<sup>(2)</sup> Maximum SO<sub>2</sub> concentration 5 g/m<sup>3</sup> × metres.

<sup>(3)</sup> Maximum SO<sub>2</sub> concentration 500 mg/m<sup>3</sup> × metres.

<sup>(4)</sup> Monitoring path 5 metres, measurement time 30 seconds.

<sup>(5)</sup> When monitoring several compounds, the shortest fibre optic cable given by the set of components (refer to product sheet P9) has to be used.

<sup>(6)</sup> For AR 650 the same values are valid as maximum zero drift per year.

• Recommended monitoring path length: 1 to 5 metres.  
• After wet scrubbers or when particulate concentration averaged over one metre is higher than 5 g/m<sup>3</sup>, the monitoring path length may have to be reduced.

Please contact your Opsis supplier to discuss your particular system requirements, including the compounds you wish to monitor. Separate product and other industrial application sheets are available.

*Specifications subject to change without notice*

# Continuous Emissions Monitoring and Process Control

## Why Opsis?

High-performance, cross-stack monitoring

Multi-gas and multi-path system

Combines the benefits of both UV and IR

No sample required

High-quality instruments for operation in harsh environment

Operates with a minimum of maintenance

Easily calibrated

Internationally approved

Hundreds of systems installed worldwide

Serviced by highly skilled service network



Opsis AB, Box 244  
SE-244 02 Furulund Sweden  
Telephone Int +46 46 72 25 00  
Telefax Int +46 46 72 25 01  
E-mail [info@opsis.se](mailto:info@opsis.se)  
URL <http://www.opsis.se>

1996 06

A4