ProDetec
Measure . Prevent . Protect . Control

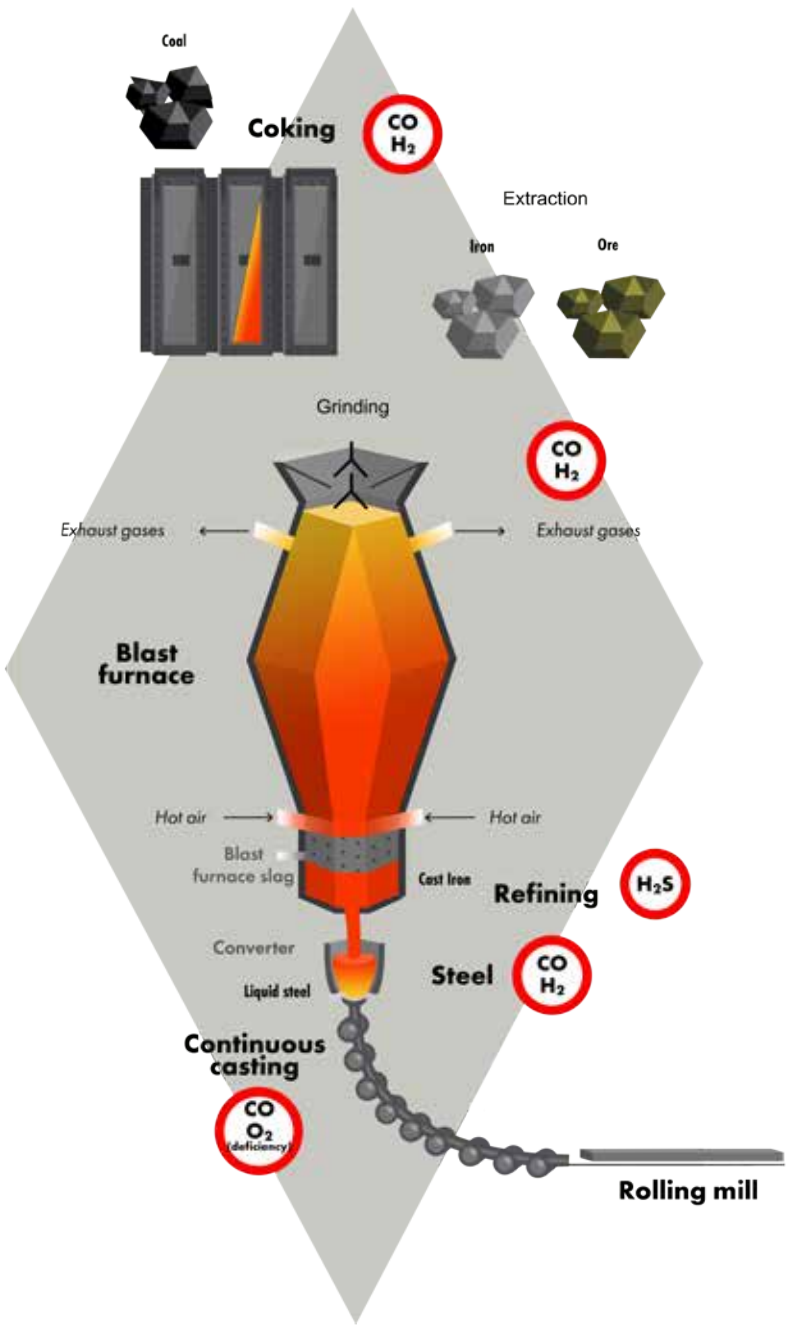
Steel is used in many sectors such as the automotive, construction, and household appliances. Steel production requires iron ore, coal, lime and iron-alloys, with gas emissions as a by product as a by product at each process stage.

How is steel made?

Coke production (or coking)

Coke *is a grey, hard, and porous fuel with a high carbon content and few impurities, made by heating coal or oil in the absence of air. It is notably used as fuel in* **blast furnaces** *as it produces very little smoke when burned, to obtain cast iron which is subsequently transformed into steel.*

The manufacturing of coke is accompanied by the emission of certain gases (hydrogen, methane gas, acetylene, ethylene, carbon oxides).



