Application of laser-based gas analyzers in steel industry

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General company information

- Airoptic is an SME based in Poznan, Poland
- Airoptic manufactures laser-based gas analyzers for industrial applications
- Main applications are process control in Power Industry, Petrochemical industry, Chemical, Wood industry, Steel, etc.
- In-house technology and R&D department
- Global distributor and service network, export accounts for 90% of total revenues

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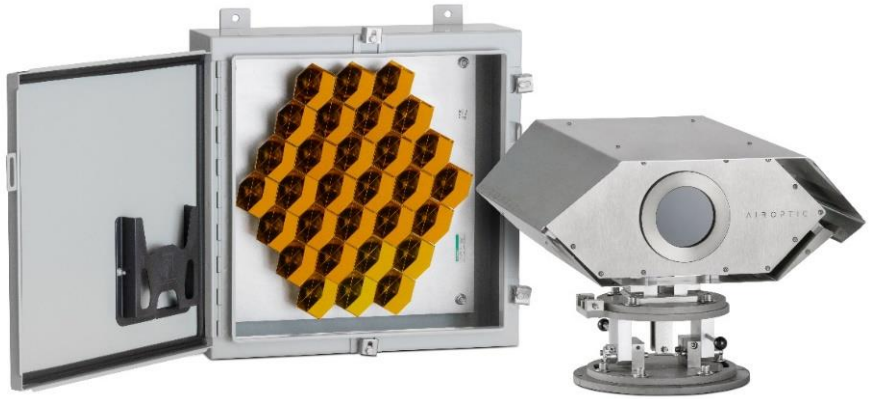
GasEye™ laser-based gas analyzers

In -situ

Open path



Extractive

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Typical applications of *in-situ* analyzers

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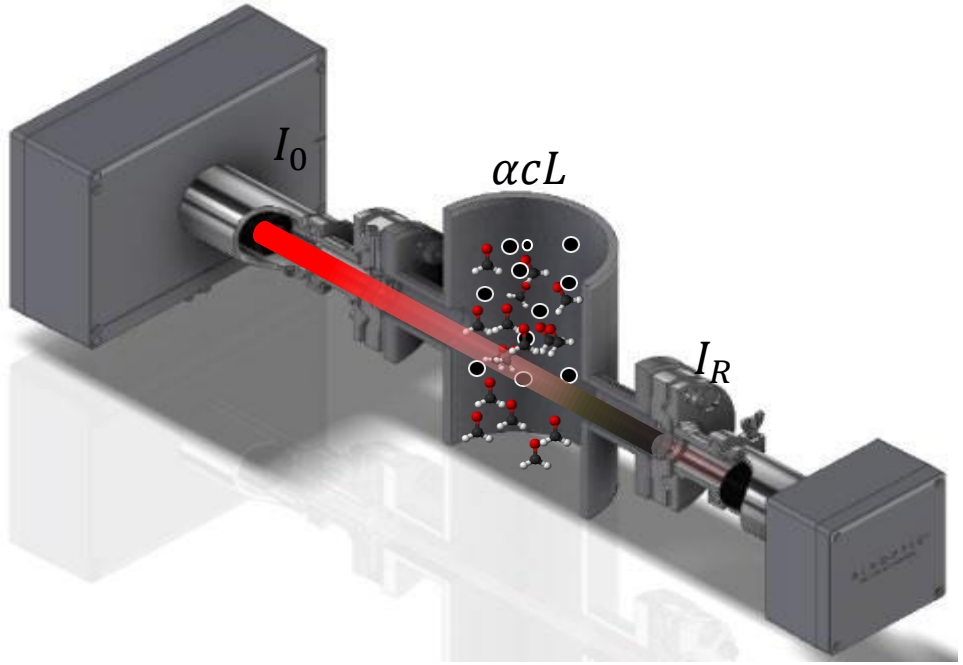
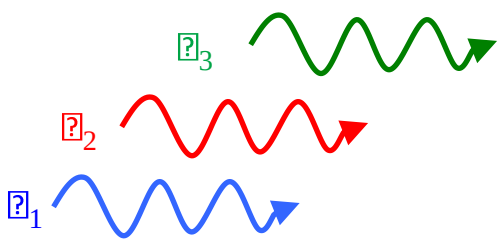
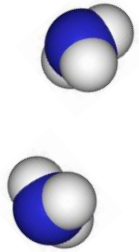
Tunable (diode) laser spectroscopy (TLS/TDLS) - principle of operation



