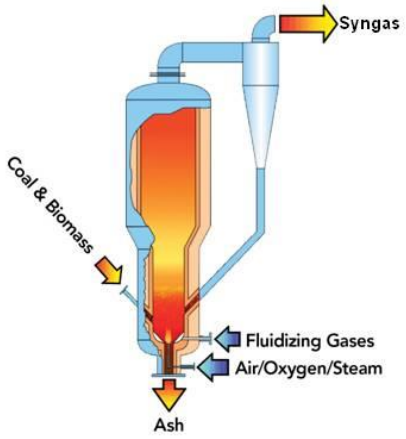
USE OF ALTERNATIVE COMBUSTION TECHNOLOGIES



BERALMAR TECNOLOGIC S.A.

SANTI AMPOSTA
R&D Manager
with Beralmar since 1992

MIQUEL MOIX
Sales Area Manager
with Beralmar since 2002

OUR COMPANY


Göteborg
North Sea
Danmark
Denmark
United Kingdom
Ireland
Éire
Birmingham
Nederland
Netherlands
Berlin
London
Paris
Česká rep
Czech Rep
Vaduz
Österreich
Austria
France
Milano
Bay of Biscay
Hrvatska
Croatia
Torino
Marseille
Barcelona
Catalonia
Roma
Portugal
España
Spain
Lisboa
Tyrrhenian Sea
Algiers
Tunis
Parc Naturel Régional des Pyrénées Ariégeoises
Bagnères-de-Luchon
Vielha
Ax-les-Thermes
Perpignan
Thuir
Prades
Elne
Port Leucate
Andorra la Vella
Le Boulou
Argelès-sur-Mer
El Pont de Suert
Campo
La Seu d'Urgell
Puigcerdà
Banyuls-sur-Mer
Figueres
Graus
Tremp
Coll de Nargó
Ripoll
Olot
Roses
Berga
Banyoles
L'Escala
Torelló
Solsona
Girona
Torroella de Montgrí
Catalonia
Vic
Cassà de la Selva
El Moianès
Palamós
Balaguer
Agramunt
Manresa
Sant Feliu de Guíxols
Lleida
Tàrrega
Granollers
Calella
Mollerussa
Terrassa
Sabadell
Fraga
Les Borges Blanques
Martorell
Barcelona
Seròs
Valls
Vilanova i la Geltrú
L'Hospitalet de Llobregat
Reus
El Vendrell
Tarragona
Gandesa
Cambrils
Tortosa
L'Ampolla
Amposta
Sant Carles de la Ràpita

OUR COMPANY

50 Beralmar
years with you!

1964 - 2014

OUR COMPANY IN 1964

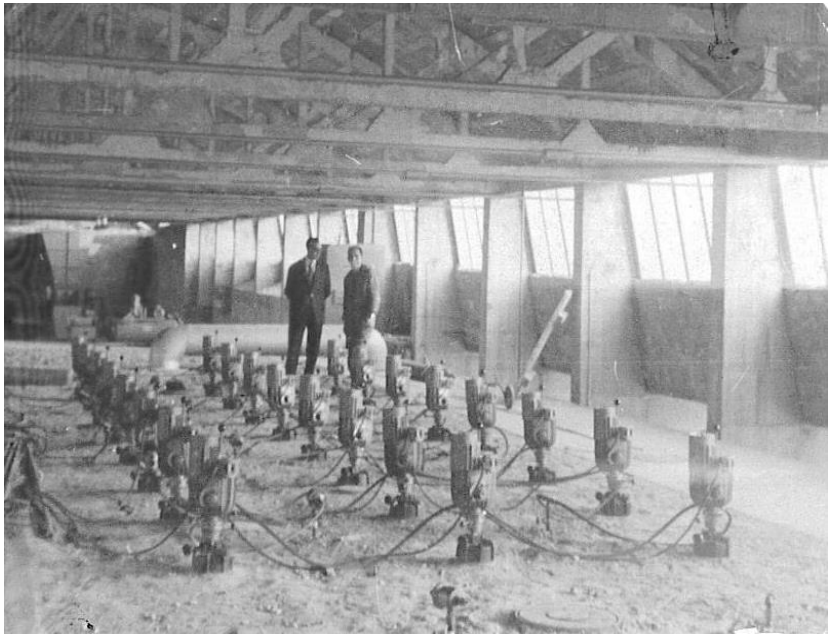
“ BERALMAR manufactures heavy-oil burners for hoffmann kilns ”

1 product

Workshop of a partner brickyard

<5 employees

Customers only in Spain



HISTORY 1964-2014

- **60's**: Foundation in 1964. Manufacturing of heavy-oil injectors.

- **70's**: Natural gas distribution arrives to many brickyards in Spain. Beralmar starts manufacturing gas burners. First supply of combustion equipment for dryers.

- **80's**: Development of automatic control systems for dryers and kilns.

- **90's**: Development of solid fuel firing systems. Foundation of Technical Office for Kilns and Dryers.

- **2000's**: Foundation of the Technical Office of Automations. Beralmar is able to supply complete plants.

OUR COMPANY IN 2014

“ BERALMAR designs, manufactures and supplies equipment and engineering for the brick and tile industry (heavy clay ceramics) ”

Full product range

Workshop of 4.200 sqm

>70 employees

Customers in over 50 countries

OUR COMPANY IN 2014

OUR COMPANY IN 2014

OUR COMPANY IN 2014

OUR COMPANY IN 2014

OUR COMPANY IN 2014

OUR COMPANY IN 2014

OUR COMPANY IN 2014

OUR COMPANY IN 2014

Beralmar

OUR COMPANY IN 2014

MANAGEMENT

RAMON SARIÓ and CRISTÒFOL CAPARRÓS – Managing Directors since 1982.

Sole shareholders.

Full-time and exclusive dedication.

OUR COMPANY IN 2014

PROFESSIONAL TEAM

>70 full time employees, of which:

- 30% college graduates.
- 90% providing direct customer service.

SCOPE OF SUPPLY

» Equipment

Firing equipment

Drying equipment

Automations

» Engineering

Kilns

Dryers

Complete plants

EQUIPMENT – Firing Technology

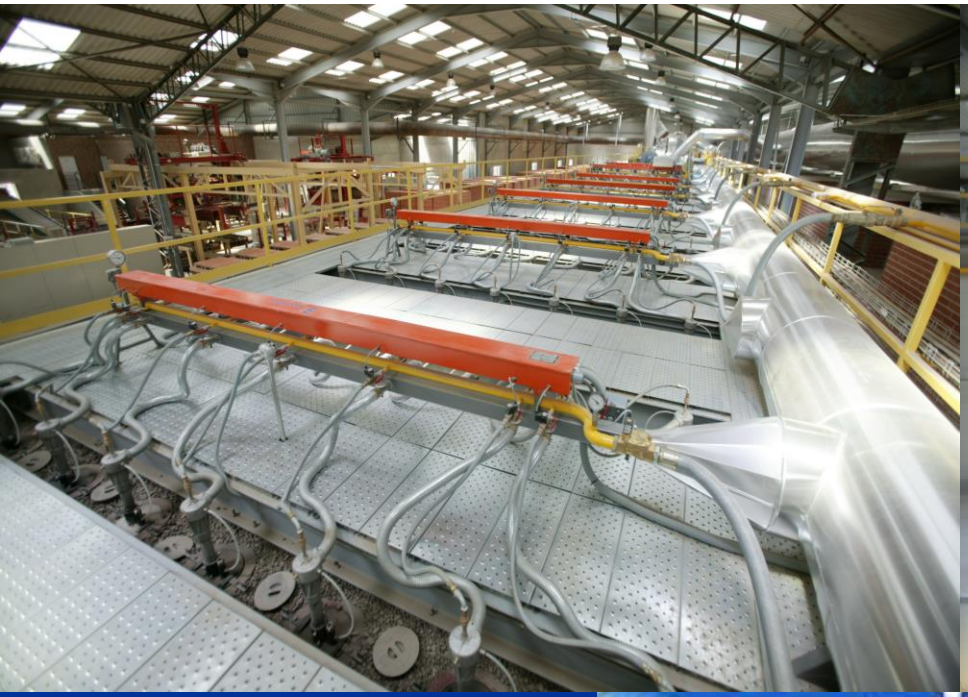
GAS BURNERS for hoffmann kilns

High speed and impulsion.

EQUIPMENT – Firing Technology

GAS BURNERS for tunnel kilns

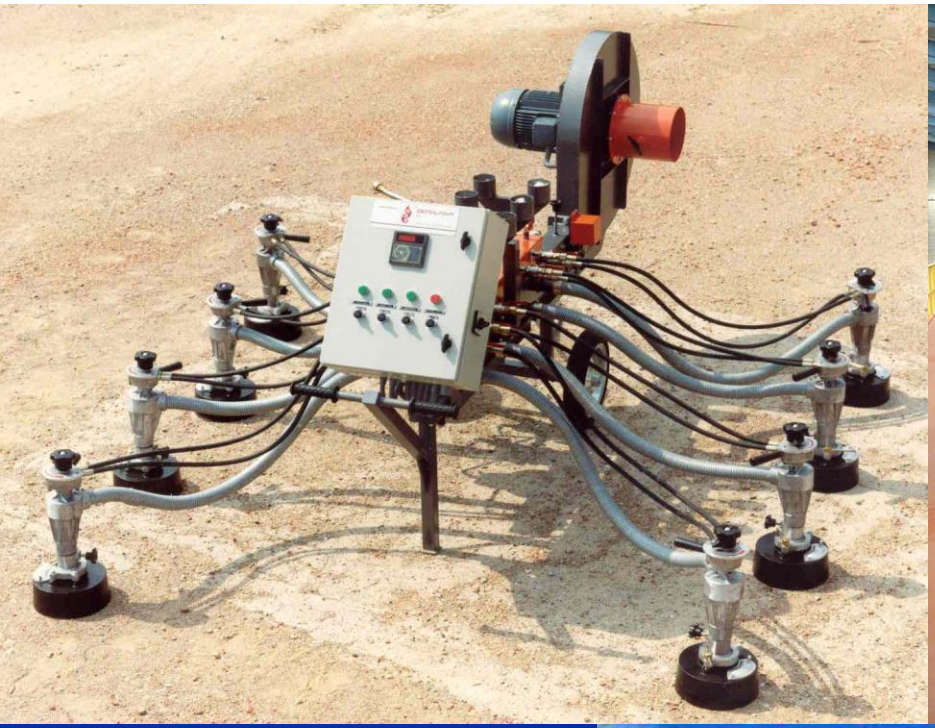
The widest range: top, lateral, high speed, impulsion, etc.



EQUIPMENT – Firing Technology

HEAVY OIL BURNERS

for Hoffmann kilns



for Tunnel kilns

EQUIPMENT – Firing Technology

SOLID FUEL BURNERS for hoffmann kilns

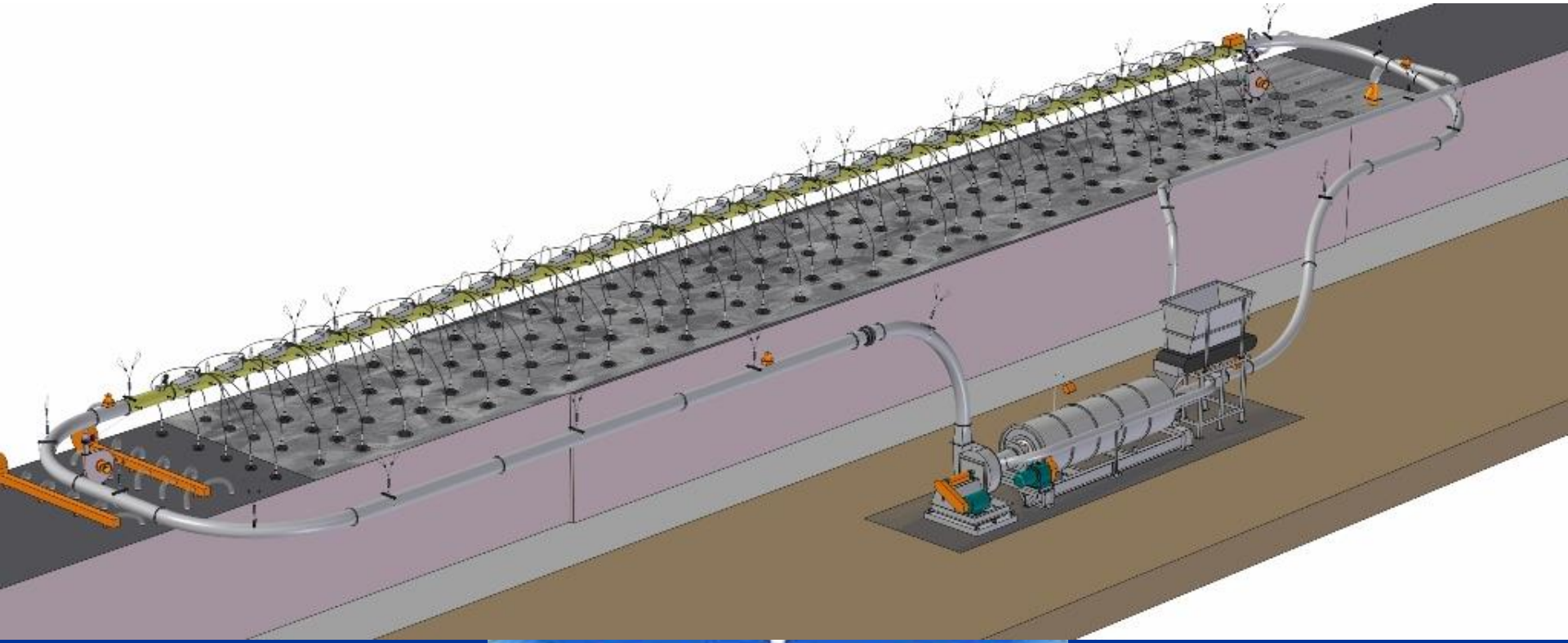
old GQS/82 model

new GQS/82 model

EQUIPMENT – Firing Technology

SOLID FUEL BURNERS for tunnel kilns

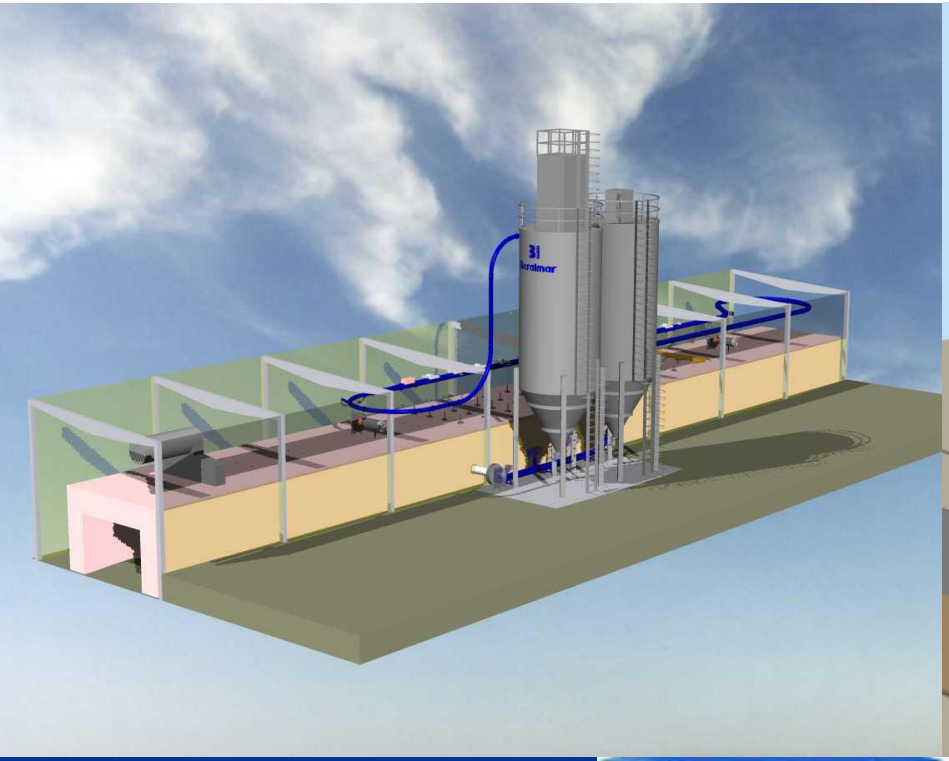
PROMATIC System – consumption of raw coals or petcoke