Blast furnace

Here, iron is extracted from its ore.
Ore and coke solids are introduces into the top through the blast tube. Hot air at 1200°C, blown into the pot furnace, causes coke combustion. Carbonic oxide will oxidize and form iron oxides (in other words it will absorb their oxygen and thereby isolate the iron), then descends down the furnace to become cast iron.
At the output of furnace, the residue, called blast furnace slag, floats on top of cast iron and is recycled or sent to other industrial sectors (cement works for example).

Blast furnace gas will be channelled through gas pipelines. The risk of explosion must be measured.

Refining (desulphurization unit)

This step will help remove the last unwanted elements, such as phosphorus or sulphur.

Steel

This step allows for cast iron to be turned into steel: the molten cast iron is poured over a bed of scrap and the unwanted elements (hydrogen sulphide, ammonia) contained in the cast iron are burnt by blowing pure oxygen, which will form carbon monoxide and produce heat.
This is how raw liquid steel, that is still imperfect, is obtained. It will then be refined by removing the remaining impurities.

When the carbon content of the molten bath is at the desired level, the alloying elements are added and the liquid steel is poured into a pre-heated ladle.
The steel gas is made up of 75% CO and 3% hydrogen.

Continuous or ingot casting

The molten steel continuously flows into a bottomless mould. While passing through the mould, it starts to solidify when it comes into contact with walls that are cooled with water. The moulded metal descends, guided by a set of rollers, and continues to cool. When it reaches the outlet, it is solidified and cut at the wanted lengths.

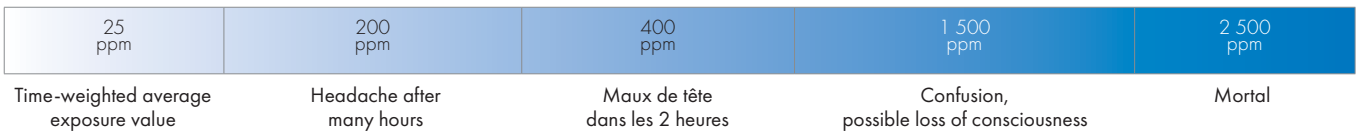
Rolling mill

Rolling is used to shape the material.

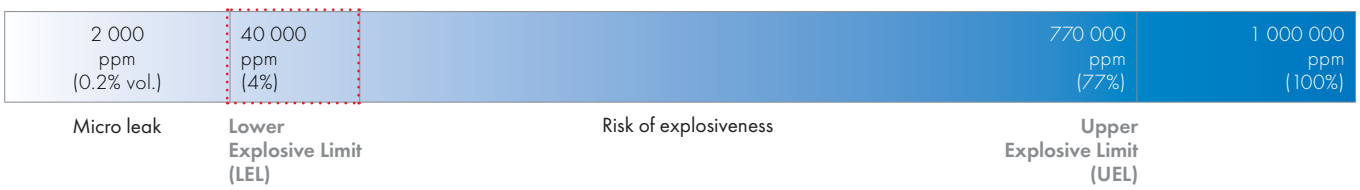
Application Note
Steel Industry

The dangers of carbon monoxide (CO)

Colorless and odorless gas (asphyxiant) formed by the combustion of carbonaceous fuels (gas, wood). Carbon monoxide inhibits the body's ability to transport oxygen to various organs and causes asphyxiation by preventing the blood from carrying oxygen.

