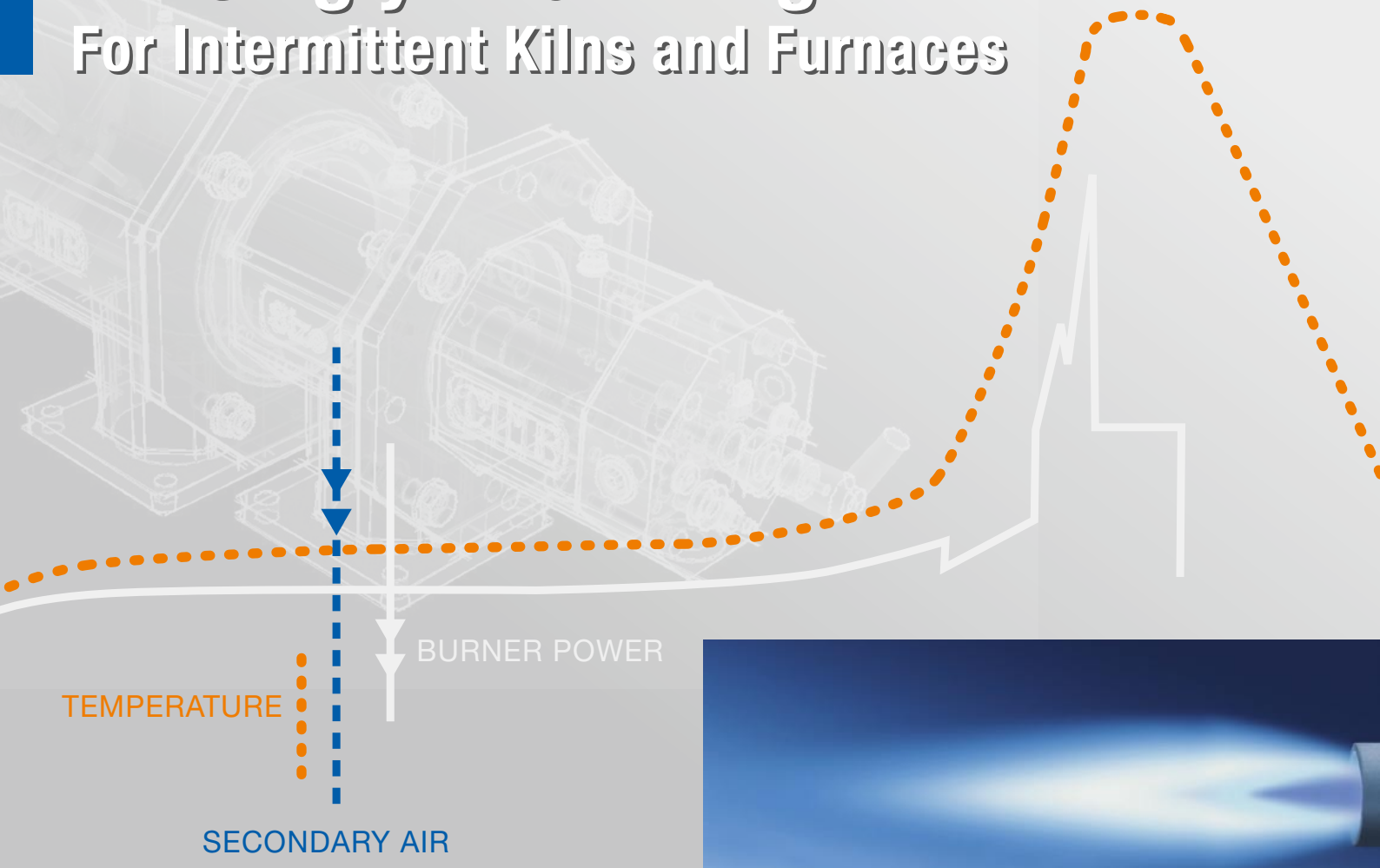
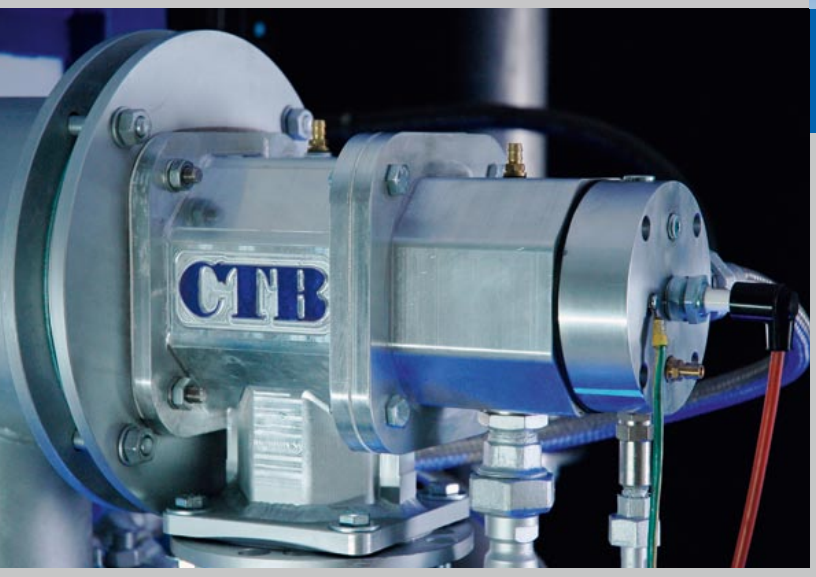
Energy Tuning
For Intermittent Kilns and Furnaces





