ENERGY SAVING WITH O_2 & CO CONTROL SYSTEMS

HIGH AND CONSTANT PERFORMANCE

HIGH COMBUSTION EFFICIENCY

REDUCED POLLUTANT EMISSIONS

baltur

Energy for People

Are you aware of the combustion efficiency of your plant?

CONSTANT HIGH PERFORMANCE

HIGH COMBUSTION EFFICIENCY

Do you know that combustion efficiency is not coxnstant over time?

Combustion efficiency is a critically important element of any heating plant: **higher efficiency means lower fuel consumption and hence lower operating costs**.
However, combustion efficiency is not always constant over time. This depends on the **ability of the plant to regulate the combustion optimally**, despite the different variables to which it is continuously subject, such as:

- **The combustion air temperature and pressure** (intake air used to generate combustion)
- **The back pressure in the generator furnace and the chimney draught**
- **The variations in the heating power**, flow rate or density of the fuel, whatever it is (methane, LPG or other)
- **The condition of the protection filters**
- **The mechanical hysteresis of the regulators**
- **The loss of efficiency of mechanical parts**

These factors, however, cannot be controlled by the traditional combustion regulation systems currently available on the market.
Regular (annual or semi-annual) checks of the system settings, mandatory by law, help to limit such inefficiencies but are not always enough.
In fact, since a correct operation must be ensured in different ambient conditions, the combustion regulation performed during regular checks never guarantees maximum efficiency.

How can you increase efficiency?

CO and O_2 control systems

> **Fuel savings**

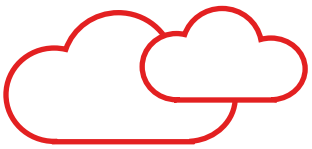
> **Reduced pollutant emissions**

1 The first step to improve combustion efficiency is to measure it.

This can be done simply and continuously by means of a sensor measuring O_2% (oxygen) at the outlet of the exhaust fumes.
In fact, the measured O_2% value is closely related to the combustion efficiency.

An O_2% value (detected at the fume exhaust) close to zero, due to incomplete combustion, results in low efficiency as well as in the production of large amounts of CO (carbon monoxide), which is toxic (combustion with insufficient air).
On the other hand, when O_2% values are too high, the reduction in efficiency is linked to the presence of an excessive air mass in relation to the fuel being fed, which results in a large part of the sensitive heat being lost through the fume outlet of the chimney, thus reducing the heat exchange.
The optimum value for maximizing combustion efficiency is in the 1÷3% range. Usually, existing and currently operating heating plants have an O_2% setting between 4% and 8%, depending on the fuel.

2 The second step to improve combustion efficiency is to change the settings of the system based on the ambient conditions.



This can be done by using an O_2 probe to measure the O_2% in the fumes and change the burner control in real time, following the trend of the preset optimal values.
This ensures that the control maintains unchanged the mixture of fuel and combustion air, even under variable ambient conditions. Therefore, the burner works over the entire operating range according to the set load curve and controls the air flow rate to ensure maximum efficiency under any load conditions.
The setting parameters are defined by the authorised technician when the machine is started.

The oxygen value detected by the probe is continuously compared to the set point value on the curve. Any deviation between the 2 oxygen values (detected/set point) generates a correction signal which is transmitted to the combustion air servomotor or, if present, to an inverter that will regulate the air flow.
The oxygen correction is carried out continuously and automatically and ensures high combustion efficiency and lower levels of harmful emissions. By continuously measuring the O_2 values in the fumes, the system is able to automatically compensate for any combustion environmental or mechanical disturbance factors, **ensuring a high combustion efficiency constant over time**. Field experience shows that an overall 3% improvement on the efficiency of the heating unit can be achieved with O_2 control.

O_2 probe: a simple and reliable solution

Baltur uses zirconium dioxide oxygen detection probes, a reliable and precise measurement solution, stable over time and offering an instant response. It is easy to install as it does not require sample gas neither maintenance nor calibration, even when it is replaced, and can be applied to any fuel, even in the case of applications with flue gas recirculation.

Is it possible to further reduce fuel consumption?