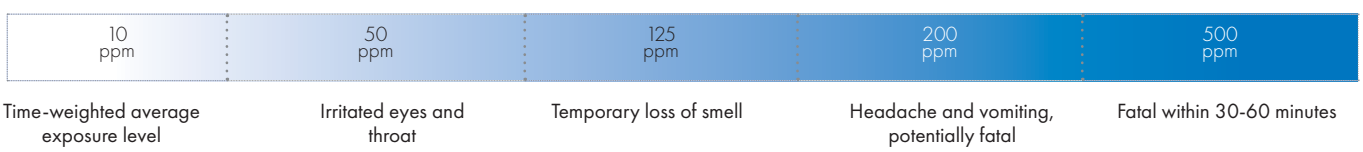


The dangers of hydrogen (H_2)

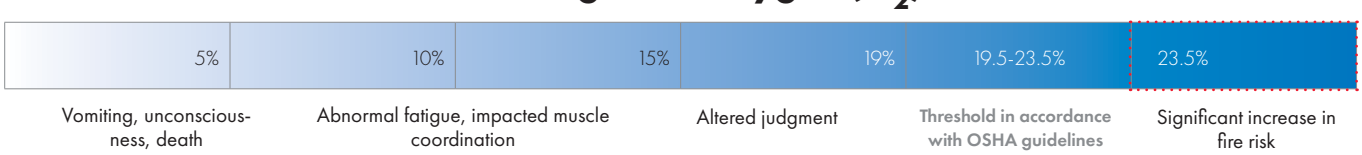


The dangers of hydrogen sulfide (H_2S)

Colorless gas with the smell of rotten eggs. Hydrogen sulfide causes a loss of smell, leading to the misconception that the gas has left space. Hydrogen sulfide inhibits the exchange of oxygen at the cellular level and causes asphyxiation. Many deaths in confined spaces are linked to excessive exposure to this gas.



The dangers of oxygen (O_2)



