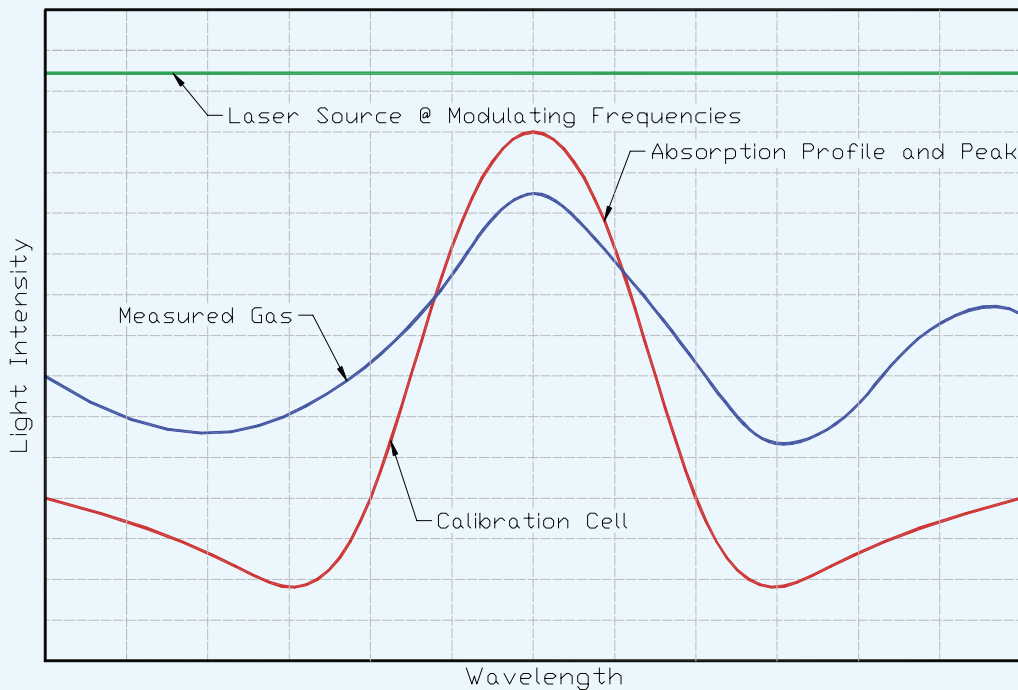


Tunable Diode Laser Technology for Advanced Exhaust Gas Monitoring



Demonstrated Benefits

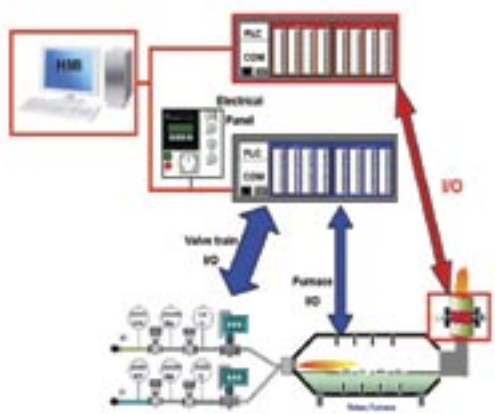
- Reduced energy costs
- Increased productivity
- Optimized furnace operation
- Accurate control of flame chemistry to:
 - Minimize metal losses
 - Minimize metal oxidation
 - Increase metal yield

ACI and Air Liquide have developed an efficient and practical exhaust gas monitoring system that uses an advanced laser diode system to precisely measure exhaust gas components (CO , CO_2 or O_2), in the harsh furnace environment. Because measurements are obtained with virtually no time delay, they are ideally suited for process and combustion control.

TDL Tunable Diode Laser Technology

TDL system features

- In-situ measurement of furnace gases
- May be taken across the flue gas path or duct
- Real time measurements , with no time delay
- Low sensitivity to dust loading
- High reliability and repeatability
- Low maintenance



TDL benefits measured on a rotary aluminum furnace

- Natural gas reduction -8%
- Metal yield increase +1.5%
- Productivity increase +5%
- Signal availability >97%

Contacts

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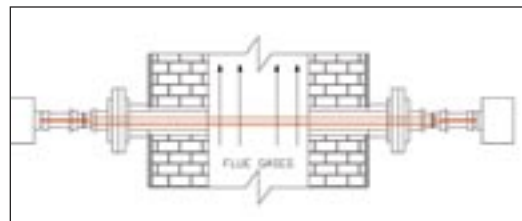
Real time exhaust gas monitoring technology

This technology, together with our “smart” oxygen based burner systems, dynamically controls the combustion and melting, or smelting process for optimum efficiency and production. Applications for the TDL technology include:

- Electric arc furnaces • Lead smelting
- Aluminum scrap processing
- Reverberatory furnaces in the non-ferrous industries

TDL measurement

At the heart of the system is the tunable diode laser. A laser beam is emitted through a gas stream to a receiver. Since many of the gas species in combustion processes (CO , CO_2 , O_2) absorb light at very specific wavelengths, the concentration of a gas specie is determined by measuring the absorption of the laser beam at its specific wavelength. To measure a specific gas, the diode is simply adjusted or “tuned” to the particular wavelength.



Process control loop

TDL monitoring technology is combined with the burner PLC based process control system to accurately control the furnace and combustion process. When combined with ACI's oxy-fuel or air-oxy-fuel Pyretron™ burner systems, burner parameters can be dynamically controlled throughout the different stages of the smelting process to maintain the optimum CO or O_2 profiles.

For example, burner excess oxygen and air can be controlled to maintain the appropriate CO levels, to maintain optimum furnace atmosphere for smelting, or to increase fuel efficiency by injecting oxygen to consume excess CO in the furnace, depending on the furnace cycle.

System configurations

Two configurations are available. 1. In-Situ systems that measure the furnace atmosphere directly above the molten bath or in the stack. 2. Ex-Situ extractive systems, allowing reliable measurement even with extremely high dust loadings, where gases are extracted using a self-cleaning sampling probe and measurements are taken outside the furnace.



Founded in 1902 and now present in 70 countries with 36,000 employees, **Air Liquide** is the **world leader** in industrial and medical gases and related services. The Group offers **innovative solutions** based on constantly enhanced **technologies** to help manufacture many indispensable everyday products and preserve life.

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