TRUE BLUE Burners

A STATE-OF-THE-ART BURNER SERIES THAT FULFILS HIGHEST STANDARDS IN THE HEAT TREATMENT OF CERAMICS

CTB
The Kiln Company

TRUE BLUE Burners

For enhancing quality and saving energy in gas-fired intermittent kilns and furnaces

Rising requirements in firing systems

Periodic/intermittent kilns and furnaces require a burner design that is not only capable of high output for maximum firing temperature and maximum heating rates, but also low output for periods of the cycle that does not require much energy. For instance during initial heat-up or in particular for process control during the de-bind portion of the firing cycle. This fact requires burners with a very high dynamic range (turn-down ratio).

At very low burner outputs, the velocity and the volume of the products of combustion from the burner is too low to generate the necessary turbulence in the firing atmosphere. Therefore, an additional amount of air as secondary or diffusion air is required to optimize the firing process regarding heat transfer and temperature uniformity. In some extent it helps lowering the dynamic range of the burners.

Currently, there is not an industrial burner nor control equipment available in today‘s market capable of such a high dynamic range required for an energy efficient and optimized firing process. Generally, the burner output can be controlled in the range of 10-100 % of the nominal capacity. Below 10 % of the capacity, severe operating problems occur resulting in flame outs of the burners and non-uniformity in the process. To solve the existing problems, the burners must always operate above their minimum outputs to function well and allow process temperature control. To compensate the high heat input from the burner, excessive amounts of secondary/diffusion air is required to maintain the kiln temperature. This has its price!

Waste of energy

- Burners operate at a higher output than is truly required.
- Excessive amounts of secondary/diffusion air causes excessive amounts of exhaust gases. Typically these gases must be treated with a catalytic or thermal oxidizer to comply with environmental regulations, thus resulting in more wasted energy.

Quality issues

- Excessive amounts of secondary/diffusion air can potentially cause cracks on the surface of the product around the ware stack due to excessive heat transfer to the product located within this area.
- Excessive amounts of secondary/diffusion air might get the kiln atmosphere too rich in oxygen, which accelerates exothermic reactions of the organic binders in the product. These reactions happen at the surface of the product creating higher temperature differentials within the product. Incidentally, exothermic reactions initiate most cracks.