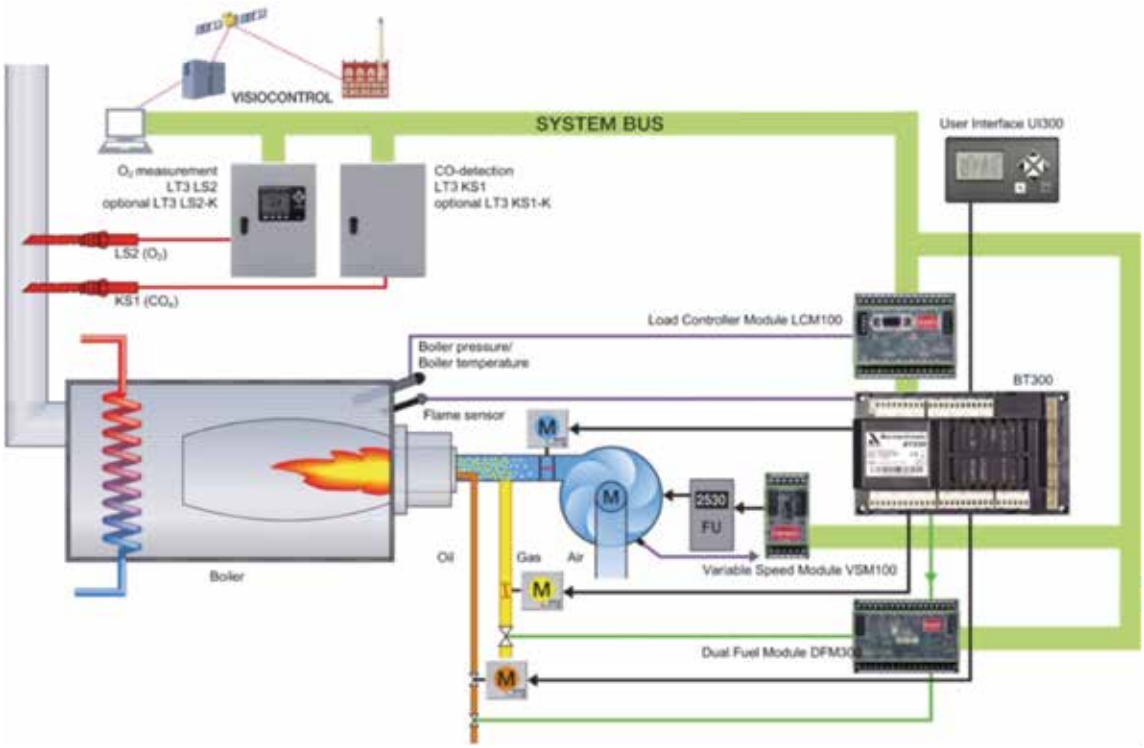
Yes, because the measurement of the O_2% content in the exhaust gas alone cannot indicate if the combustion of the fuel fed into the system has been successfully completed. For this reason, it is very important to be able to detect the content of the unburned gases in the chimney. **The combustion system with CO control (in addition to O_2 control) aims to achieve the working point at the lowest possible excess air value (close to 1÷1.5%) by continuously checking for the absence of CO production increasing furthermore the savings on fuel consumption.**

Moreover, with CO control, the best point for combustion efficiency is automatically given at any moment by the electronic system. For each load condition, the system automatically tries to reach the set point that minimises, at the same time, both O_2 and CO content in the fumes.

The burner, therefore, operates completely independently over the entire working field, continuously monitors CO emissions and keeps excess air to a minimum (by way of example, see the diagram on the next page). **In this way, the CO monitoring ensures optimal, constant performance over time, significant fuel savings and reduced pollutant emissions.**

In the case of multi-fuel burners, depending on the type of fuel, there is the possibility to activate the CO or O_2 regulation (CO control ONLY available for operation with methane gas/LPG) as the chimney probe features a double sensor to measure both CO and O_2 concentrations.

CO CONTROL DIAGRAM



Benefits of CO control over O_2 alone

HIGHER ENERGY SAVING:

estimated up to +0.5% compared to O_2 control

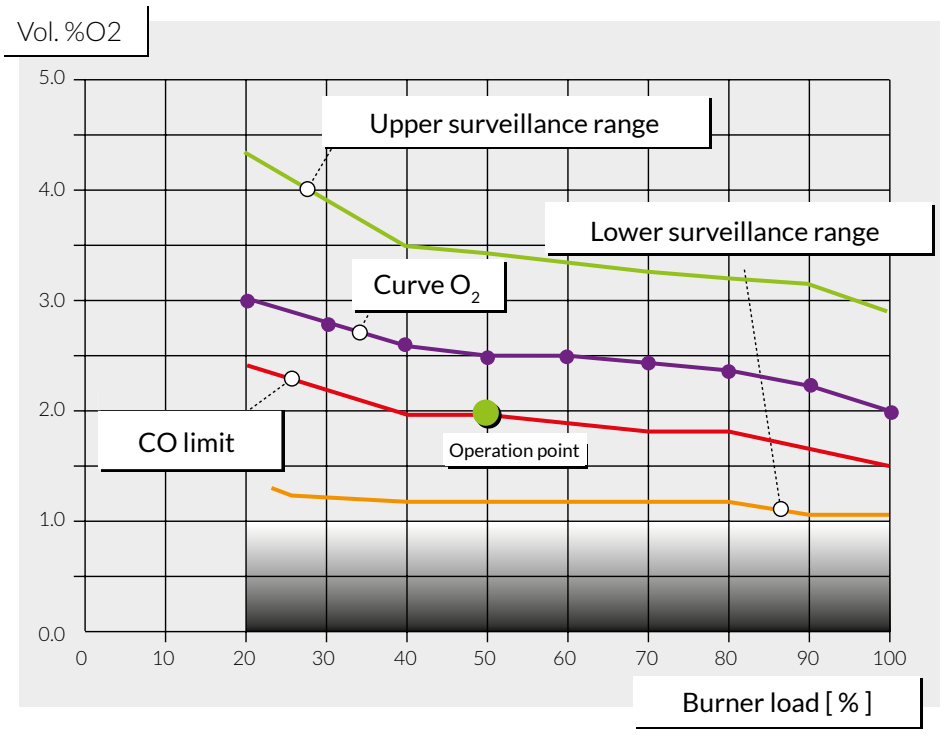
INDEPENDENT OF EXTERNAL AIR:

the measurement and regulation of combustion is highly reliable as it is independent of external air (infiltration). The O_2 control requires a perfect tightness of the connection between boiler, fume duct and chimney, precisely to prevent external air from entering and distorting the O_2 probe reading and hence the combustion regulation.