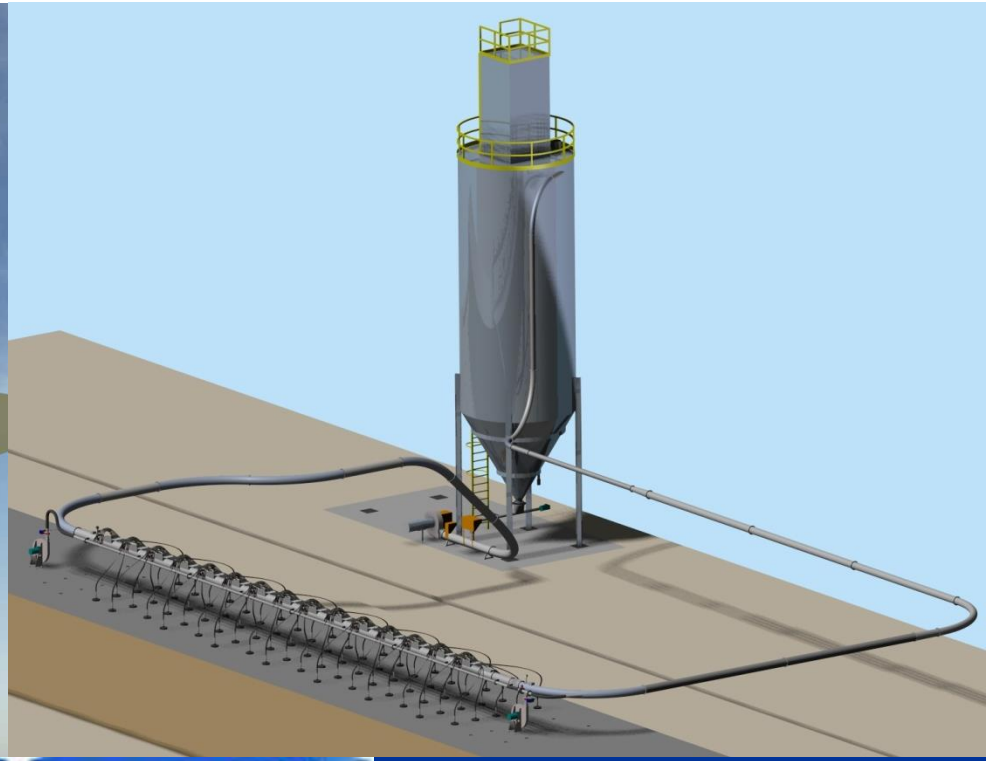


EQUIPMENT – Firing Technology

SOLID FUEL BURNERS for tunnel kilns

MICROMATIC System – consumption of micronized petcoke





EQUIPMENT – Firing Technology

SOLID FUEL BURNERS for tunnel kilns

BIOMATIC System – consumption of biomass

EQUIPMENT – Drying Technology

ALL KIND OF VENTILATORS for the drying process

Conical

Axial

Fixed

Traveling

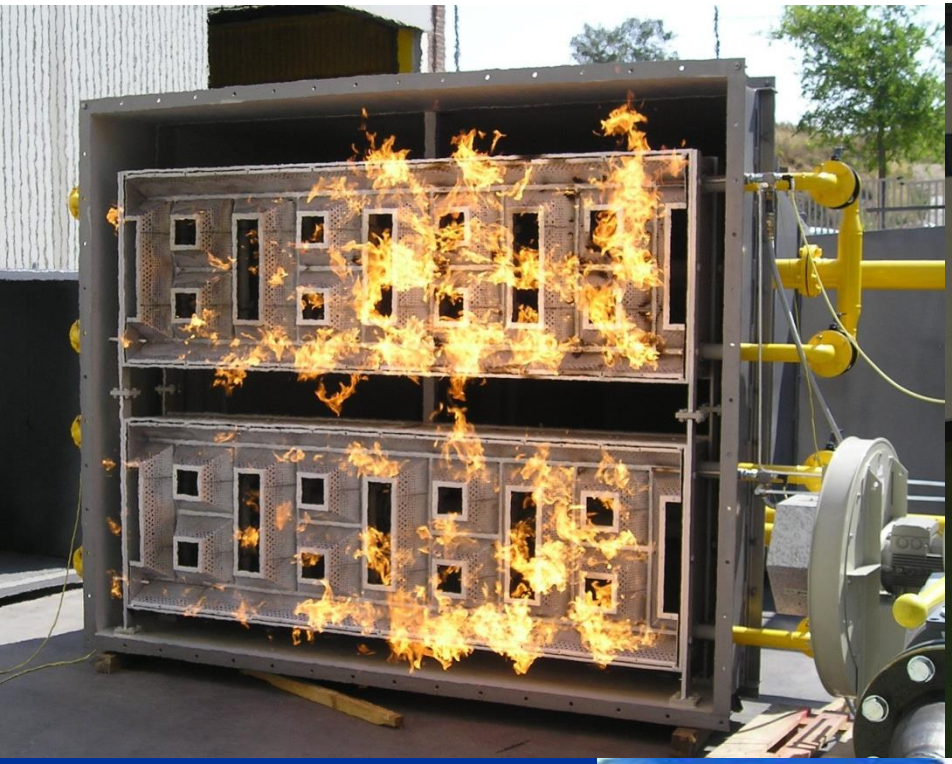
All sizes

All powers

EQUIPMENT – Drying Technology

HEAT GENERATORS for all kind of fuels

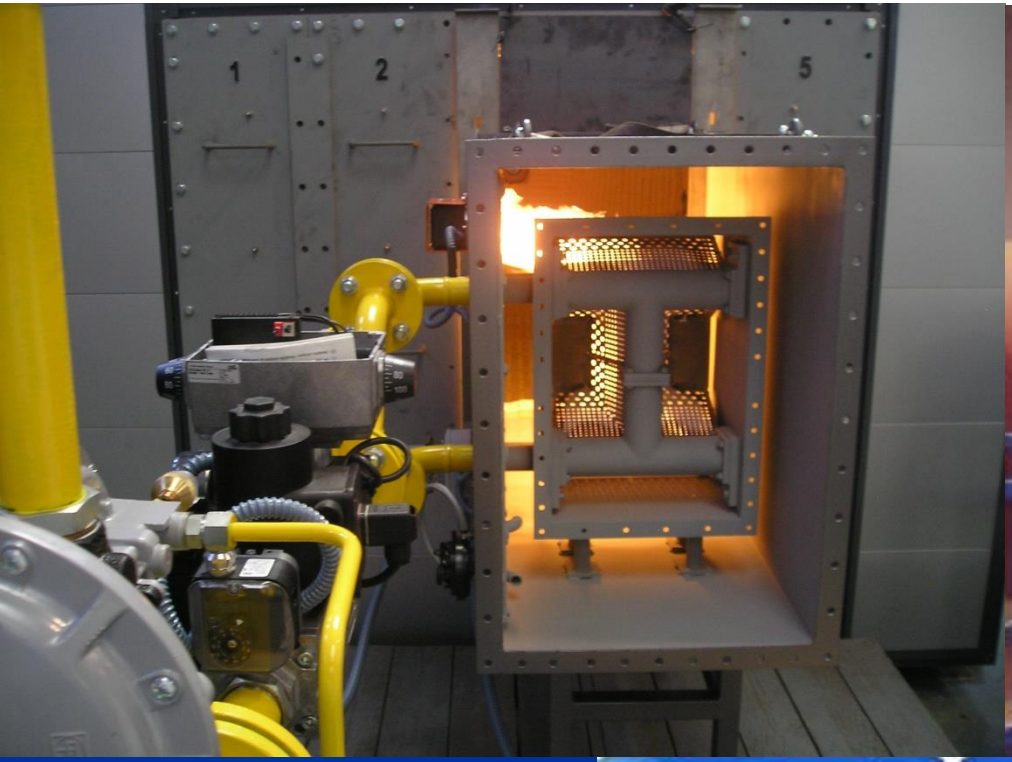
NATURAL GAS - PROPANE

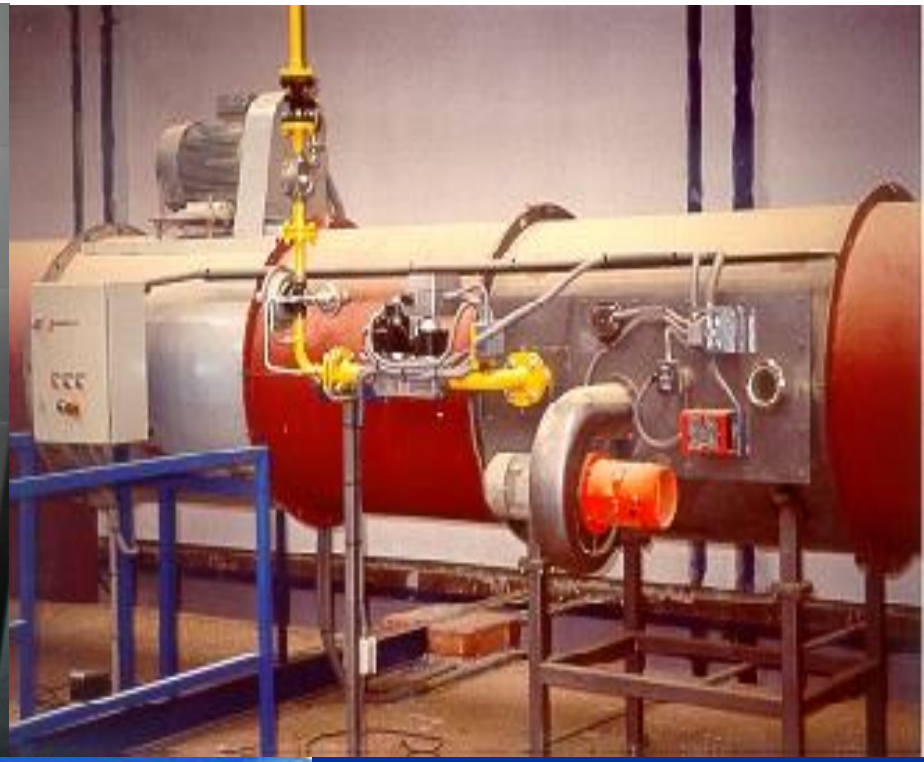


EQUIPMENT – Drying Technology

HEAT GENERATORS for all kind of fuels

NATURAL GAS - PROPANE - BIOGAS





EQUIPMENT – Drying Technology

HEAT GENERATORS for all kind of fuels

HEAT EXCHANGERS FOR **HEAVY OIL - DIESEL**

HOT, CLEAN AIR
FOR THE DRYER

70-80%
EFFICIENCY

EQUIPMENT – Drying Technology