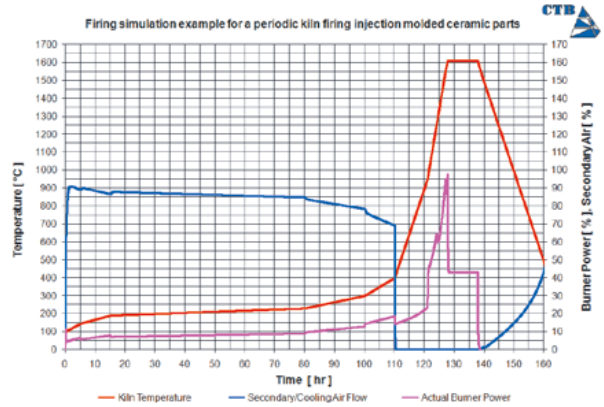
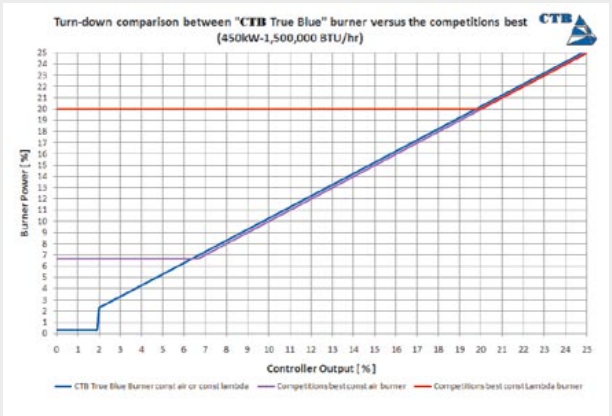


Chart 1: For a defined optimum firing curve (red line), the energy requirement of the burners in the first 80 hours of the firing cycle is well below 10 % of the burner capacity. The volume of secondary/diffusion air shown here (blue line) is necessary for good temperature uniformity as well as for the firing atmosphere. Burners that do not cover the lower control range are not suitable for this model process.

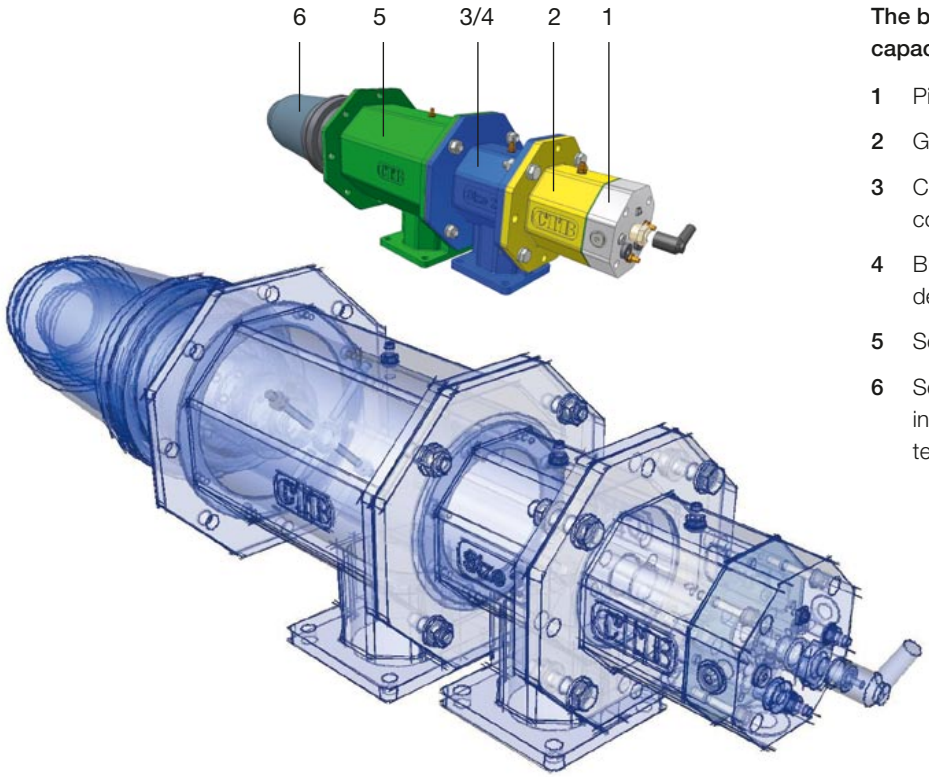


The solution
Utilizing potential with TRUE BLUE burners

The development of the new CTB burner provides an extremely energy-efficient solution to the problems explained above. These burners operate well below 10% of the nominal capacity to form a stable and blue soot-free flame. The control range is extended to 2-100 % (turn down ratio of 1:50) of the nominal capacity at constant Lambda and to 0.7-100 % (1:100) at constant air volume: The TRUE BLUE burners have closed a gap on the international market for industrial burners!