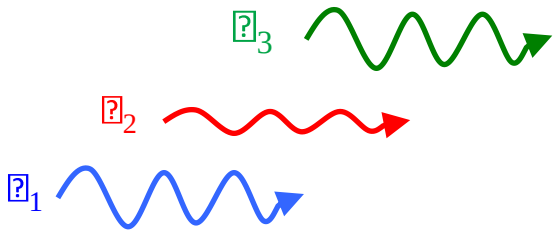
Laser light scans from λ_1 to λ_3



Molecule absorbs @ λ_2



"Filtered" light detected



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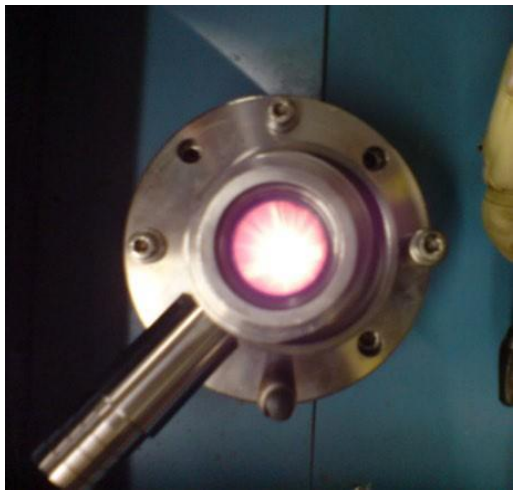
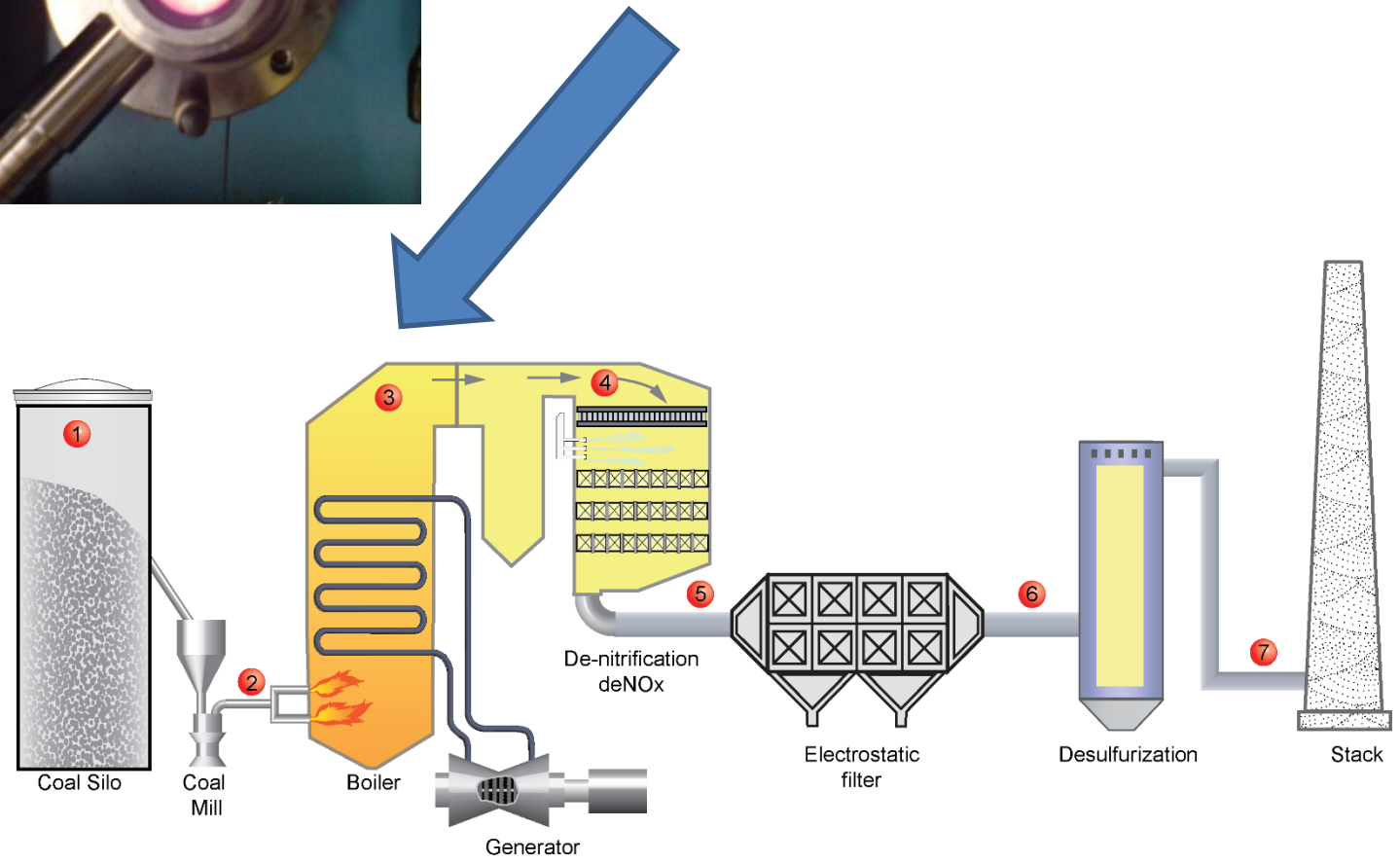
Oxygen/carbon monoxide measurement –combustion optimization