ABSOLUTE OPERATIONAL SAFETY:

with this system, absolute operational safety is also guaranteed, since unburned gases are directly measured by a CE-certified sensor.

O_2 REGULATION CURVE DEPENDING ON THE LOADING POSITION



O_2 / CO probe and VFD: the ultimate benefit for you and the environment

Attention to the environment and proper use of resources have become an obligation for all business activities. In Baltur, we see this as an opportunity not only to contribute to the **reduction of pollutant emissions**, but also to offer significant economic benefits to our customers.

Baltur burners equipped with **VFD (Variable Frequency Drive)** technology are capable of significantly reducing power consumption, starting from **a minimum of 35% savings** up to **over 45%**, depending on the application.

Success stories:

APPLICATION 1

INDUSTRIAL SECTOR	Dairy production
APPLICATION	Three-pass steam boiler
BURNER	TBG 200LX ME-V O_2
AVERAGE CHANGE IN HEAT LOAD	90% to 60% of rated power

	TBG 200LX ME	TBG 200LX ME-V O2	SAVING
Technology	Low NOx	**Low NOx VFD O_2 probe control**	
Annual power consumption	3,420 kWh	2,092 kWh	1,328 kWh **(38.8%)**
Annual gas consumption	213,891 Sm^3	209,686 Sm^3	4,205 Sm^3 **(1.96%)**

APPLICATION 2

INDUSTRIAL SECTOR	Distillery
APPLICATION	Three-pass steam boiler
BURNER	TBG 650LX ME-V CO
AVERAGE CHANGE IN HEAT LOAD	90% to 75% of rated power

	TBG 650LX ME	TBG 650LX ME-V CO	SAVING
Technology	Low NOx	**Low NOx VFD CO probe control**	
Annual power consumption	84,246 kWh	47,466 kWh	36,780 kWh **(43.7%)**
Annual gas consumption	3,362,994 Sm^3	3,277,156 Sm^3	85,838 Sm^3 **(2.55%)**

APPLICATION 3

INDUSTRIAL SECTOR	Chemical industry
APPLICATION	Thermal oil boiler
BURNER	TBG 200LX ME-V CO
AVERAGE CHANGE IN HEAT LOAD	100% to 30% of rated power

	TBG 200LX ME	TBG 200LX ME-V CO	SAVING
Technology	Low NOx	**Low NOx VFD CO probe control**	
Annual power consumption	6,296 kWh	3,680 kWh	2,616 kWh **(41.5%)**
Annual gas consumption	385,288 Sm^3	375,601 Sm^3	9,687 Sm^3 **(2.51%)**

Fields of application

- Residential heating
- Industrial
- Dryers
- Paper mills
- Incinerators
- Paint booths
- Asphalt machines
- Food and beverage
- Livestock industries
- Roasting
- Ceramics
- District heating

Some projects

DISTRICT HEATING - SPECIAL PROJECT
Burner model: **PBR 6 G ME V O2 FGR**
- 5MW plate burner - O2 control, flame register, inverter and flue gas recirculation
NOx <80mg/kWh

PAPER MILLS - SPECIAL PROJECT
Burner model: **TBG 1100 ME V O2 FGR**
- O2 control, inverter and flue gas recirculation
NOx <80mg/kWh

DISTRICT HEATING
Burner models: **No.6 IB 1200 G ME LX**
- electronic modulation
- Low NOx combustion head
- O2 control

HOSPITAL HEATING
Burner models: **No. 2 IB 650 G ME CO V, No. 2 IB 1200 G ME CO V**
- electronic modulation
- inverter and CO control
NOx <100mg/kWh

PLEASE CONTACT YOUR
SALES REPRESENTATIVE
FOR MORE INFORMATION.

FOOD AND BEVERAGE
Burner model: **TBG 600 ME CO V**
- electronic modulation
- inverter and CO control

HOSPITAL HEATING
Burner models: **No. 3 TBML 800 ME CO**
- electronic modulation
- inverter and CO control

FOOD AND BEVERAGE
Burner model: **TBG 800 ME CO O2 V**
- electronic modulation
- inverter, O2 and CO control
- superheated water boiler - 170°C 20 bar

HOSPITAL HEATING
Burner models: **No. 2 TBR 8GL ME O2 V, No. 1 TBML 800 ME O2 V, No. 1 TBG 210 ME, No. 1 TBML 200 ME**
- electronic modulation
- inverter and CO control

Energy for People

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