Chart 2 illustrates the difference in the regulation and control of a TRUE BLUE burner compared to the best burners currently available on the market for ceramic kiln and furnace construction.
The name TRUE BLUE was specifically chosen for the new burner generation with allusion to the blue color of a gas flame during stoichiometrically optimal combustion.
The TRUE BLUE burner‘s unique design comes in 3 sizes that are optimal for today‘s diverse firing and atmosphere requirements catering to the ceramic industry!

Burner size	Application	Output range kW (BTU/hr)	
1	Continuous firing units, small-size intermittent firing units	15-100	(50,000 - 340,000)
2	Medium-size intermittently operated firing units	100-300	(340,000 - 1,000,000)
3	Intermittently operated large-volume firing units	300-600	(1,000,000 - 2,000,000)



The basic burner set-up is identical for all three capacity classes:

1 Pilot housing with integrated pilot burner

2 Gas housing with flame cell

3 Combustion air housing for preheated combustion air to 350 °C

4 Burner nozzle available in different grades depending on the firing temperature

5 Secondary/diffusion air housing (optional)

6 Secondary/diffusion air burner nozzle available in different grades depending on the firing temperature (optional)

CTB uses proprietary process simulation software in order to help the customer choose the optimum burner size for a defined firing cycle. In this simulation, the necessary volumes of secondary/diffusion air are calculated to ensure optimal temperature distribution and to comply with requirements for the concentration of combustibles in the firing atmosphere specified in the European standard EN1539 and the American standard NFPA 86-2003 respectively. However, if the amount of secondary/diffusion air creates atmosphere that is too high in oxygen, low oxygen or any other process gas can be supplied and mixed with the burner jet to maintain the proper oxygen level inside the kiln. This is often required in order to have better control of the de-bind process.

The Optimum Solution
TRUE BLUE burners in Combination with CTB Firing Technology

- **TRUE BLUE high-velocity burners** for all gaseous fuels with clearly enhanced control, available with supplementary secondary air or secondary gas connection.
- **High-precision regulation** of the fuel media supplied based on measurement of the mass flow rates instead of temperature- and pressure-dependent volume flow rates over a control range of 1:150 at constant combustion air or 1:50 at a constant lambda value.
- **Single burner mode** freely selectable from pulsed operation through proportional regulation to automatic optimization of the burner jet to ensure constant heat transfer conditions with optimum temperature balancing.
- **Maintenance-free** - no manual adjustment of the burners required, not on start-up nor after several years of operation. No inter-influence of the gas and combustion air streams as a result of individual burner regulation.
- **Single burner regulation** for gas, air and secondary air streams over the entire control range.
- **Auto-regulation of secondary air** to meet the highest requirements for temperature distribution and constant firing atmosphere.
- **Auto-regulation of the air-gas ratio** for every firing atmosphere required.
- **Automatic generation of an optimal, product-specific firing curve** with CTB - “Energy Transfer Control (ETC)” software.
- **Measurement of the concentration of organic constituents** in the firing chamber and defined regulation for expelling/debinding organic additives in the product.
- **Remote operation** - the kiln/furnace can be completely remote-monitored and controlled, consequently remote diagnostics and trouble-shooting by CTB are also possible - from anywhere - worldwide!
- **Mobility** - transfer of alarms, state and values of variables and messages to a mobile phone - the firing system is always “under control” even when the operatives are absent.

CTB
The Kiln Company

CTB ceramic technology gmbh berlin
Industriestraße 16
D - 12009 Berlin
Phone: +49-30-340 956 0
Fax: +49-30-340 956 99
E-Mail: mail@ctb-berlin.de
Internet: www.ctb-berlin.de

CTB North America Inc.
1025 Flint Ridge Road
Hopewell, Ohio 43746
USA
Phone: +1-607-368 9545
E-Mail: mail@ctb-usa.com
Internet: www.ctb-usa.com

TRUE BLUE_1_EN_10/09