- Measurement of CO, O2, H2O directly in a boiler
- High temperature
- High dust load (up to 50 g/m3)



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Multi-component analyzer for combustion control CO+O2+H2O (2018)

Analytical performance

CO/O2 minimum measurement range: 0–10 ppm / 0–1%

LOD: CO/O2: 0.2 ppm*m/100 ppm*m @STP and 3 sec response time

Precision: CO/O2: 0.2 ppm*m/100 ppm*m or 1% of the measured value, whichever is larger @STP and 3 sec response time

Accuracy: CO/O2: 0.2 ppm*m/100 ppm*m or 2% of the measured value, whichever is larger @STP and 3 sec response time

Response time (T90): < 1 second

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Combustion optimization – steel plant

- Measurement in-situ, CO: 0-1000 ppmv and O2: 0-10 vol%
- 24/7 operation with close to 100% availability
- Process temperatures 0 - 1350°C
- Process pressures: 0.5 - 2 atm
- Smaller total form factor. No sample preparation sample losses, no clogging due to dust
- Utilizes one pair of flanges compatible with single gas analyzer flanges
- Successfully proven for steel industry applications with processes up to **1350°C** (**2500 F**)

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Laser-based measurement of fuel composition in a steel plant

COG

BFG

LDG

LNG

Gas Mixer

Plate Mill

CO+CO2+H2S

CH4+C2H4+H2O

To Re-Heating Furnace

Hot Roll Mill

CH4+C2H4+H2O

CO+CO2+H2S

To Re-Heating Furnace

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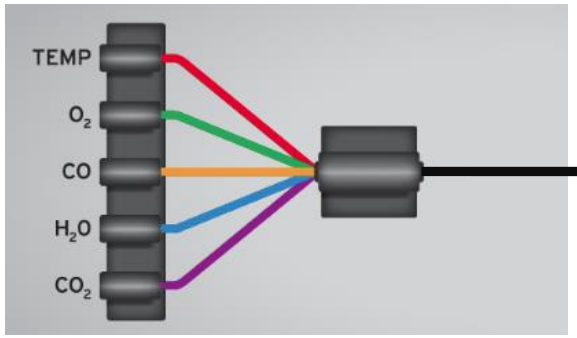
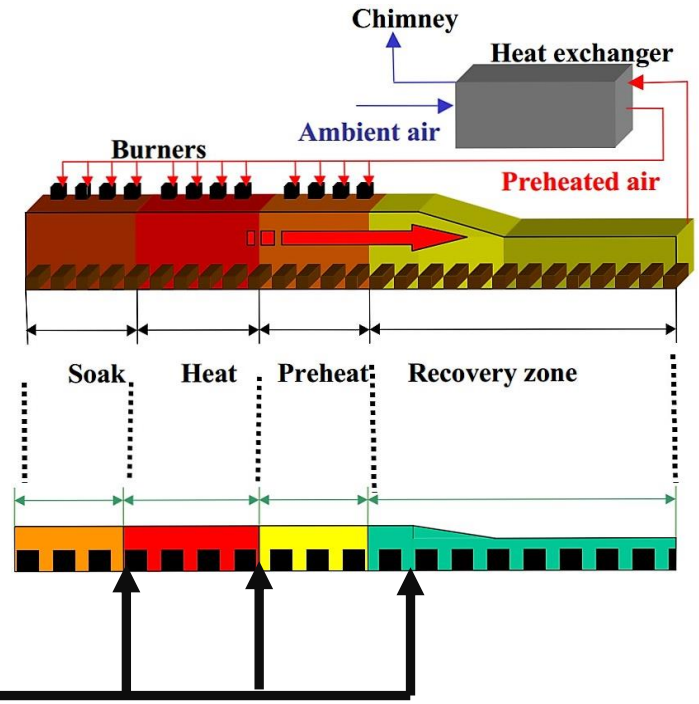
Optimization of combustion in a reheating furnace

