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# CINERIS, ONLINE MEASUREMENT OF UNBURNED CARBON IN FLY ASH



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## PROCESS

Cineris is able to determine the percentage of unburned carbon in fly ash produced in pulverized coal combustion.

The major advantage of Cineris is its ability to provide measurements in real time and in situ, thus supplying prompt information about the combustion process.

## CINERIS, ONLINE MEASUREMENT OF UNBURNED CARBON IN FLY ASH

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The amount of unburned carbon (UBC) in fly ash is a good marker of efficiency of coal blends combustion. The presence of unburned carbon is, in fact, a consequence of incomplete combustion which originates from the devolatilisation of the coal fed to the boiler. Thus, determination of the carbon content in the fly ash can provide useful information on the combustion process. Improvement of plant efficiency should therefore involve a real-time feedback control on UBC, which ensures that the plant is always operating at optimum level. Cineris is the instrument suitable to this aim. While monitoring in real time UBC content in fly ash, Cineris allows coal saving and the reduction of UBC content in the ashes sold for cement or other industrial application.

### TECHNOLOGY

Cineris is based on Laser Light Scattering Technology. The term scattering refers to an interaction between incident radiation and a target entity that results in redirection and possibly a change in frequency (or energy) of the radiation (Fig.2).

### LAYOUT

- > The gas and fly ash mixture is extracted from duct via a sampling probe consisted of a length stainless-steel tube adapted to the duct size.
  - > Together with the device, a cyclone is provided in order to collect fly ash samples and to allow the analysis of the samples.
- Fly ash sample is analysed by standard laboratory LOI (Loss On Ignition) method, and this unburned carbon value used for Cineris calibration.

- > The control unit is housed in a cabinet divided into two compartments: one is for electrical devices and signal processing components, the other one for pneumatic control hardware. An operator's control panel with display is located on the control cabinet front, which provides possibilities to show the measuring results as well as error messages.
- > Cineris configuration permits extremely simple installation without time-consuming adjustment, and the ability to carry out measurements with a long maintenance interval.

### SOFTWARE

The Cineris software processes the scattering signals, sent by the acquisition units, evaluates and stores the percentage of unburned carbon.

A diagnostic system allows to reject the measurements in case of acquisition failure or others anomalies.

### FEATURES

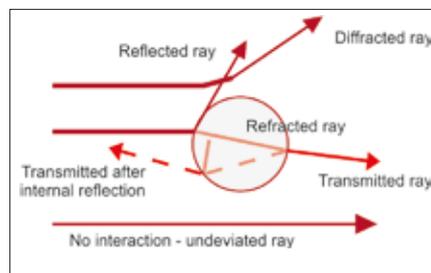
- > Patented online measurement technology
- > Isokinetic sampling system
- > Direct and instant process analysis
- > Coal-independence
- > Continuous and automatic operation
- > Modular design for ease installation and maintenance
- > No moving mechanical parts

### BENEFITS

- > Feedback on combustion
- > Improvement of combustion efficiency
- > Optimization of mills performance
- > Reduction of ash disposal cost and quantities
- > Improvement of fly ash quality



1. Cineris instrument



2. Light scattering principle

**MAIN CHARACTERISTICS**

**MEASURING**

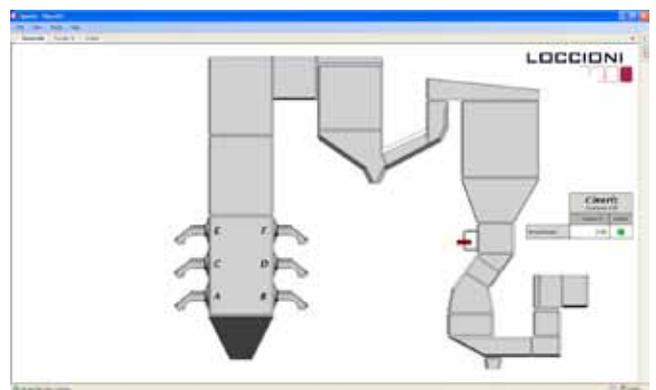
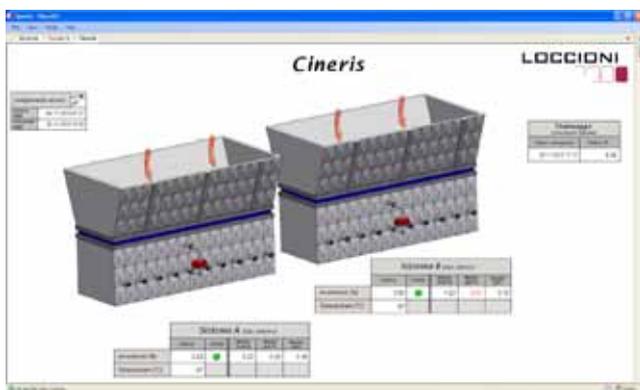
<b>Principle</b>	Laser Light Scattering
<b>Measurements range</b>	0 - 20%-wt
<b>Measurements resolution</b>	30 sec
<b>Accuracy</b>	1%-wt (absolute)
<b>Carbon type</b>	Independent
<b>Alignment</b>	Automatic

**WORKING CONDITIONS**

<b>Flue gas temperature</b>	<400°C
<b>Flue gas pressure</b>	~1 bar
<b>Ambient temperature</b>	-5 - +35°C

**BASIC CONFIGURATION**

<b>Cineris instrument</b>	It is the measuring cell where gas with fly ashes passes through and laser scattered signals are generated and acquired
<b>Control cabinet</b>	It houses all the devices for power supplying, signal processing, UBC values calculation and general system management
<b>Pneumatic Circuit</b>	It allows gas-ash mixture to be sampled from exhaust duct, to be fed into Cineris instrument and then to be sent back to the duct
<b>Output</b>	4 - 20 mA, Modbus, OPC
<b>Connectivity</b>	USB, ethernet, optical fiber
<b>Installation</b>	Extractive
<b>Maintenance interval</b>	4 months



4-5. Data acquisition software

We transform data into value