HEAT GENERATORS for all kind of fuels

HEAT EXCHANGERS FOR **SOLID FUELS**

HOT, CLEAN AIR
FOR THE DRYER

70-80%
EFFICIENCY

EQUIPMENT – Drying Technology

HEAT GENERATORS for all kind of fuels

COMBUSTION CHAMBERS FOR **HEAVY OIL - DIESEL**

DIRECT FUEL COMBUSTION

99% EFFICIENCY

EQUIPMENT – Drying Technology

HEAT GENERATORS for all kind of fuels

COMBUSTION CHAMBERS FOR **SOLID FUELS**

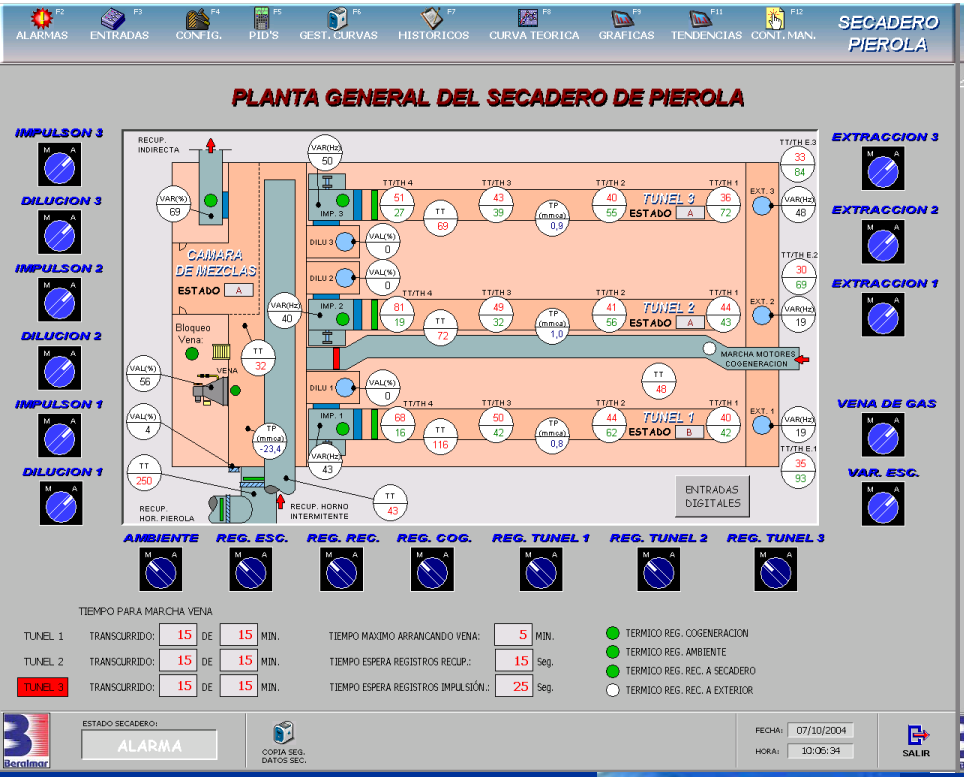
DIRECT FUEL COMBUSTION

99% EFFICIENCY

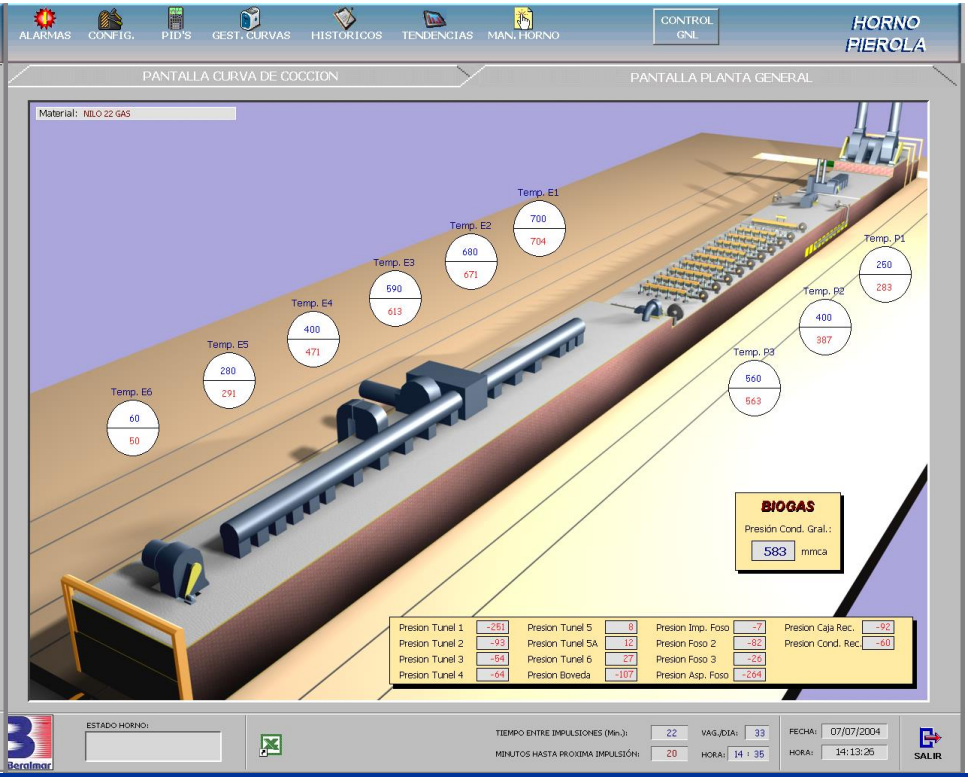
EQUIPMENT – Control

Automatic control management of drying and firing

DRYER CONTROL



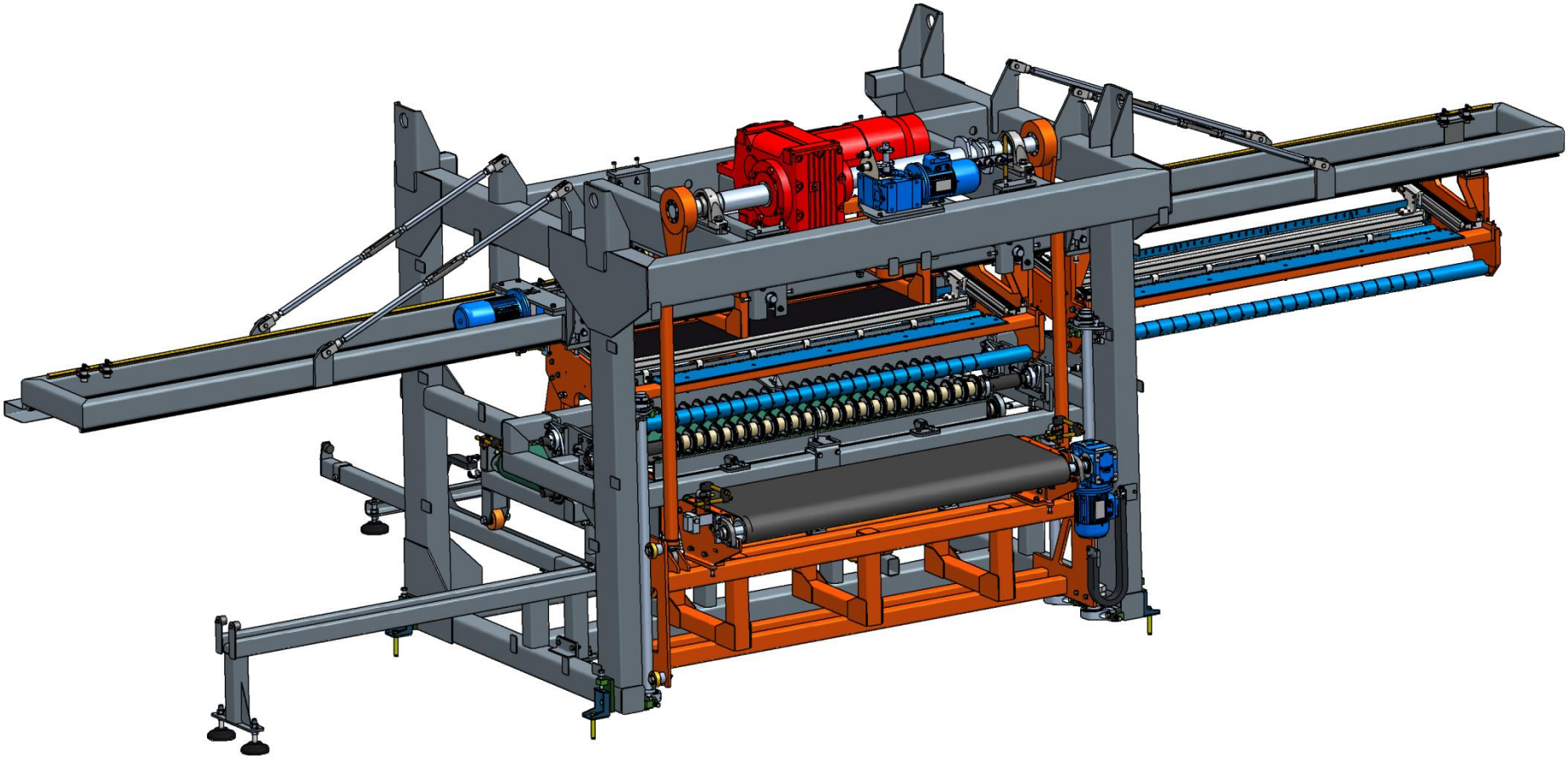
KILN CONTROL

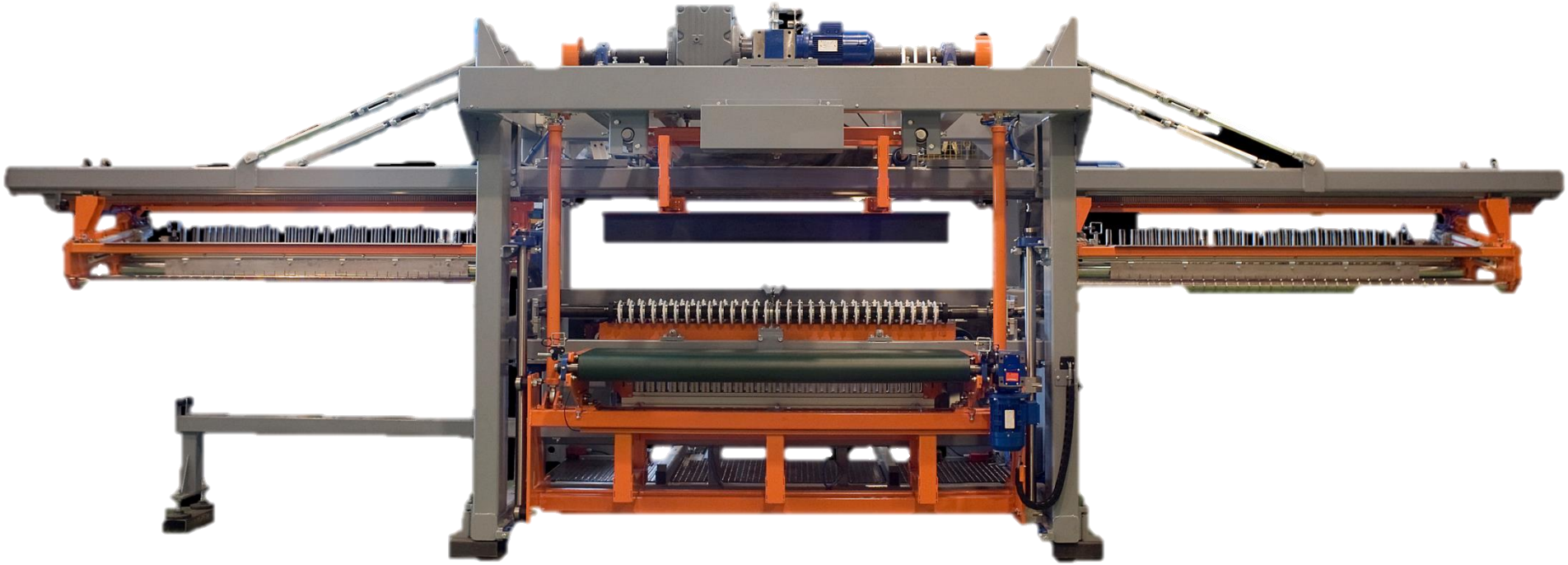


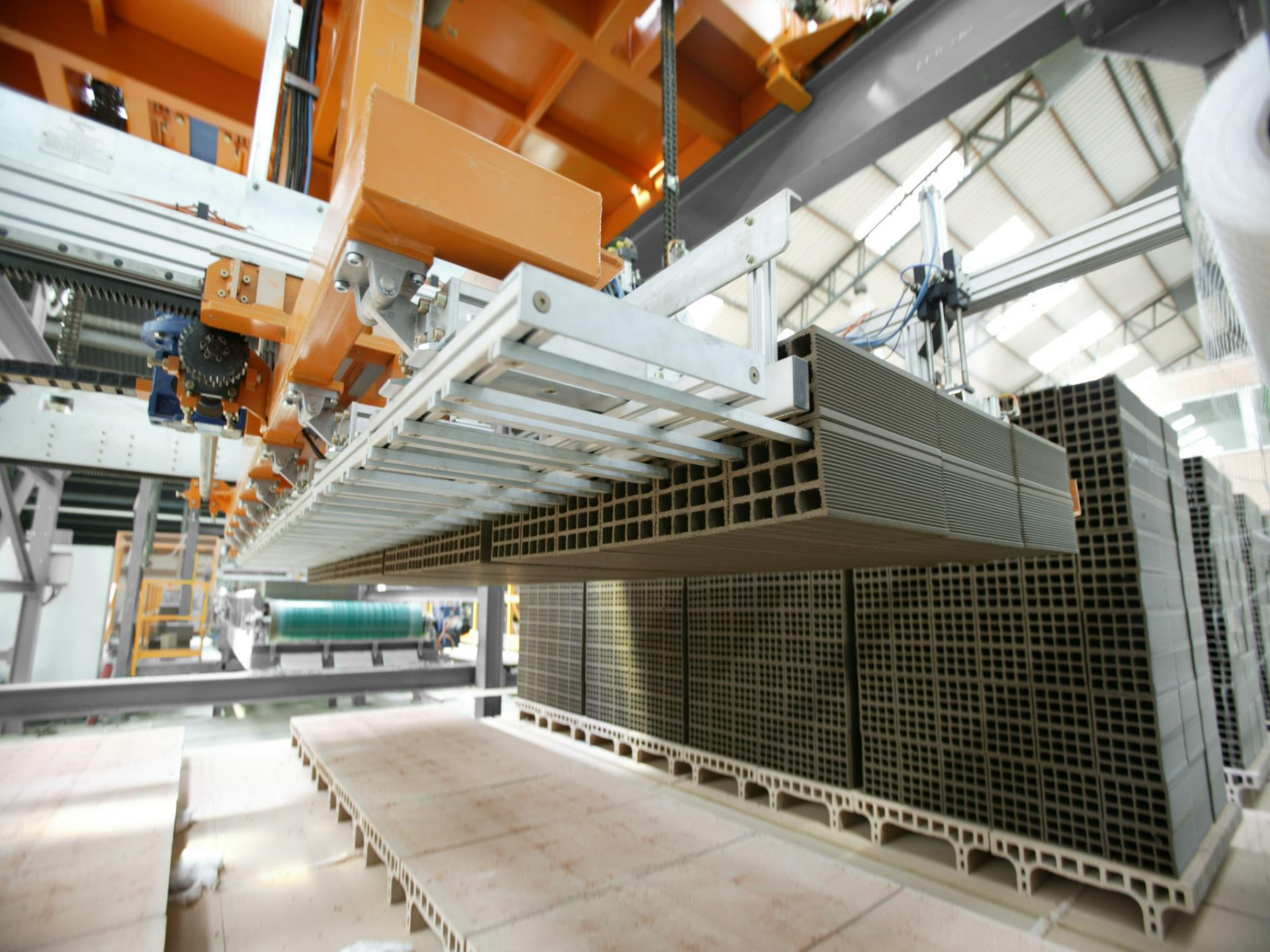
EQUIPMENT – Automations

DESIGN AND MANUFACTURING OF ALL KIND OF AUTOMATIONS:

- CUTTING
- DRYER LOADING AND UNLOADING
- KILN CAR SETTING AND DEHACKING
- PACKAGING
- ETC.