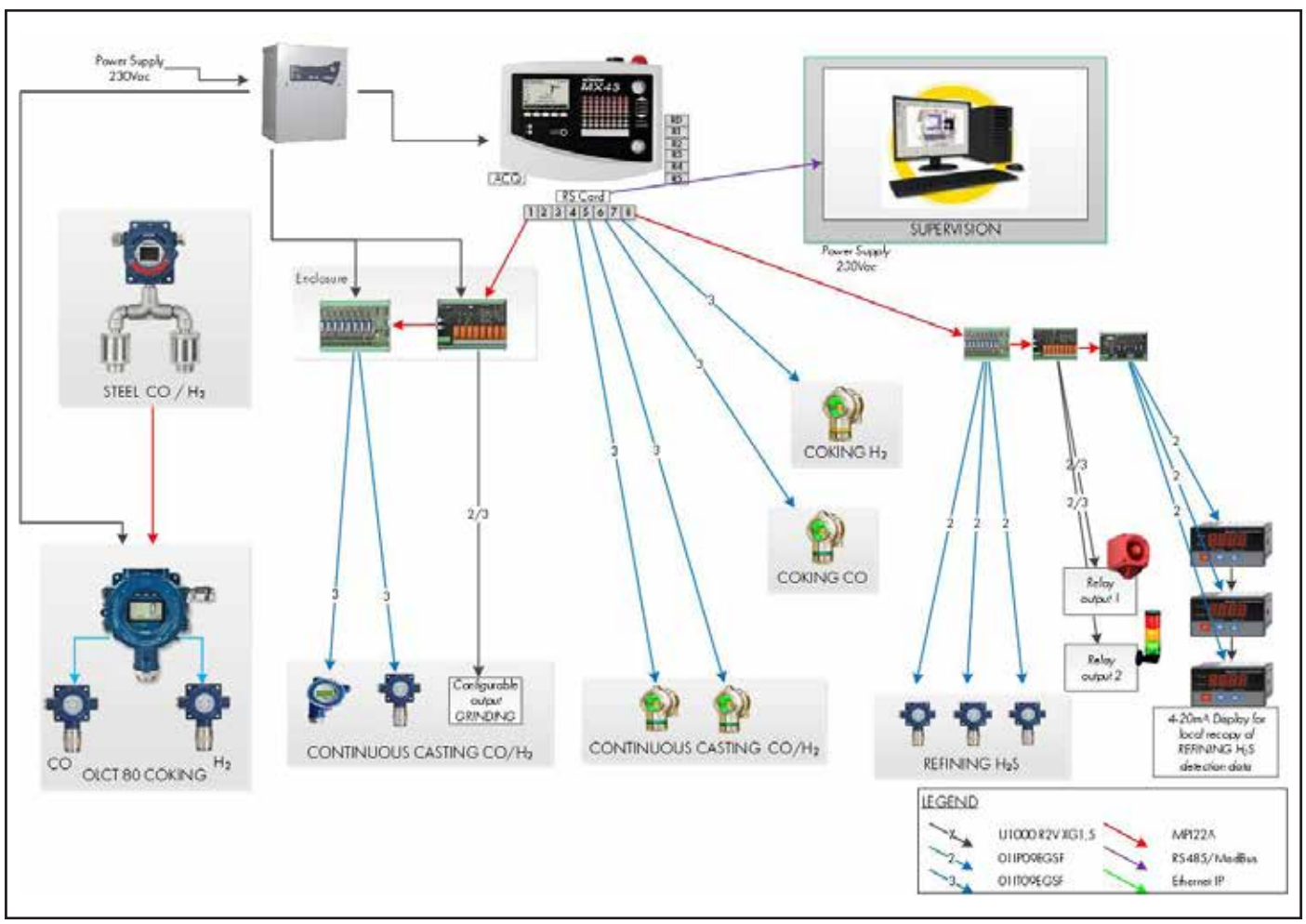
Application Note
Steel Industry

See below an illustration of the capacity of the MX 43 to supervise detection data in different areas of the production site : coking, steel, blast furnace, ingot casting, refining, whatever the gas detection needs are (H_2, CO ou H_2s).

Line 1 connects to a rack with three 8-Analog-input modules and one relay-module. Each module connects to detectors type OLCT 100 and DG controlling different areas and all detection data is sent to the controller which can be located in a safe area. The relay module automatically gets detection data and actions the relays (ie: strobe and horn).

Lines 5 and 7 are covering the coking area with DG transmitters detecting H_2 and CO and line 8 connects to another 8-Analog-input module, a relay-module and an Analog-output module to allow detection in the refining area and a local copy of detection data on touch screens displays.

A modbus RS485 allows connection to a centralized supervision located in a safe area.



Application Note
Steel Industry

Solutions and benefits

DGi-TT7 toxic gas detectors

Designed to facilitate configuration and maintenance operations, these detectors are made from a common box and electronics, the detection properties are determined by the type of sensor (cartridge) used.

The DF-TV7 flame detector

Designed to detect carbonaceous fires and offers the best solution for the detection of fires generating a lot of smoke. SIL3 certified, the DF-TV7-T is the safest flame detector on the market.

The OLCT 100 gas detector

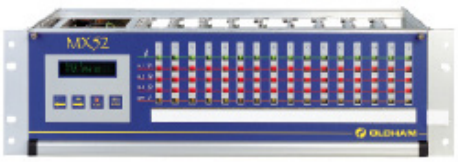
The OLCT 100 gas detector has been designed for the detection of combustible, toxic or oxygen gases. Available in explosion-proof or intrinsically safe version, the OLCT 100 is suitable for detecting all gases in ATEX zones. SIL 2 certified according to EN 50402 / EN 61508, it combines robustness, reliability and increased service life.

The MX 43 digital control unit

The MX 43 is a digital and analog control unit intended for measuring gases present in the atmosphere and more generally for processing any 4-20 mA signal or digital contact.

The MX 62 digital control unit

SIL3 certified according to EN50402, this control unit allows you to connect up to 64 sensors. Its modularity considerably reduces cabling costs and its reliability will ensure minimal maintenance.



The MX 52 datalogger

SIL 2 certified according to EN61511, this unit available in rack version will allow you to monitor up to 16 measurement points.
*As an option, you can provide its emergency power supply (dimensions 435 * 315 * 120 mm), equipped with a 24V 12A charger and 24Ah batteries (ref 6312888).*

Remember to include all required accessories.

TELEDYNE
GAS AND FLAME DETECTION
Everywhereyoulook™

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