LAMINOIRS DES LANDES HEAVY PLATES





- Goal: Reduction of material and energy waste by means of closed loop control of combustion process
- Real time measurements of gas constituents at several locations inside the furnace and chimney
- Closed loop control of combustion process

multiple

LAMINOIRS DES LANDES HEAVY PLATES

RUSSULA

aimen

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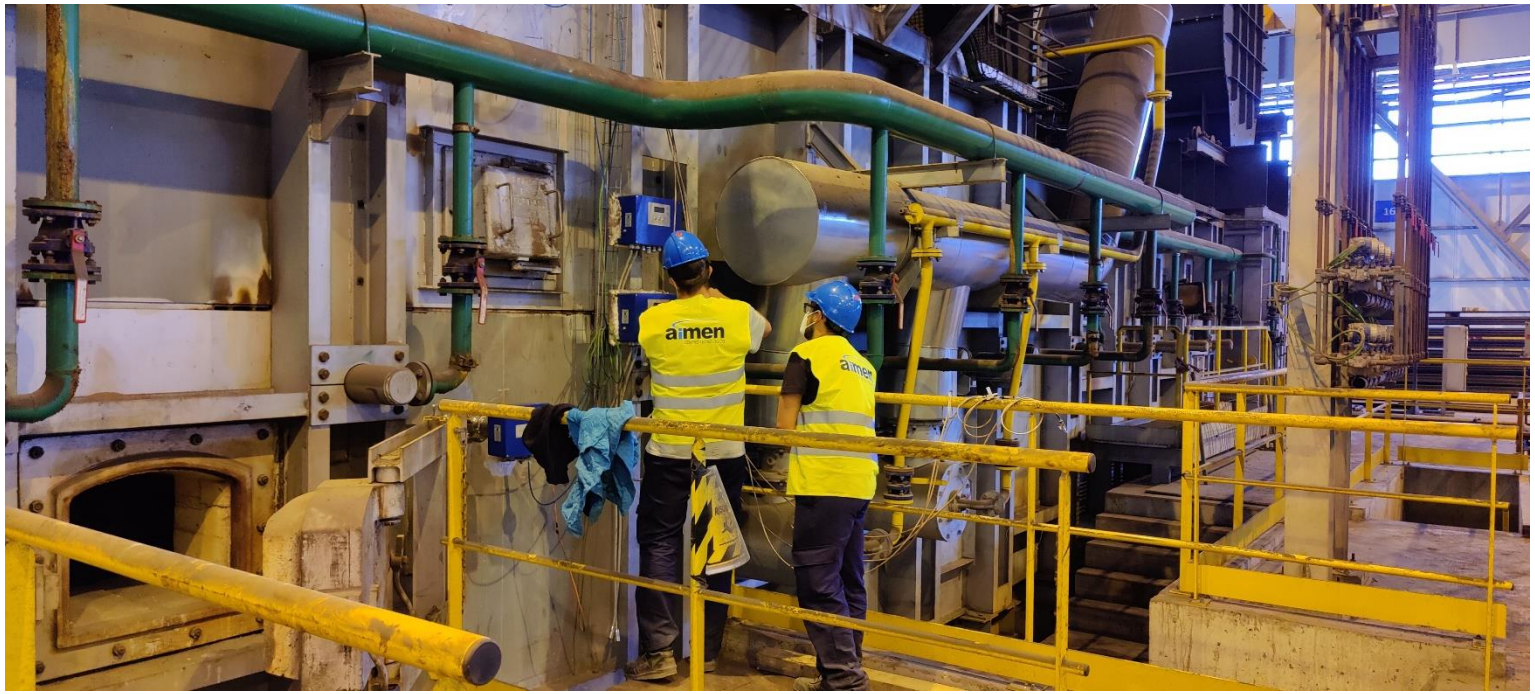
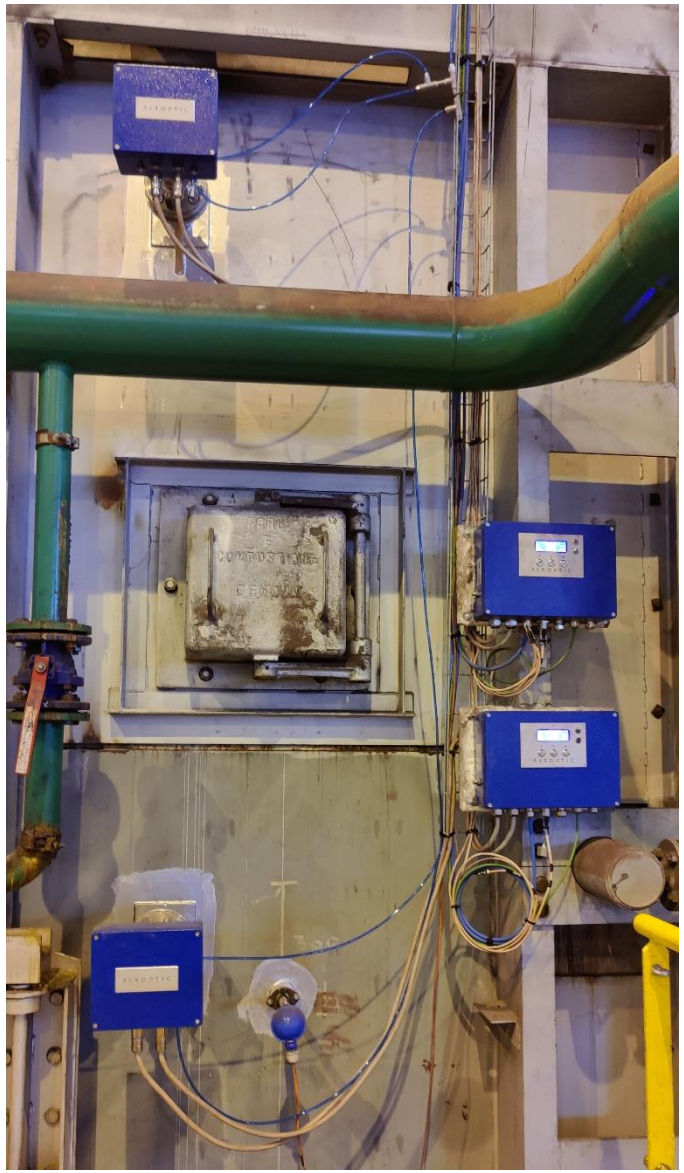
Optimization of combustion in a reheating furnace