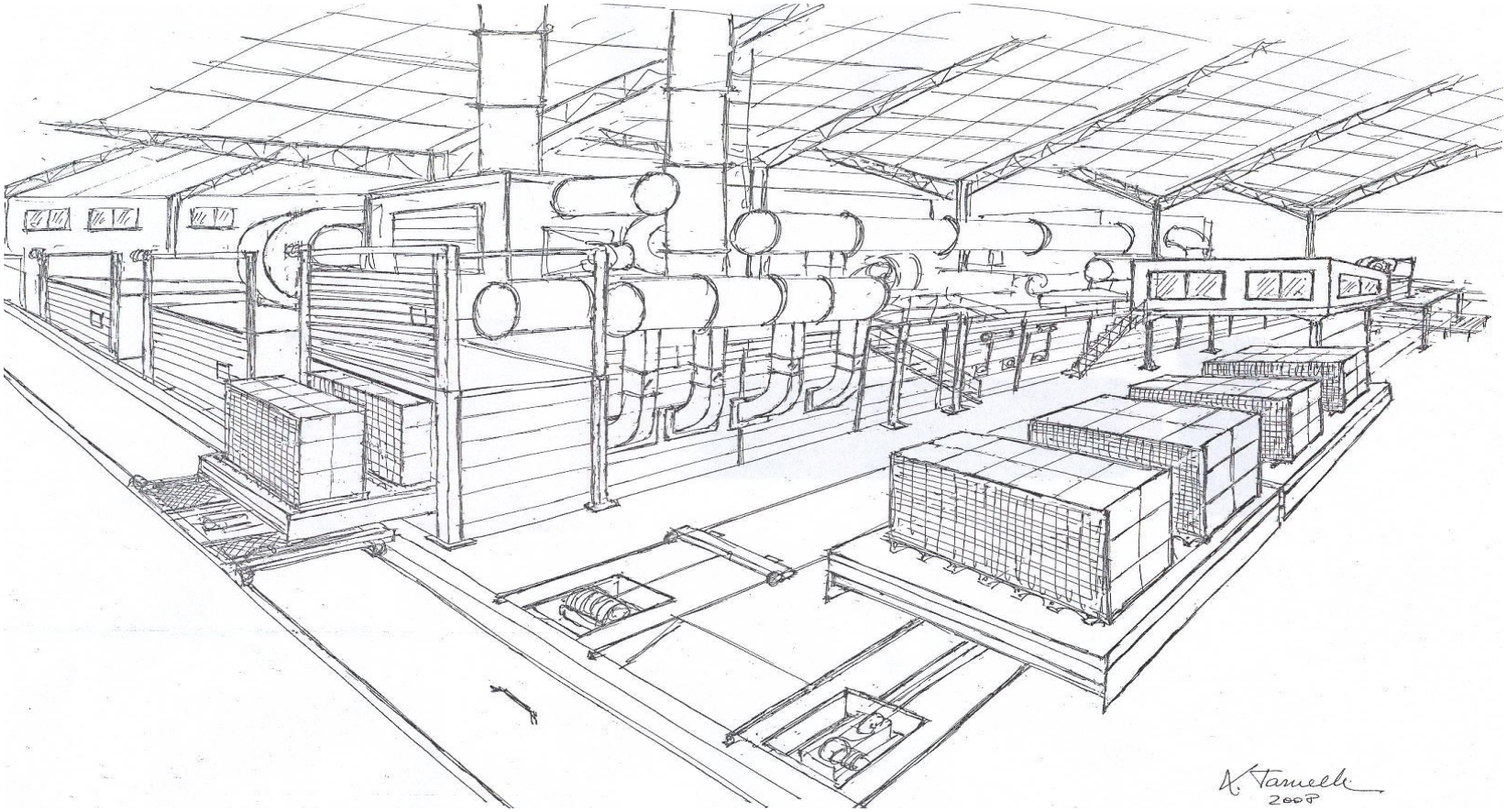



Beralmar
Beralmar Tecnologic S.A.
Beralmar


Beralmar
FANUC
Beralmar

ENGINEERING

DRYERS ▪ KILNS ▪ COMPLETE PLANTS



ENGINEERING – Dryers

JETDRYER

QUICK DRYER

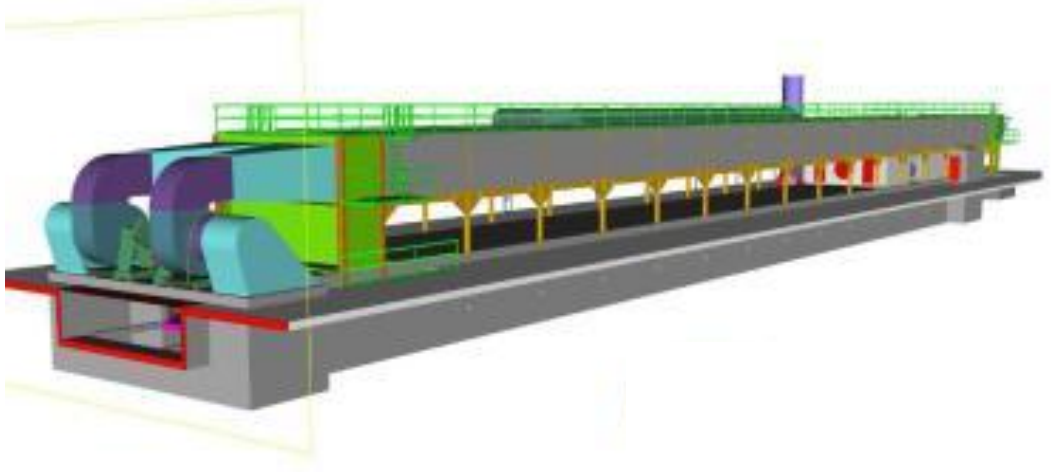
- 3 to 8 hours drying
- Compact installation
- Low electrical consumption
- Horizontal flow

ENGINEERING – Dryers

MIGJORN

QUICK DRYER

- 3 to 5 hours drying
- Compact installation
- Higher electrical consumption
- Vertical flow



ENGINEERING – Dryers

MESTRAL

SEMICONTINUOUS DRYER WITH DRYER CARTS

- Flexible drying cycles
- Suitable for most kind of clays
- Recommended for frequently changing production parameters

ENGINEERING – Dryers

GARBI

SEMICONTINUOUS DRYER WITH PLATFORMS

- Low investment
- Alternative to the classic semicontinuous dryer
- Flexible drying cycles

ENGINEERING – Dryers

LLEVANT

DIRECT SETTING OF GREEN BRICKS ON KILN CARS

- Low investment in automations
- Low energy consumption
- Easy management

ENGINEERING – Dryers

CHAMBER DRYER

CHAMBERS WITH TRAYS OR DRYER CARTS

- Independent regulation of each chamber

- Interesting for a very wide scope of formats

ENGINEERING – Kilns

FORNTHERMIC KILN

Traditional Design

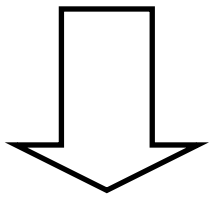
⇩

Reliable facility:

- Quality materials
- Long operational life

PRESTHERMIC KILN

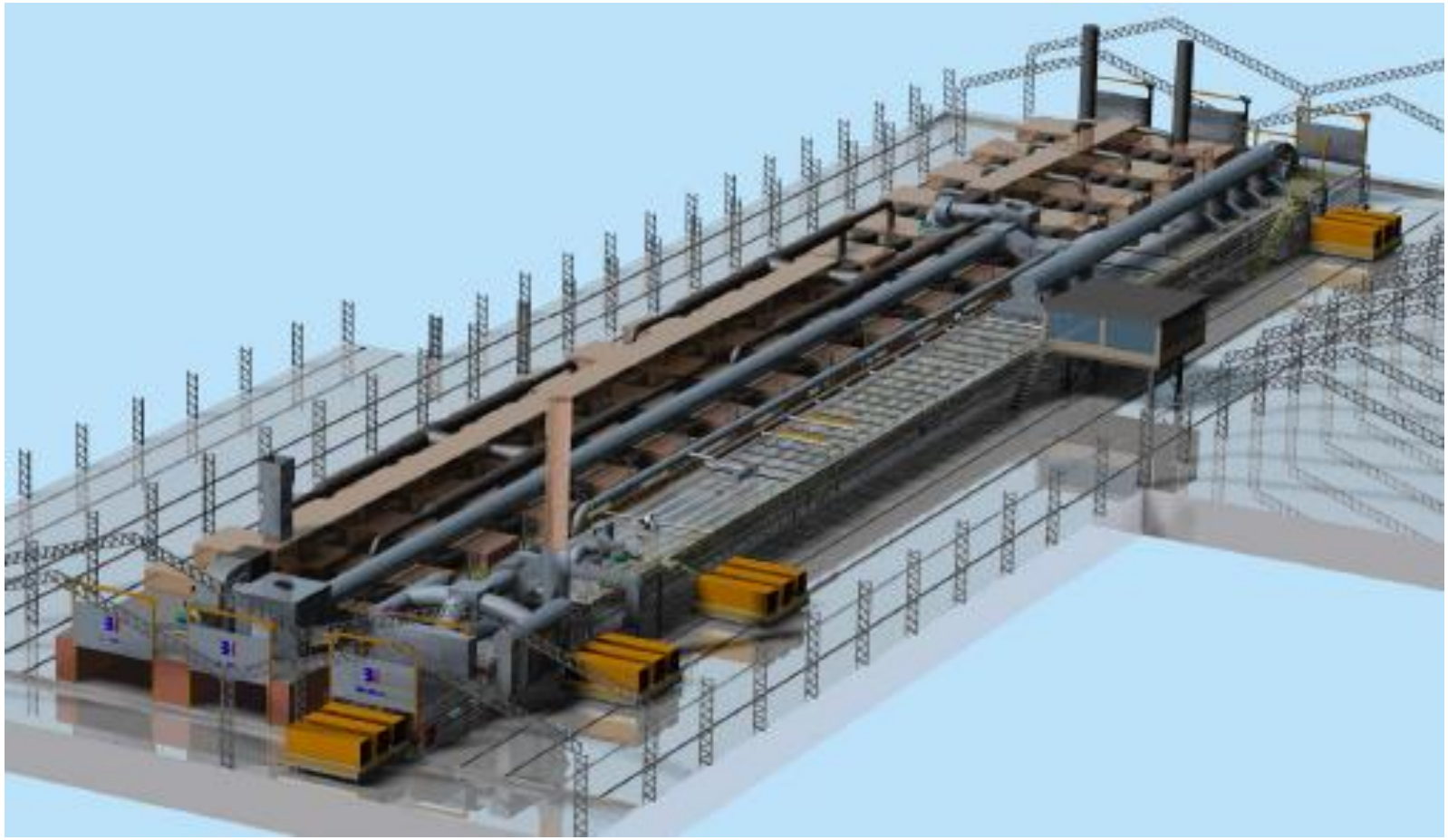
Hermetic Design



High performance:

- Low consumption
- High productivity

ENGINEERING – Complete Plants



REMARCABLE FACTS

Beralmar supplies combustion equipment for all type of fuels:

- Gaseous: natural gas, propane, biogas, syngas, etc.
- Liquid: heavy-oil, diesel, recycled oils, etc.
- Solid: coals, petcoke, biomass, etc.

For both drying and firing processes.

Unique case in our industry?

REMARCABLE FACTS

Beralmar supplies of all type of dryers:

- Fast dryers: models JETDRYER and MIGJORN.
- Semi-continuous: models GARBÍ and MESTRAL.
- Direct setting: model LLEVANT.
- Chamber dryers.

Most suppliers specialize in 1 or 2 types of dryers.

Unique case in our industry?

ACCOMPLISHMENTS

- BERALMAR has supplied equipment to 54 countries

ACCOMPLISHMENTS

- Since 1998, BERALMAR has supplied more than 40 kilns and 40 dryers, in 14 countries

ACCOMPLISHMENTS

- BERALMAR is market leader in solid fuel firing.

Equipment in more than 250 kilns since 1993, in 26 countries.

CURRENT PROJECTS (2014)

OAO KOMBINAT STROITELNIJ (Kansk – Russia)
Production: 20.000.000 units/year of solid bricks.
Dryer: direct setting on kiln cars mod. Llevant.
Tunnel kiln: mod. Presthermic. Fuel: mineral coal.
Automations: full automation line with robots.

CERÁMICAS DEL ESTE (Santa Cruz de la Sierra – Bolivia)
Production: 220.000 tn/year of hollow blocks.
Dryer: Semi-continuous mod. Mestral.
Tunnel kiln: mod. Fornthermic. Fuel: natural gas.

BRIQUETERIE TIMADANINE (Adrar – Algeria)
Production: 327.600 tn/year of hollow blocks.
Dryer: Semi-continuous mod. Mestral.
Tunnel kiln: mod. Presthermic. Fuel: natural gas.
Automations: full automation line with robots.

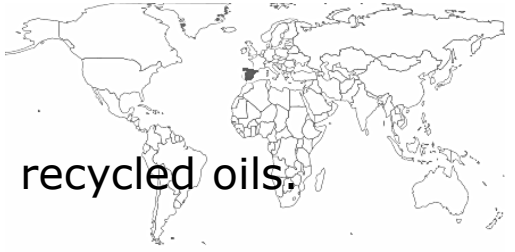
CURRENT PROJECTS (2014)

BRIQUETERIE AMRAOUA (Tizi Ouzou – Algeria)

Production: 126.000 tn/year of hollow blocks.
Dryer: Semi-continuous mod. Mestral.
Tunnel kiln: mod. Presthermic. Fuel: natural gas.
Automations: full automation line.

NUEVA CERÁMICA CAMPO (Villalonga – Spain)

Production: 50 tn/day of refractory products.
Tunnel kiln: mod. Presthermic firing at 1.400ºC. Fuel: recycled oils.



