





## Welcome

Zolo Technologies, Inc. provides unique instruments that simultaneously measure key combustion constituents in real-time and in ultra-harsh environments such as fossil-fired power-plants or super-sonic jet engine turbines.

Founded in 1999 to manufacture fiber-optic multiplexers, Zolo Technologies employs innovative wavelength - multiplexed tunable diode laser absorption spectroscopy (WM-TDLAS) instruments which combine lasers, fiber-optic technology, and sophisticated tomographic techniques to measure and map the combustion zone reactions.

# better measurements

As operators and engineers know more about the instantaneous combustion zone environment, they can run it more efficiently and thereby reduce the carbon footprint of the process. Other technologies cannot reliably measure multiple constituents directly in the combustion zone due to the challenges of high temperatures, bright emission, caustic contaminants, and mechanical issues such as vibration.

Zolo Technologies' laser-based instruments enable fossil power plants to balance and optimize the combustion in their boilers to reduce emissions and improve efficiency. Our sensors can also characterize ultra-fast dynamic processes in jet engines allowing engineers to monitor and improve performance and longevity. Industrial processes can be similarly improved with the information available from Zolo Technologies' instrumentation.



## Markets

Zolo Technologies core technology, WM-TDLAS, measures inside ultra-harsh environments where traditional intrusive probes cannot survive.

Using a laser beam to penetrate the combustion zone, our instruments require only small access ports to measure and map important combustion characteristics. Just as better measurement tools enabled the leap from carburetors to fuel injection in automobiles, Zolo Technologies enables fossil-fired boilers to measure directly in the combustion zone and optimize performance through continuous adjustments.

## better results

Optimized combustion results in improved efficiency and a reduced carbon footprint. A wide range of processes can benefit from in-situ measurements of temperature, O<sub>2</sub>, CO, CO<sub>2</sub>, and H<sub>2</sub>O. Real-time maps of the combustion zone enable operators and designers to ensure balanced combustion as fuels and environments change.

In addition, Zolo Technologies instruments can probe parasitic dynamic processes in combustion turbines and aero engines, enabling efficiency improvements and increased longevity. In these high performance applications, measurement rates of up to 100 KHz are possible.

Sensors that are capable of measurements directly in the combustion zone also improve the effectiveness of many existing technologies including CFD modeling, combustion optimization systems (neural networks) and intelligent soot blowing systems.



### MARKETS

- Fossil-fired boilers (coal, oil, and natural gas)
- Industrial boilers
- Black liquor boilers
- Cement kilns
- Steel and aluminum mills
- Glass works furnaces

### APPLICATIONS

- Combustion turbines
- Super-sonic jet engine turbines

### BENEFITS

- Increased efficiency
- Improved reliability
- Reduced green house gas production
- Reduced occurrence of boiler de-rating
- Reduced occurrence of forced outage
- Extended maintenance schedules





## Wavelength Multiplexed TDLAS

Tunable diode-laser absorption spectroscopy (TDLAS) is a proven technique that uses lasers to measure combustion constituents.

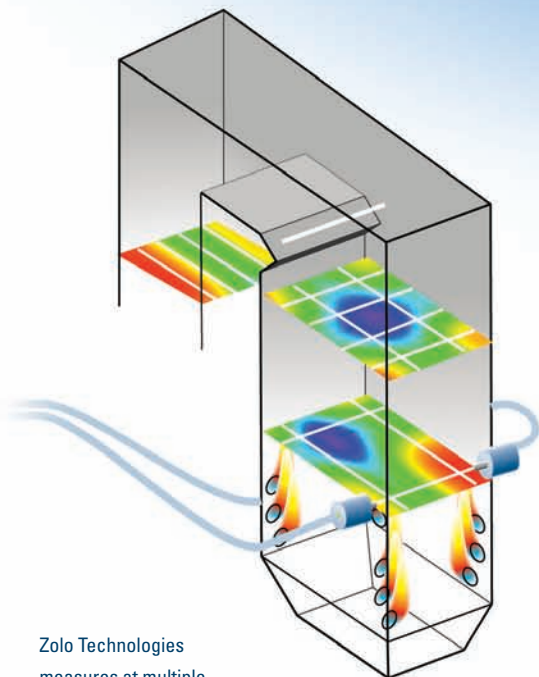
Individual combustion gases absorb light at specific wavelengths, like a fingerprint unique to each gas. By directing a laser beam through the gases and measuring how much light is absorbed at each of these characteristic wavelengths, our solutions determine the concentration of gases along each laser path. TDLAS technology is well proven and has been in use for over 25 years. Since the wavelengths for each constituent do not change, the Zolo Technologies' instruments never need to be re-calibrated and exhibit zero drift.

# increased efficiency

Unlike other instruments that use traditional TDLAS to measure concentrations, Zolo Technologies utilizes a patented wavelength multiplexer. Wavelength multiplexed TDLAS (WM-TDLAS) allows Zolo Technologies to transmit multiple wavelengths on a single optical fiber and simultaneously direct each wavelength through the combustion zone.

Zolo Technologies' WM-TDLAS measures multiple constituents, and temperature, all concurrently. Zolo instruments incorporate telecom industry standard, reliable and robust diode-lasers and optical switches to measure at multiple locations with a single, centrally-located, instrument.

Multiple optical paths can be arranged in an intersecting grid, and the grid can be used to generate two dimensional tomographic concentration profiles for each available constituent and temperature.



Zolo Technologies measures at multiple locations simultaneously, enabling user to map combustion parameters throughout a boiler in real-time.



*Increasingly stringent emission requirements are forcing companies to do more with less. The most effective way to increase efficiency and reduce emissions is to optimize the combustion process.*

## reduced emissions

To accommodate the significant structural movements of a utility-sized boiler, Zolo Technologies incorporates its SensAlign system which actively maintains optimum laser alignment and thereby facilitates the measurements in these mechanically dynamic environments.

Zolo Technologies' wavelength multiplexed TDLAS technology simultaneously measures O<sub>2</sub>, CO, CO<sub>2</sub>, H<sub>2</sub>O, and temperature in very harsh combustion environments such as fossil-fired boilers and jet engine turbines. However, WM-TDLAS technology is applicable to a wide range of additional constituents and can also measure super-sonic gas velocities. Contact us for more information.

**ZoloBOSS**  
Boiler Optimization Spectroscopy Sensor

**SensAlign**

 **ZOLO**  
TECHNOLOGIES



**Zolo Technologies, Inc**

4946 North 63rd Street,  
Boulder, Colorado 80301

T : 303.604.5800

F : 303.530.1843

[www.zolotech.com](http://www.zolotech.com)