- Two CO/O2/H2O/temperature analyzers has been deployed at LDL in August 2021
- First test results expected September 2021





multiple

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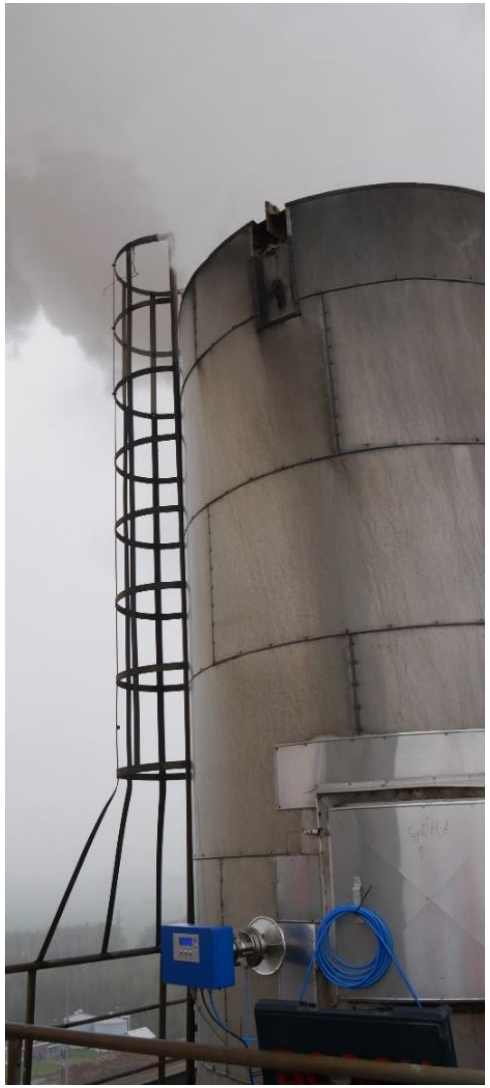
Conclusions – advantages of laser-based gas analyzers for steel industry

- No sample extraction, very short response time, can be coupled in a fast closed loop control system
- Operates *in-situ* in process temperatures up to 1500 degC
- High sensitivity and selectivity, low cross interference
- Continuous 24/7 operation, low maintenance, low cost of ownership
- Robust design, IP66, suitable for harsh environment
- Suitable for Hazardous Areas (Zone 1/21, process Zone 0/20)



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