SEKRA CERAMICS (Novocheboksarsk – Russia)

Production: 30.000.000 units/year of klinker and facing bricks.
Dryer: Semi-continuous mod. Mestral.
Tunnel kiln: mod. Presthermic. Fuel: natural gas.
Automations: full automation line with robots.

NATURAL GAS IN THE UK

- Natural gas is the mainstream fuel in the UK.
- Technically, the best fuel there is: firing quality, logistics, etc.
- Price: 0,27 GBP/Nm^3 (0,0268 GBP/kwh)*
- Heat Value: 8.600 Kcal/Nm^3
- CO_2 emission factor: 56 tn CO_2/TJ

* Source: www.gov.uk/government/statistical-data-sets/international-industrial-energy-prices

ALTERNATIVES TO NATURAL GAS

- PETROLEUM COKE
- MINERAL COAL
- BIOMASS
- BIOGAS
- SYNTHESIS GAS (SYNGAS)
- RECYCLED OILS

ALTERNATIVE FUELS

» PETROLEUM COKE

ALTERNATIVE FUELS

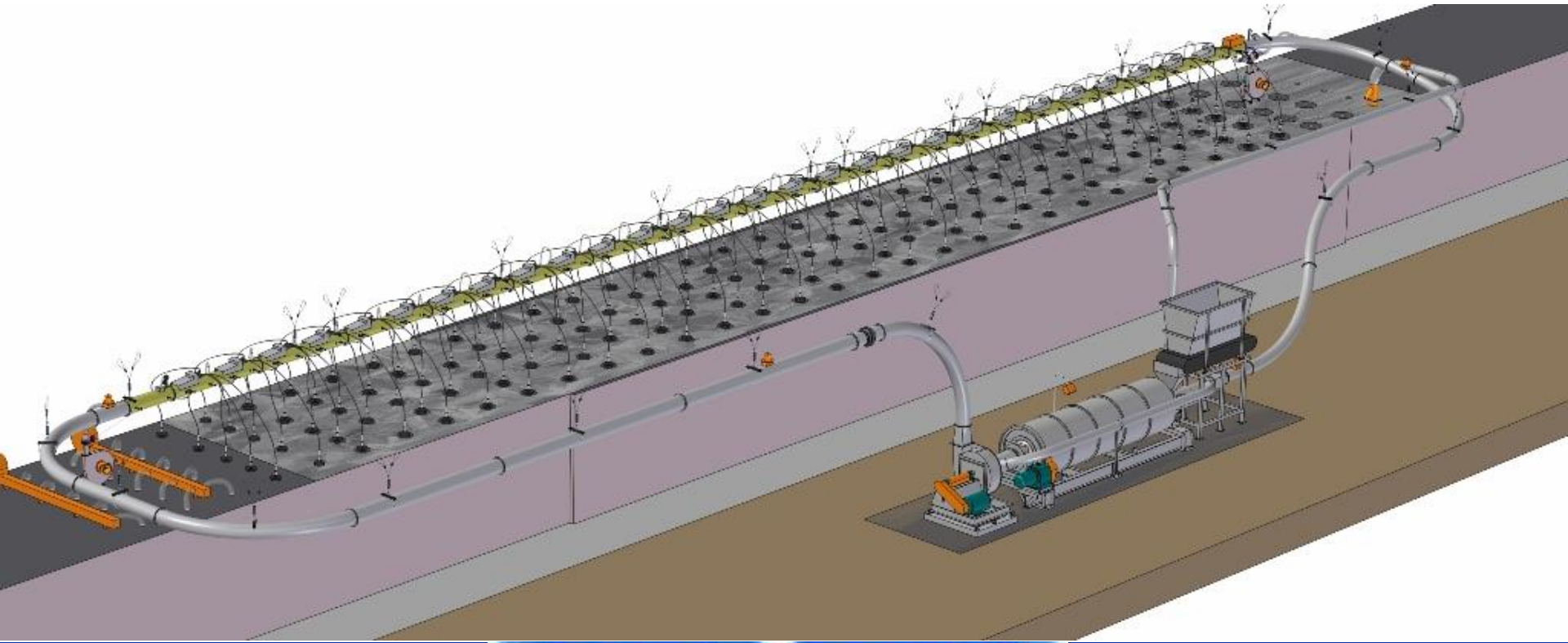
» PETROLEUM COKE – fuel characteristics

- Solid fuel: grain size or micronised
- LCV: 8.400 Kcal/kg – 35.000 Kj/kg
- Ash content: < 1%
- Sulphur content: < 1% available (depends on screening)
- Price: around 160 GBP/ton (ground, transport included)
- CO_2 emiss. factor: 98,3 tn CO_2/TJ

ALTERNATIVE FUELS

» PETROLEUM COKE – available technologies

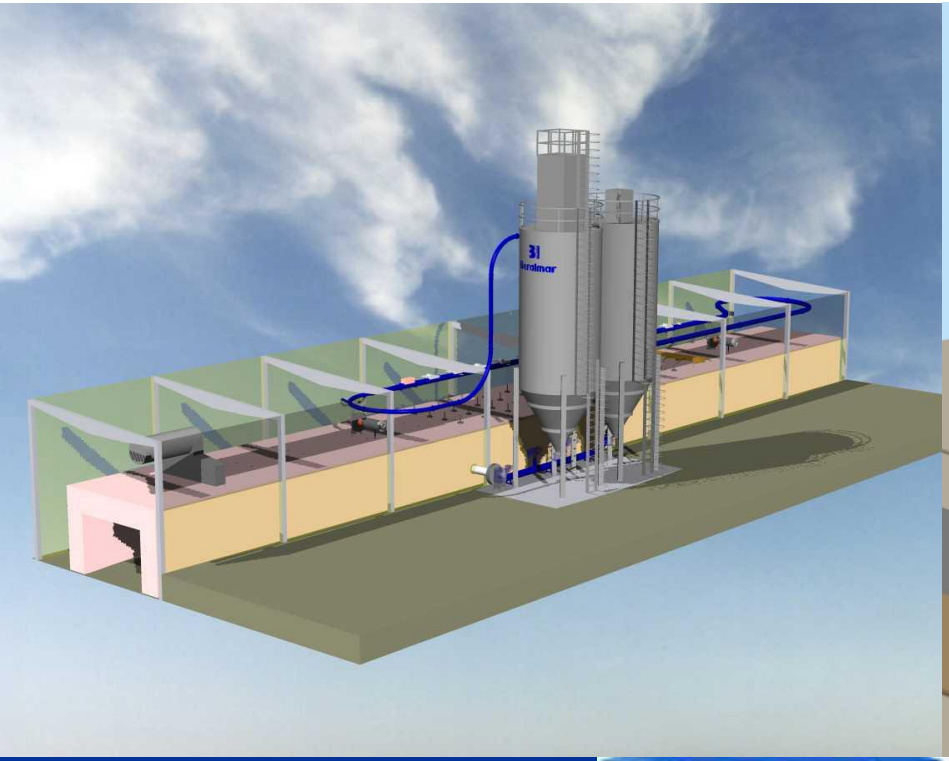
PROMATIC System

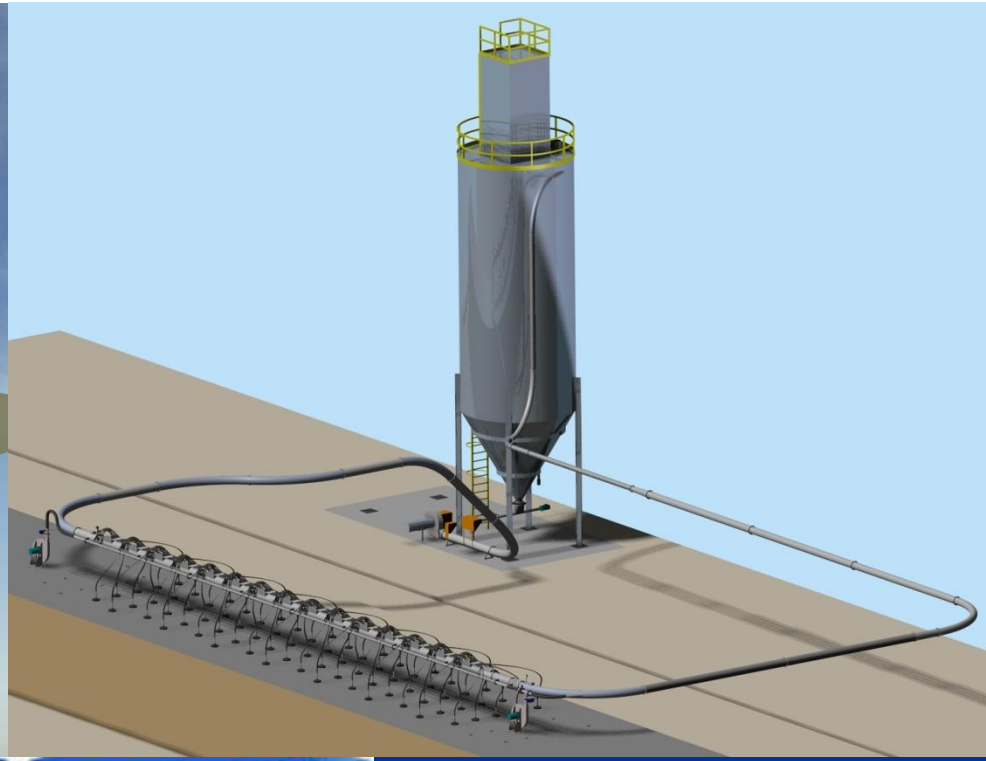


ALTERNATIVE FUELS

» PETROLEUM COKE – available technologies

MICROMATIC System



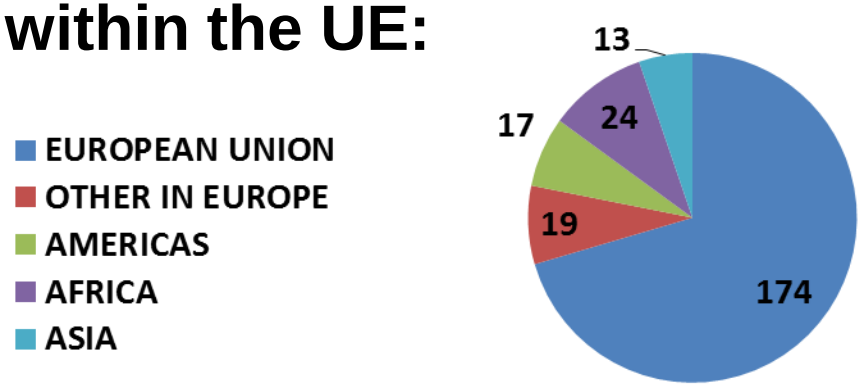


ALTERNATIVE FUELS

» PETROLEUM COKE – experience

PROMATIC and MICROMATIC systems

- **More than 250 references on tunnel kilns.**
- **Average of 1 commissioning per month since 1993.**
- **Most references are within the UE:**

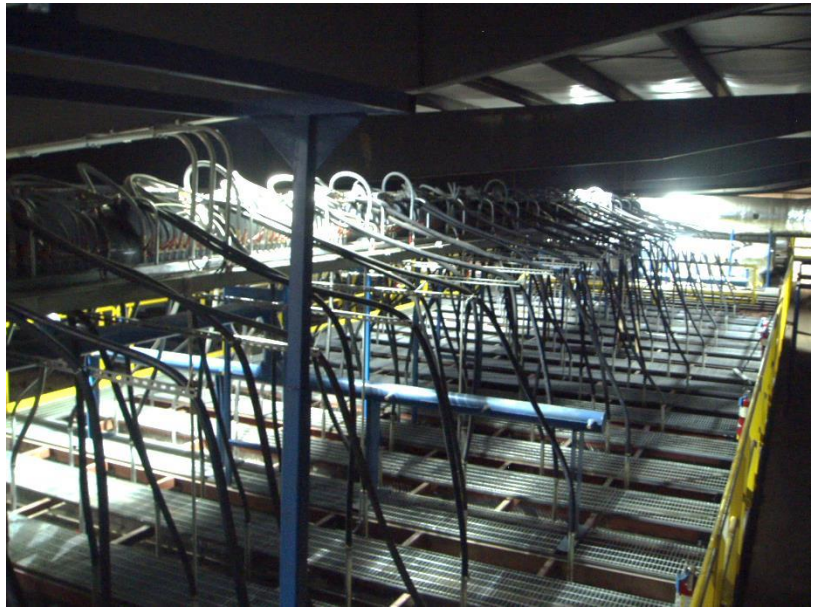


ALTERNATIVE FUELS

» PETROLEUM COKE – experience

MICROMATIC w/ grinding at UNITED BRICK (IA, USA)

30% gas + **70% petcoke**



ALTERNATIVE FUELS

- **PETROLEUM COKE – experience**

MICROMATIC w/ grinding at UNITED BRICK (IA, USA)

30% gas + **70% petcoke**

ALTERNATIVE FUELS

- **PETROLEUM COKE – experience**

MICROMATIC System at TRL KROSAKI (INDIA)

100% petcoke, fired at 1.650ºC

ALTERNATIVE FUELS

» PETROLEUM COKE – experience

MICROMATIC System at TRL KROSAKI (INDIA)

100% petcoke, fired at 1.650ºC

ALTERNATIVE FUELS

» PETROLEUM COKE – experience

MICROMATIC System at TAYLOR BRICKS (NC, USA)

White facing brick: 70% NG + **30% petcoke**

ALTERNATIVE FUELS

» PETROLEUM COKE – experience

MICROMATIC System at TAYLOR BRICKS (NC, USA)

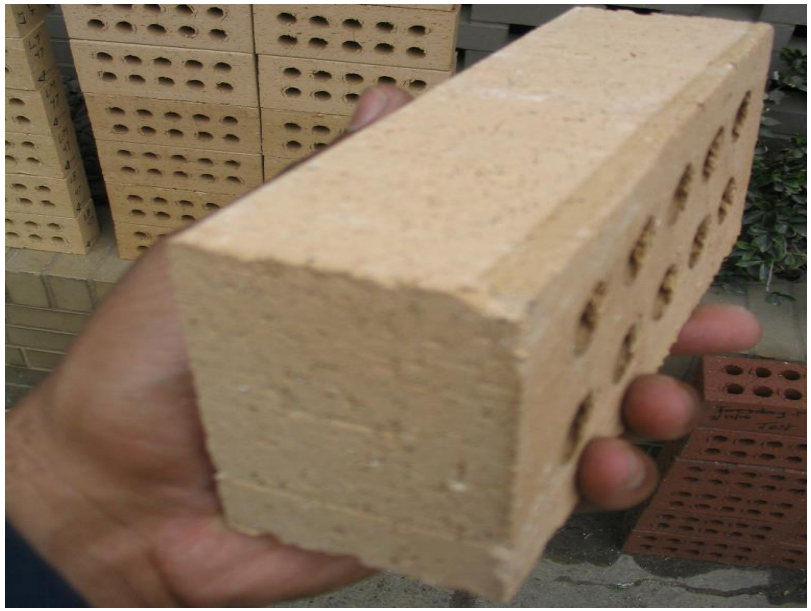
Other formats: 50% NG + **50% petcoke**

ALTERNATIVE FUELS

» PETROLEUM COKE – experience

MICROMATIC System at TAYLOR BRICKS (NC, USA)

