



BFT-Industriefeuerungstechnik

Brenner und Feuerungstechnik Burner and Firing Technology

INDUSTRIEBRENNAGGREGATE * IMPULSBRENNTÉCHNIK * PM-BBM REGELUNGSTECHNIK

Combustion plant for ceramic firing processes

BBM- Impulse fan burner with LAMBDA automatic

Plant: Tunnel kiln 75 m with periodical push process

Products: Process ceramics

Firing Problems: Water uptake tolerance
Shrinkage allowance
Homogeneous temperature control in the combustion chamber

Objectives before reconstruction:

- Homogeneous temperature compensation in the firing zone
- Improvement of the water uptake tolerance
- Reduction of Energy (Gas and Electrical)
- Reduction of CO₂ Emissions
- Reduction of noise emissions
- Changeover to Vipa S7 with Profibus communication
- General improvement of the combustion quality

Reconstruction Goals:

- Elimination of above shown problems
- Installation of new electronic wiring
- Energy savings of 20% (Natural gas)
- Energy savings of 50-80% (Electric)
- Reduction of noise emission to max. 50 dB





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Technical details of existing tunnel kiln:

Tunnel kiln body: 75 m length split up in the pre-fire zone and main-fire zone, 2x hot air exhausts, rapid cooling and air-push fan

Combustion type: Side combustion

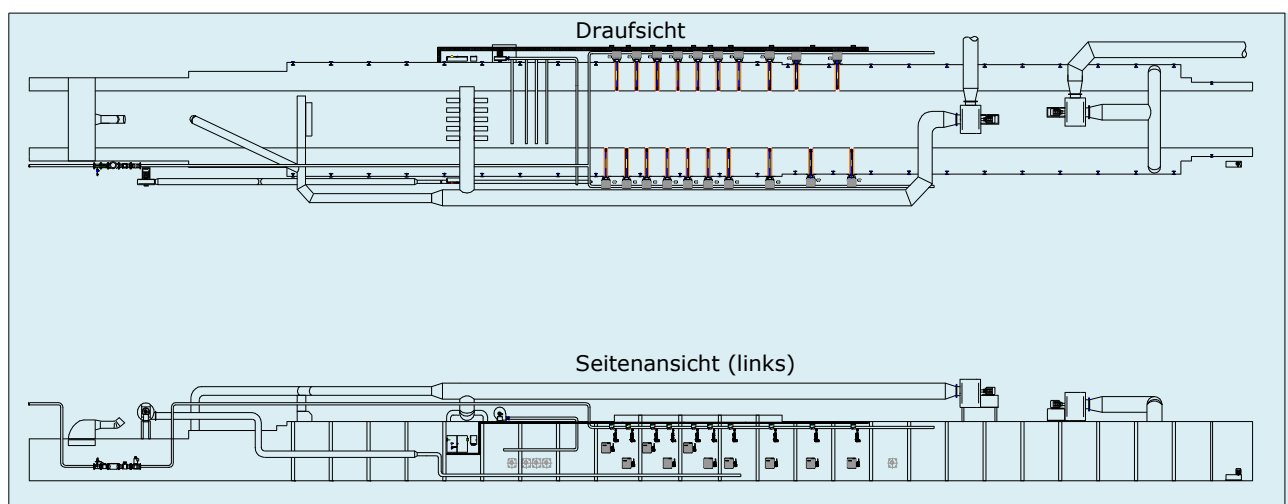
Burners: 8 x WG-10/ Burner 15-185 kW – 0-800 Imp. /Min.
12 x WG-20/ Burner 25-250 kW – 0-800 Imp. /Min.

Combustion temperature: product dependent 1150° to 1300°

Firing zone lay-out:

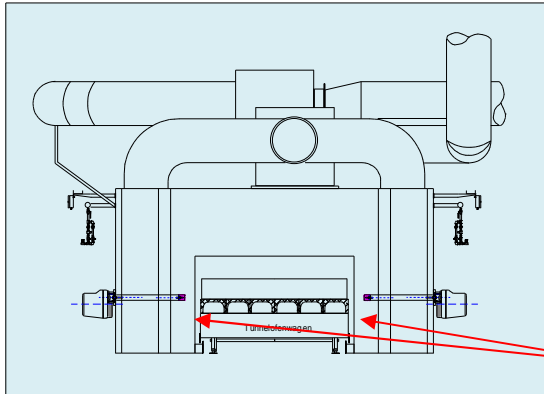
Pre-fire zone: 4 firing zones with each 3 Burners max. 180kw combustion performance
Main-fire zone 1: 5 firing zones with each 2 or 3 Burners max 200kw combustion performance
Main-fire zone 2: 2 firing zones with each 2 Burners max. 200kw combustion performance