Other formats: 50% NG + **50% petcoke**

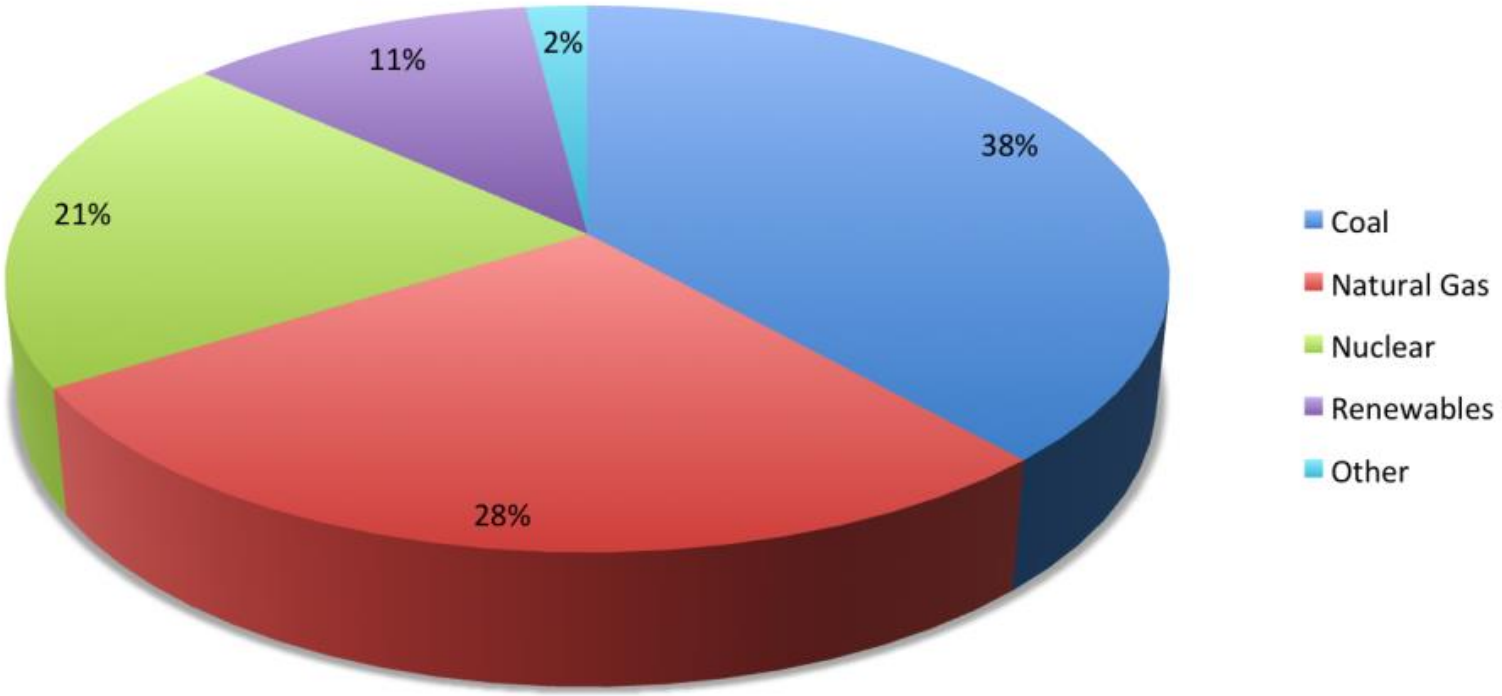


ALTERNATIVE FUELS

» MINERAL COAL

ALTERNATIVE FUELS

MINERAL COAL – Energy Mix UK 2013



ALTERNATIVE FUELS

» MINERAL COAL – fuel characteristics

- Solid fuel: grain size, wide range of coals.
- LCV: > 5.500 Kcal/kg – 23.000 Kj/kg available in the UK
- Ash content: < 10% (ideally)
- Price: ≈ 120 GBP/ton
- CO_2 emission factor: 112 tn CO_2/TJ

» MINERAL COAL – fuel characteristics

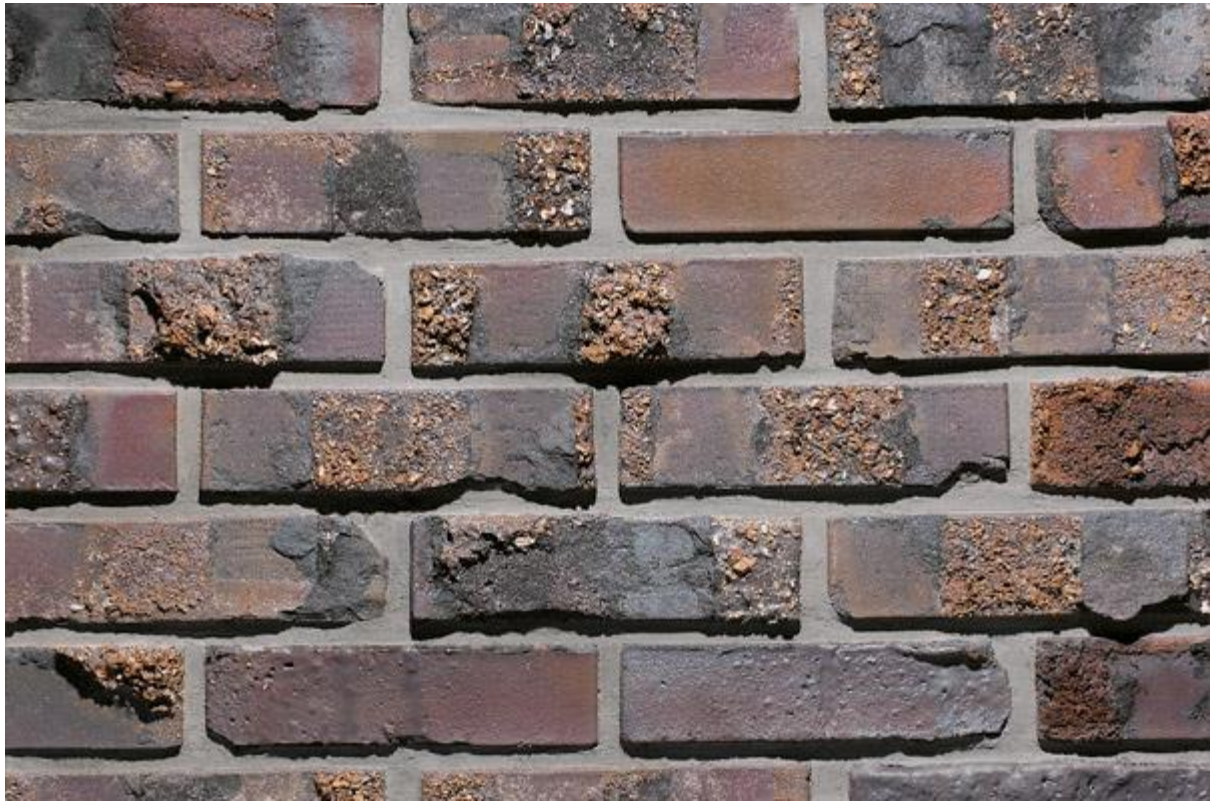
Examples of coal-fired facing bricks in the EU:

Plant: PATOKA (CRH), Poland.

» MINERAL COAL – fuel characteristics

Examples of coal-fired facing bricks in the EU:

Plant: PATOKA (CRH), Poland.



MINERAL COAL – fuel characteristics

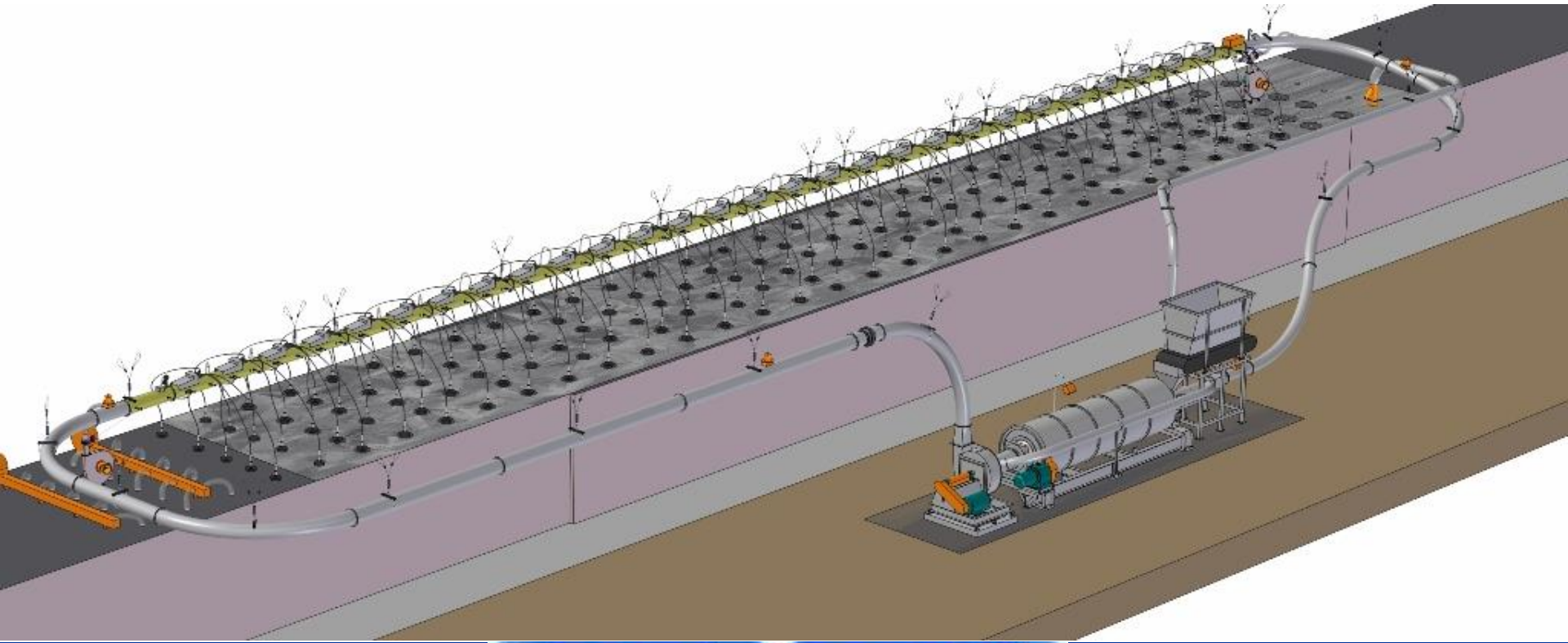
Examples of coal-fired facing bricks in the EU:

Plant: Steenfabriek Bemmel (Wienerberger) - Netherlands

ALTERNATIVE FUELS

» MINERAL COAL – available technologies

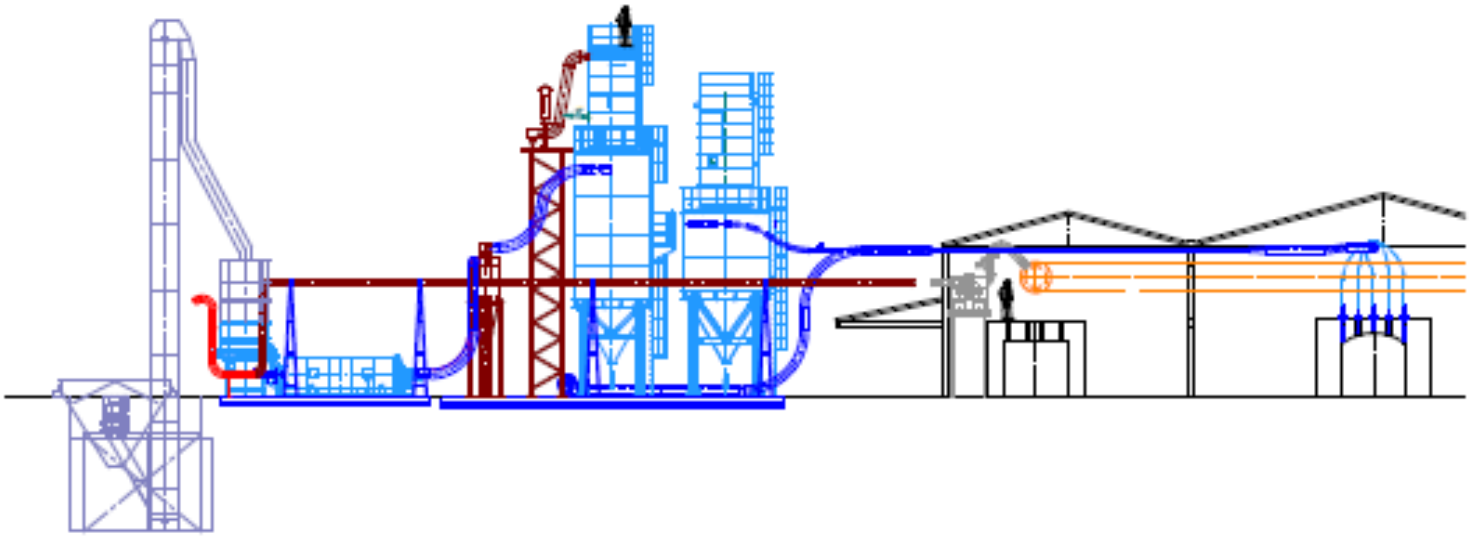
PROMATIC System



ALTERNATIVE FUELS

- **MINERAL COAL – available technologies**

MICROMATIC System with grinding of coal

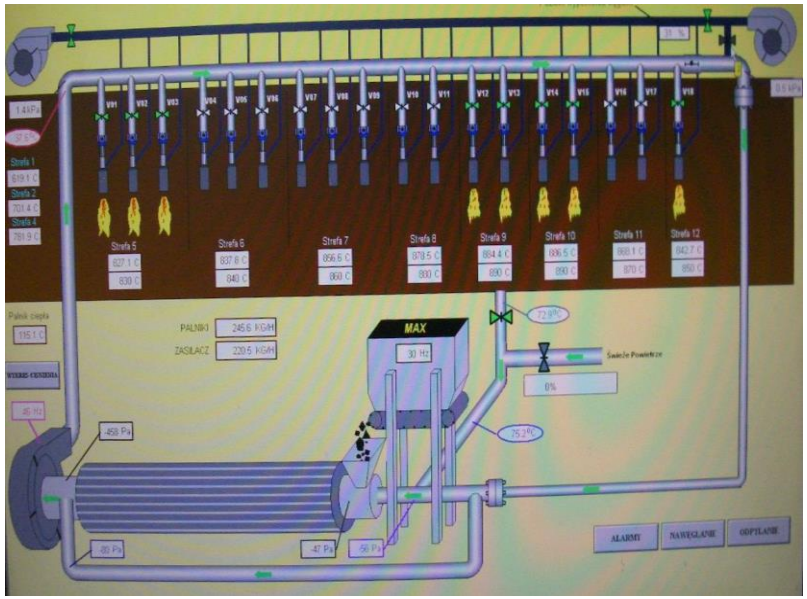


ALTERNATIVE FUELS

» MINERAL COAL – experience

PROMATIC System, at Wienerberger – Zielonka (Poland)

50% NG + **50% mineral coal**



ALTERNATIVE FUELS

» MINERAL COAL – experience

PROMATIC System, at Wienerberger – Zielonka (Poland)

50% NG + **50% mineral coal**

ALTERNATIVE FUELS

» MINERAL COAL – experience

MICROMATIC System w/ coal grinding, at LADRILLERIA SANTA FE (Colombia) – 6 kilns – with NG + mineral coal

ALTERNATIVE FUELS

» MINERAL COAL – experience

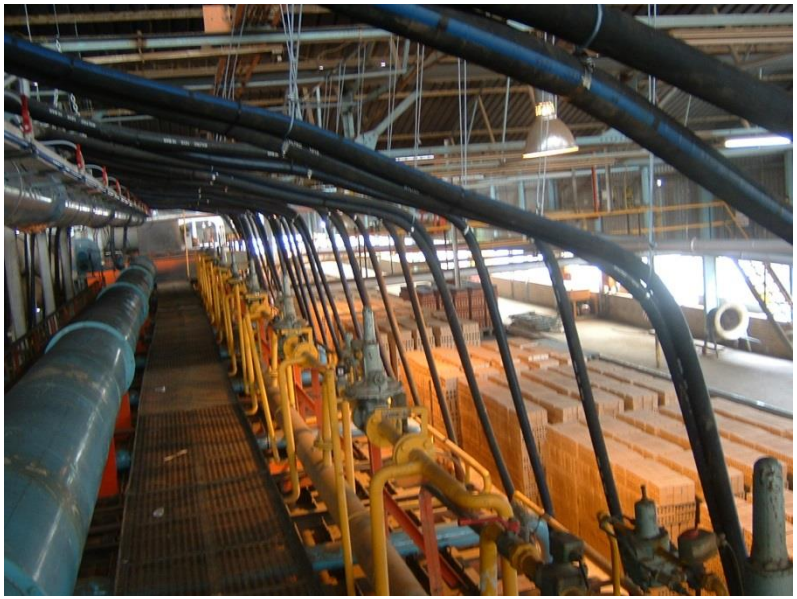
MICROMATIC System w/ coal grinding, at LADRILLERIA SANTA FE (Colombia) – 6 kilns – with NG + mineral coal

ALTERNATIVE FUELS

» MINERAL COAL – experience

PROMATIC System, at BRIKOR (South Africa)

100% mineral coal



ALTERNATIVE FUELS

» MINERAL COAL – experience

PROMATIC System, at BRIKOR (South Africa)

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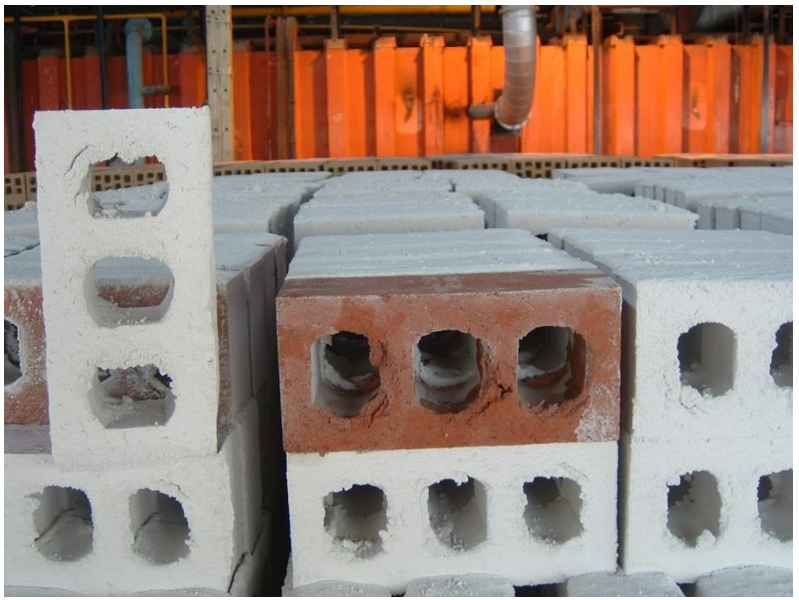


ALTERNATIVE FUELS

- **MINERAL COAL – experience**

MICROMATIC System with coal grinding, at CERAMICA PRINCESA (Chile) – 2 kilns

25% NG

+

75% coal

ALTERNATIVE FUELS

» MINERAL COAL – experience

MICROMATIC System with coal grinding, at CERAMICA PRINCESA (Chile) – 2 kilns

25% NG

+

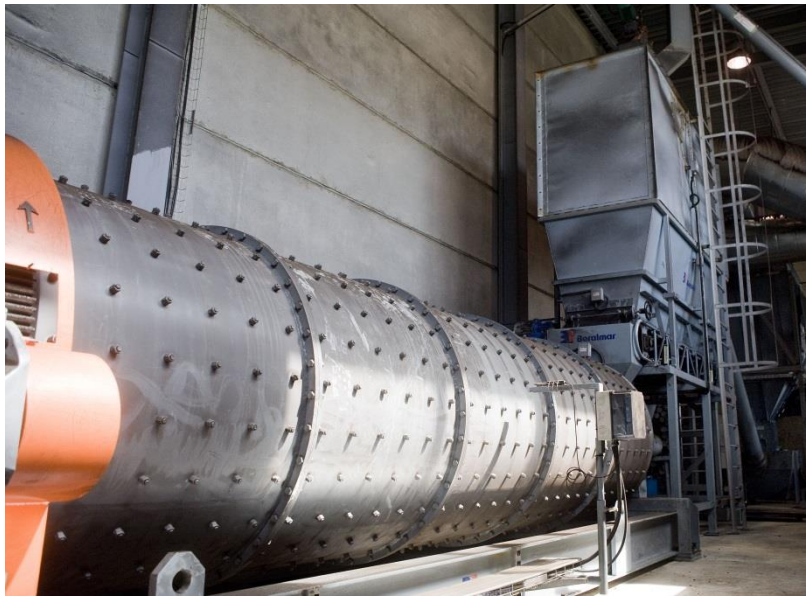
75% coal

ALTERNATIVE FUELS

» MINERAL COAL – experience

PROMATIC System, at ARBAN (Siberia, Russia)

100% mineral coal



ALTERNATIVE FUELS

» MINERAL COAL – experience

PROMATIC System, at ARBAN (Siberia, Russia)

100% mineral coal

ALTERNATIVE FUELS

» BIOMASS

ALTERNATIVE FUELS

» BIOMASS – fuel characteristics

- Solid fuel: different sources and sizes
- LCV: around 4.000 Kcal/kg – 16.750 Kj/kg
- Ash content: 2-6%
- Chemical comp.: depending on source
- Price: 40-90 GBP/ton (ideally)
- CO_2 emiss. coef.: NEUTRAL

» BIOMASS – available technologies

BIOMATIC System

Solid fuel injection system for firing clay products with:

- Biomass.
- Micronized petcoke.
- Mix of the previous fuels at whatever rate.

Any timely lack of sufficient biomass is completed by micronized petroleum coke (automatic regulation).

ALTERNATIVE FUELS

- **BIOMASS – experience**

BIOMATIC System at CERAMICAS MIRA (Spain)

ALTERNATIVE FUELS

- **BIOMASS – experience**

BIOMATIC System at CERAMICAS MIRA (Spain)

ALTERNATIVE FUELS

» BIOMASS – experience

BIOMATIC System at CERAMICAS MIRA (Spain)

www.ceramicasmira.com

ALTERNATIVE FUELS

- **BIOMASS – experience**

Clean, hot air generation at TOP BANJA LUKA (Bosnia)

Model PULS+GB/2000

Fuel: Pellets

Heat Value: 4.000 Kcal/kg

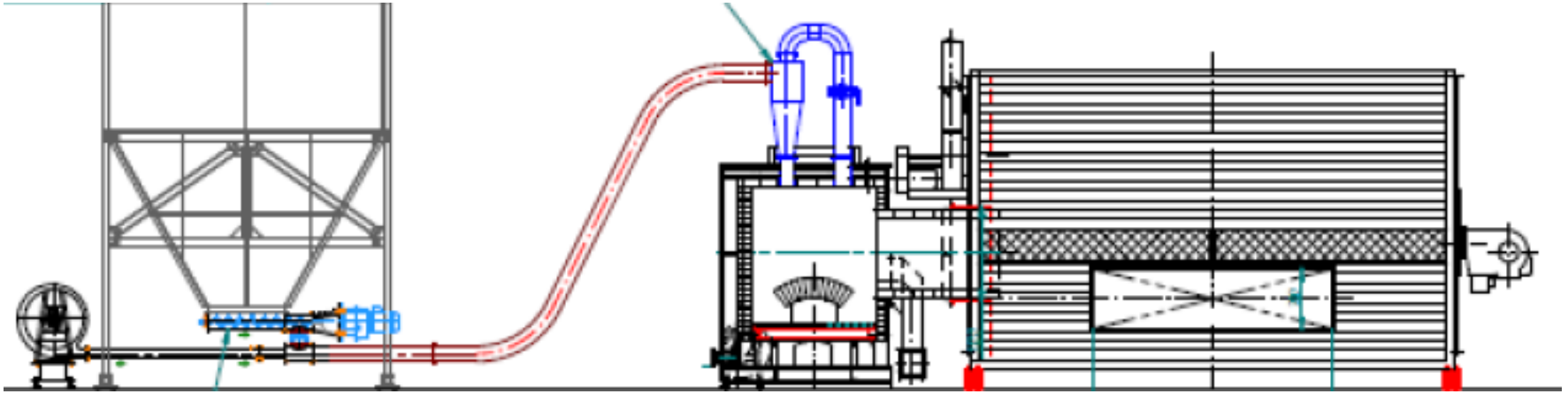
100% substitution of 60 Tn of heavy-oil consumption per month.

ALTERNATIVE FUELS

- **BIOMASS – experience**

Clean, hot air generation at TOP BANJA LUKA (Bosnia)

Model PULS+GB/2000



ALTERNATIVE FUELS

- **BIOMASS – experience**

Clean, hot air generation at TOP BANJA LUKA (Bosnia)

Model PULS+GB/2000

<u>Feeder</u>

Dosing of fuel

Grinding of fuel

Pneumatic transport to combustion chamber

ALTERNATIVE FUELS

» BIOMASS – experience

Clean, hot air generation at TOP BANJA LUKA (Bosnia)

Model PULS+GB/2000

<u>Combustion chamber and heat exchanger</u>

Combustion of fuel.

Exchange of heat from combustion smokes to ambience air.

Clean hot air (150ºC) to dryer.

ALTERNATIVE FUELS

- **BIOMASS – experience**

Clean, hot air generation at CER. TETOUAN (Morocco)

Model PULS+GB/2000

Fuel: Olive pomace

Heat Value: 3.600 Kcal/kg

100% substitution of 90 Tn of heavy-oil consumption per month.

ALTERNATIVE FUELS

» BIOMASS – experience

Clean, hot air generation at CER. TETOUAN (Morocco)

Model PULS+GB/2000

<u>Combustion chamber and heat exchanger</u>

Combustion of fuel.

Exchange of heat from combustion smokes to ambience air.

Clean hot air (150ºC) to dryer.

ALTERNATIVE FUELS

- **BIOMASS – experience**

Clean, hot air generation at WIENERBERGER – KUNIGAL (India)

Model GBS/1500

Fuel: Coconut shells, briquettes

Heat Value: 3.600 Kcal/kg

100% substitution of LNG consumption.

ALTERNATIVE FUELS

» BIOMASS – experience

Clean, hot air generation at WIENERBERGER – KUNIGAL (India)

Model GBS/1500

Heat exchanger with grill

Combustion of fuel.

Exchange of heat from combustion smokes to ambience air.

Clean hot air (150ºC) to dryer.

ALTERNATIVE FUELS

» BIOMASS – experience

Clean, hot air generation at AG TECNO3 (Spain)

Model GBS/2000

Fuel: Almond shells

Heat Value: 3.600 Kcal/kg

100% substitution of NG consumption.

ALTERNATIVE FUELS

» BIOMASS – experience

Clean, hot air generation at AG TECNO3 (Spain)

Model GBS/2000

<u>Heat exchanger with grill</u>

Combustion of fuel.

Exchange of heat from combustion smokes to ambience air.