AutoCAD drawing



Firing zone classification in cross-sectional area (pre- and main fire)

Combustion chamber cross section pre fire



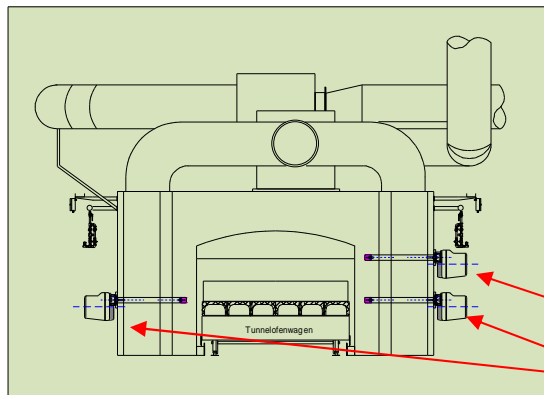
3 Firing zones with each 2 impulse fan burners with LAMBDA automatic. Under plateau firing.

Technical data burners:

Burner performance: 20-180 kW
 Impulse output: 0-800 Imp. /Min.
 LAMBDA control: Combustion air volume
 Impulse frequency dependent

Under plateau firing

Combustion chamber cross section main fire



4 Firing zones with each 2 or 3 impulse fan burners with LAMBDA automatic. Under plateau and vault firing.

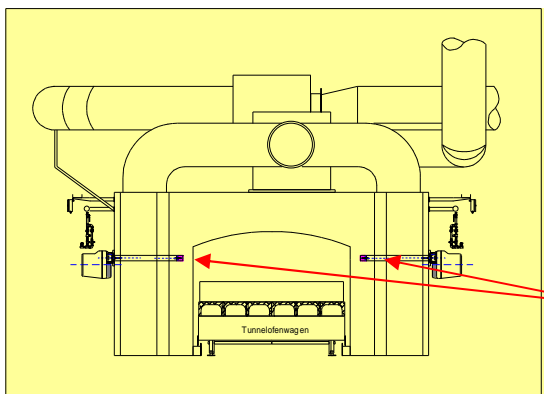
Technical data burners:

Burner performance: 20-280 kW
 Impulse output: 0-800 Imp. /Min.
 LAMBDA control: Combustion air volume
 Impulse frequency dependent

Vault firing

Under plateau firing

Combustion chamber cross section main fire (rear)



2 Firing zones with each 2 impulse fan burners with LAMBDA automatic. Vault firing.

Technical data burners:

Burner performance: 20-280 kW
 Impulse output: 0-800 Imp. /Min.
 LAMBDA control: Combustion air volume
 Impulse frequency dependent

Vault firing



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Description of the replacement:

The reconstruction was done in 5 steps as subsequently described in the companies winter downtime.

Step 1: Cutting out the complete old combustion equipment:

- Disassembling of the complete combustion equipment(side combustion)
- Disassembling of the combustion air fans
- Disassembling of the complete media distributor system of the comb. Air
- Demounting of all electrical components of the old combustion system
- Demounting of the old cable line construction

Step 2: Complete electronic wiring:

- Assembly of cable trays
- Assembly of complete cable wiring
- Assembly of the peripheral control units

Step 3: Complete assembly of the new combustion equipment:

- Assembly of the single firing zones
- Assembly burners
- Assembly of the cutting points for natural gas

Step 4: Final assembly:

- Electronical connection to the burners
- Complete connection to the control and metering equipment

Step 5: Start of operation and lineup of all firing equipment:

- Electronical function tests
- Gas leak tightness tests
- Functional tests of all burners
- Progressive start of all firing zones
- Adjustment of gas and air volume of all burners



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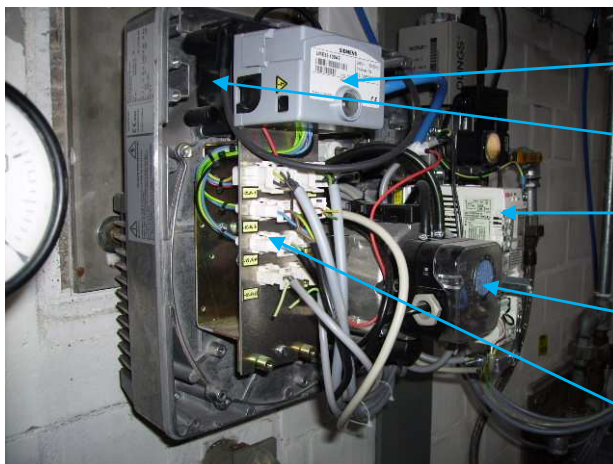
Picture gallery tunnel kiln:

Firing zone set up



Head burner (firing lower vault)

Lower burner (firing lower vault)



Flame control device (Siemens LME)

Integrated ignition transformer

Frequency converter for infinitely control of the combustion air

Pressure control for combustion air monitoring

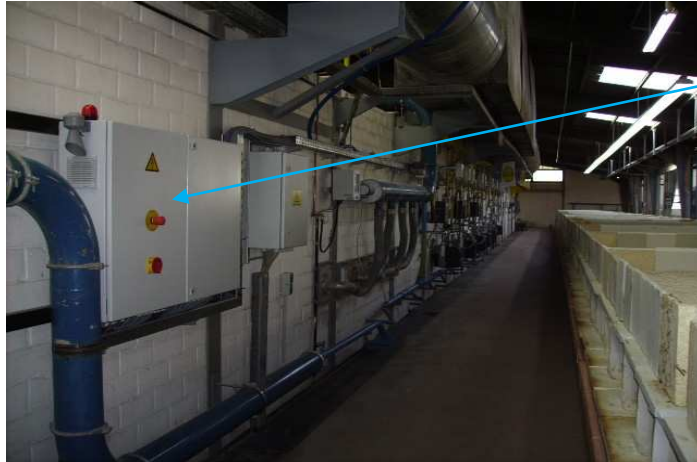
Connector interface for the different peripheral devices



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Measuring and Control System

Decentralised SPS control (VIPA S7) at both kiln sides for each 10 burners with Profibus coupling
Main control system in control room

Measuring and control station



VIPA S7 technology with Profibus

Output terminal blocks to each combustion point

Set-up measuring and control station



Distribution box for each burner with status indicator and wiring for the electronic burner coupling

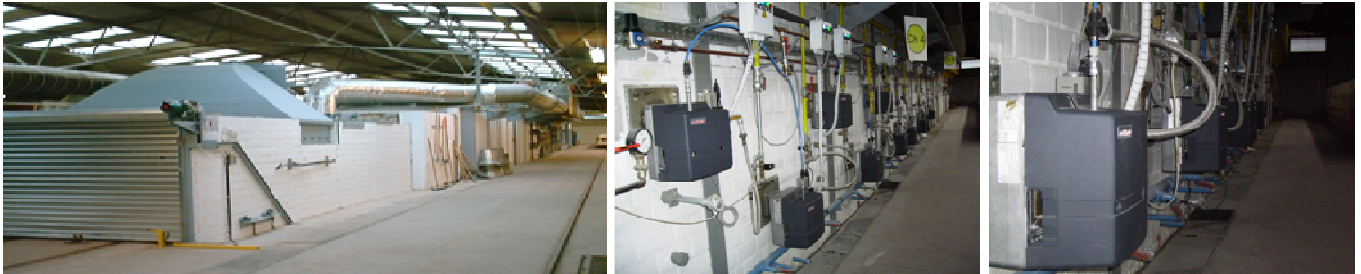
Distribution Box



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Tunnel kiln reconstruction with impulse fan burner technology.

After reconstruction of the tunnel kiln all the above mentioned goals have been achieved. Energy savings of natural gas have been constant around 19-20% over a period of 1 year. Furthermore a proportionate reduction of CO₂ emissions. Therefore a noteworthy relieve for the environment is being done.

Quantitative modification of energy consumption of the kiln and plant:

Kiln	<u>Before reconstruction</u>	<u>After reconstruction</u>
Electric energy [kWh/ year]	289.080	96.360
Fuel consumption [kWh/ year]		
Natural gas	1657 kWh/p.m.	1387 kWh/p.m.
Time period:	Year 2010 March to June October + November (Short-time work)	Year 2011 February to December
Electronical power output	33 kW/h	11 kW/h
Further factors:		Less breakage

Quantitative modification of the complete energy consumption of the plant:

Electronical power consumption [kWh/ year]	822.000	709.200
Fuel consumption [kWh/ year]		
Natural gas:	19.880.000	16.574.400



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Result:

With our impulse fan combustion technology energy savings of 20-25% can be achieved at industrial firing equipment in areas between (1-6 MW) flame output.

Summary:

Under consideration of all above mentioned firing problems, the main aspect was a worthy reduction of energy costs and emission output in connection with improvement of the product quality.

With our latest development the impulse fan burner all of these goals could easily be achieved and furthermore new improvement ideas developed.

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