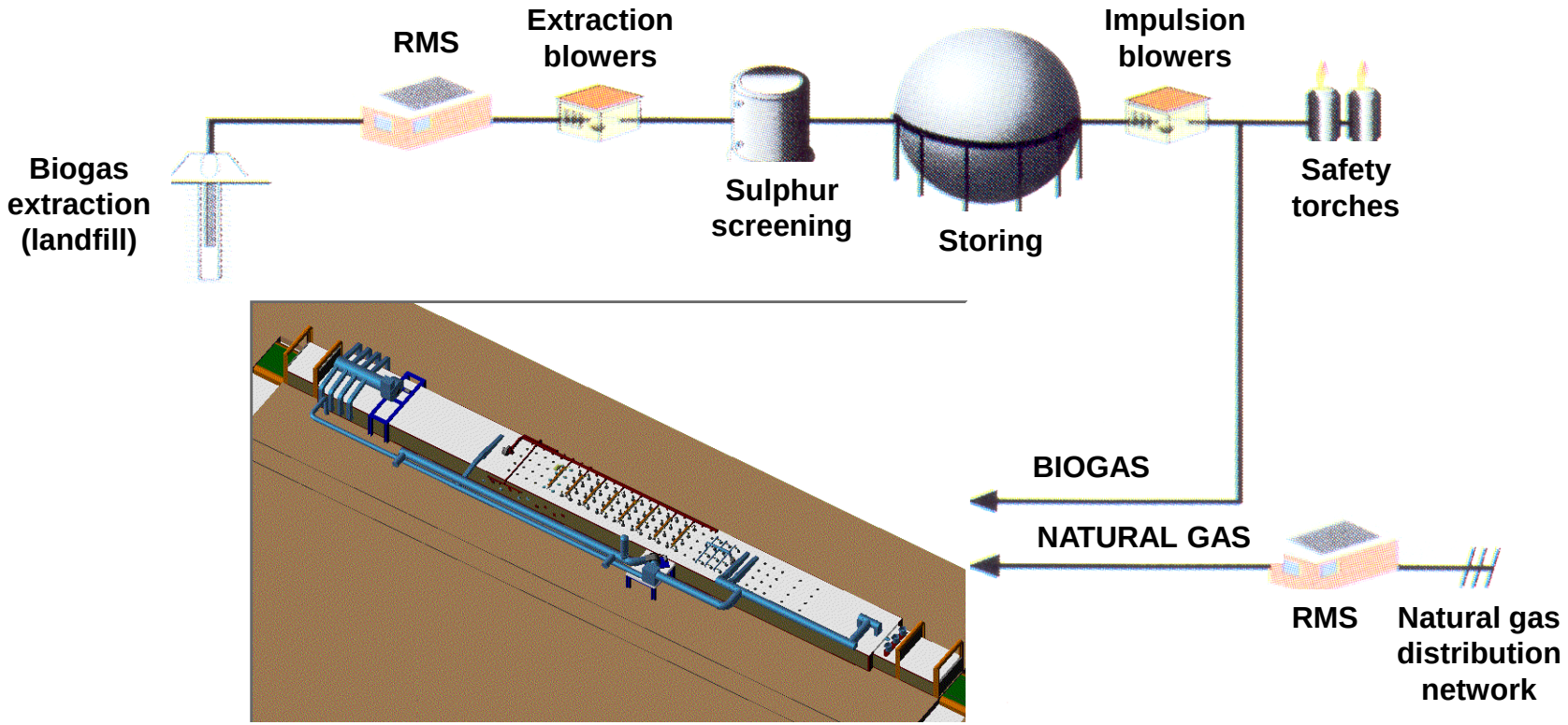
Clean hot air (150ºC) to dryer.

ALTERNATIVE FUELS

» BIOGAS

ALTERNATIVE FUELS

» BIOGAS



ALTERNATIVE FUELS

» BIOGAS – fuel characteristics

- Gaseous fuel: difficult availability, requires co-operation of landfill management and administrations.
- LCV: 4.500 Kcal/Nm^3 – 18.840 Kj/Nm^3
- Composition: > 50% Methane
- Price: ?
- CO_2 emissions coef.: NEUTRAL

ALTERNATIVE FUELS

» BIOGAS – technologies available

BERALMAR biogas burners models ICV/BG and FOC/BG

- Dual supply BIOGAS / NG
- Automatic switch of gas.
- Anti-corrossion components

» BIOGAS – experience

Dual BIOGAS / NG firing installation at PIERA ECOCERAMICA (Barcelona) – 3 kilns

ALTERNATIVE FUELS

» BIOGAS – experience

Dual BIOGAS / NG firing installation at PIERA ECOCERAMICA (Barcelona) – 3 kilns


Eco Klinker NEGRO


Eco Gres OXFORD Flaseado


Eco Klinker VOLGA


Eco Klinker GARROTXA


Eco Klinker MARRÓN (Brown)


Eco Klinker Rojo


Eco Gres SAHARA


Eco Klinker TUNDRA

» BIOGAS – experience

Dual BIOGAS / NG firing installation at PIERA ECOCERAMICA (Barcelona) – 3 kilns

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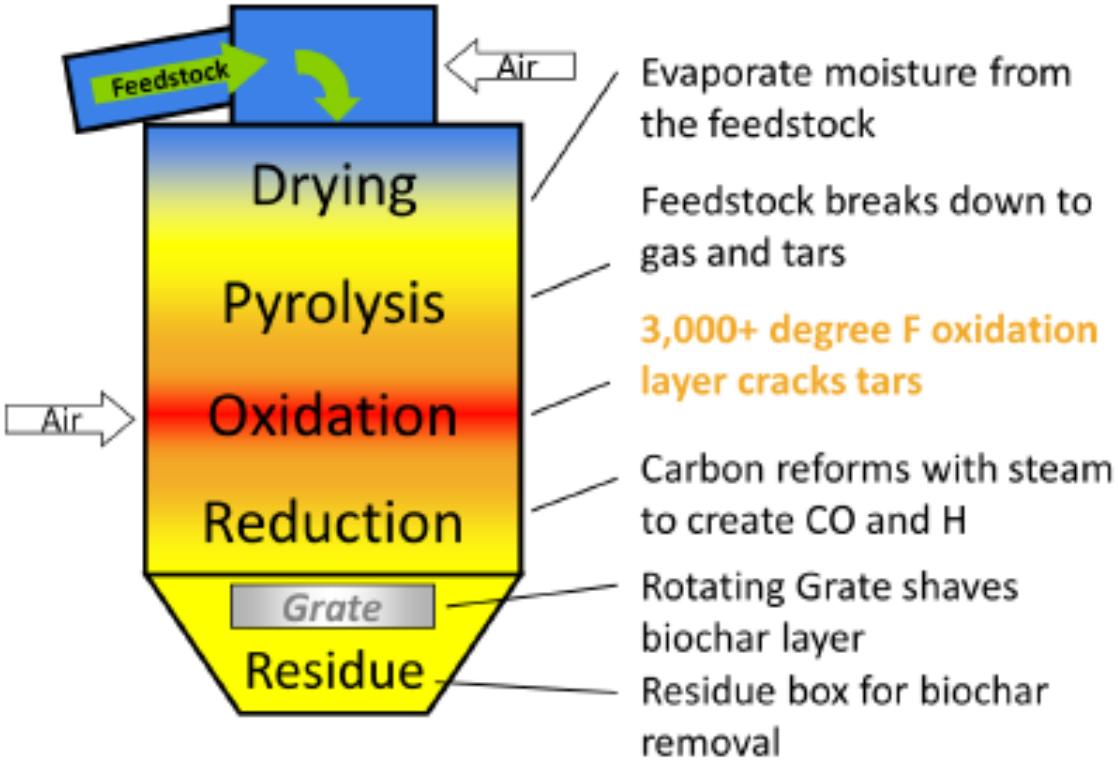
Dual BIOGAS / NG firing installation at PIERA ECOCERAMICA (Barcelona) – 3 kilns

ALTERNATIVE FUELS

SYNTHESIS GAS

ALTERNATIVE FUELS

» SYNTHESIS GAS



ALTERNATIVE FUELS

» SYNTHESIS GAS – fuel characteristics

- Gaseous fuel: on-site production from biomass gasification.
- LCV: 1.200 Kcal/Nm^3 – 5.000 Kj/Nm^3
- Composition: depending on source
- Price: cost of biomass + operative costs of gasifier + 15% loss of efficience
- CO_2 emissions coef.: NEUTRAL

ALTERNATIVE FUELS

» SYNTHESIS GAS – technologies available

<u>Biomass gasifier</u>

- Sizeable investment but quick payback
- Tars fired in kiln: no waste management required
- Output: up to 8 MWh

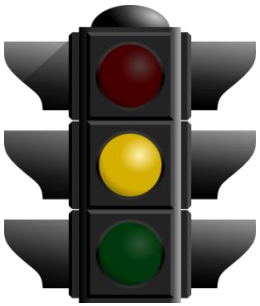
» SYNTHESIS GAS – technologies available

Syngas burners

- Adapted Beralmar range of gas burners.
- Continuous flow of syngas from gasifier.
- When off, syngas is burnt at safety torch.

ALTERNATIVE FUELS

» SYNTHESIS GAS – experience



First project in Spain 100% defined.

Waiting for green light...!

Scope of supply:

- Biomass gasifier of 2000 kW/h (1.500.000 Kcal/h).
- Syngas high speed burners for the pre-heating zone of a tunnel kiln firing hollow blocks.

ALTERNATIVE FUELS

- **RECYCLED OILS**

ALTERNATIVE FUELS

» RECYCLED OILS – fuel characteristics

- Liquid fuel: Collection and filtering of used car and kitchen oils.
- LCV: 9.500 Kcal/kg – 40.000 Kj/kg
- Composition: depends on source.
- Price: **? -** operative costs of oils management.
- CO_2 emiss. coef.: 73 tn CO_2/TJ

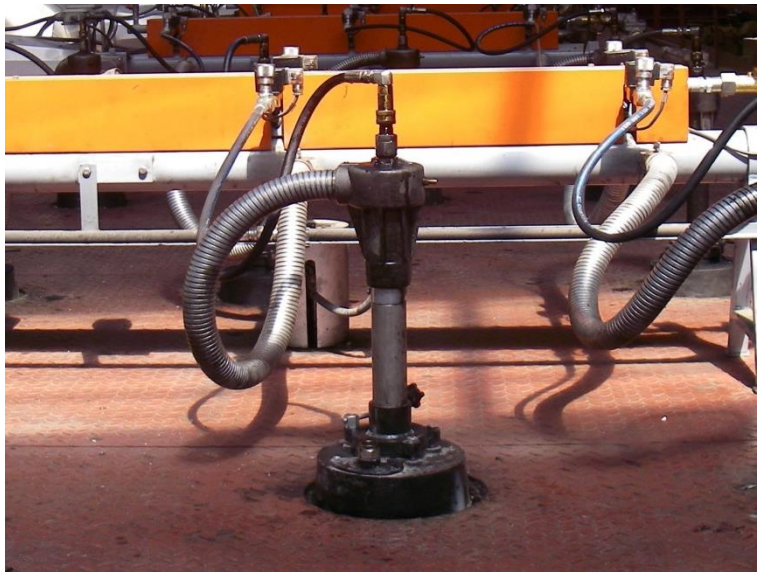
ALTERNATIVE FUELS

» RECYCLED OILS – available technologies

BERALMAR adapted injectors Model GT/99

- Output per injector: up to 170.000 Kcal/hour / 200 kWh

- Injection by gasification.



ALTERNATIVE FUELS

» RECYCLED OILS – experience

NUEVA CERÁMICA CAMPO (Spain)

Firing of refractory bricks (up to 1.400ºC)

ALTERNATIVE FUELS

» RECYCLED OILS – experience

NUEVA CERÁMICA CAMPO (Spain)

Firing of refractory bricks (up to 1.400ºC)

SAVINGS

Current fuel prices in UK

Fuel	Unit	Price (GBP)	Heat Value (Kcal)	Price (GBP/Th)	Price over NG (%)
Natural Gas	Nm^3	0,27	8.600	0,031	**100**
Ground Petcoke	Kg	0,16	8.400	0,019	**61**
Mineral Coal	Kg	0,12	6.500	0,018	**58**
Biomass	Kg	0,06	3.600	0,017	**54**

SAVINGS

Example of savings: NG to Petcoke

– 27,7%

Production: 300 Tn/day Specific consumption: 450 Kcal/kg	
Current gas consumption: 15.700 m^3/day	**4.239 GBP/day**
Future gas consumption (30%): 4.710 m^3/day	1.272 GBP/day
Future petcoke consumption (70%): 11,2 tn/day	1.792 GBP/day
Total future energy cost:	**3.064 GBP/day**
Total savings:	**1.175 GBP/day** **428.875 GBP/year**

SAVINGS

Example of savings: NG to Coal

– 28,9%

Production: 300 Tn/day Specific consumption: 450 Kcal/kg	
Current gas consumption: 15.700 m^3/day	**4.239 GBP/day**
Future gas consumption (30%): 4.710 m^3/day	1.272 GBP/day
Future coal consumption (70%): 14,5 tn/day	1.740 GBP/day
Total future energy cost:	**3.012 GBP/day**
Total savings:	**1.227 GBP/day** **447.855 GBP/year**

SAVINGS

Example of savings: NG to Biomass

– 32,9%

Production: 300 Tn/day
Specific consumption: 450 Kcal/kg

Current gas consumption: 15.700 m^3/day	**4.239 GBP/day**
Future gas consumption (30%): 4.710 m^3/day	1.272 GBP/day
Future coal consumption (70%): 26,2 tn/day	1.572 GBP/day
Total future energy cost:	**2.844 GBP/day**
Total savings:	**1.395 GBP/day**
	509.175 GBP/year

SAVINGS

Other considerations

- Added costs CO_2 emissions (petcoke, coal, recycled oils).
- Added income from trade of excess of CO_2 emission rights (biomass, biogas, syngas).
- Marketing benefits: eco-branding (biomass, biogas, syngas).

CO_2 EMISSIONS

Example: 300 tn/day production, 450 Kcal/kg consumption

Fuel	CO_2 emission coefficient	Annual emissions	% of fuels
NATURAL GAS	**56** CO_2/TJ	**11.553** tons CO_2	100% gas
PETCOKE	**98,3** CO_2/TJ	**17.662** tons CO_2	30% gas 70% petcoke
MINERAL COAL	**112** CO_2/TJ	**19.640** tons CO_2	30% gas 70% coal
RECYCLED OILS	**73** CO_2/TJ	**15.060** tons CO_2	100% oils
BIOMASS	**NEUTRAL**	**3.466** tons CO_2	30% gas 70% biomass
BIOGAS	**NEUTRAL**	**0** tons CO_2	100% biogas
SYNTHESIS GAS	**NEUTRAL**	**0** tons CO_2	100% syngas

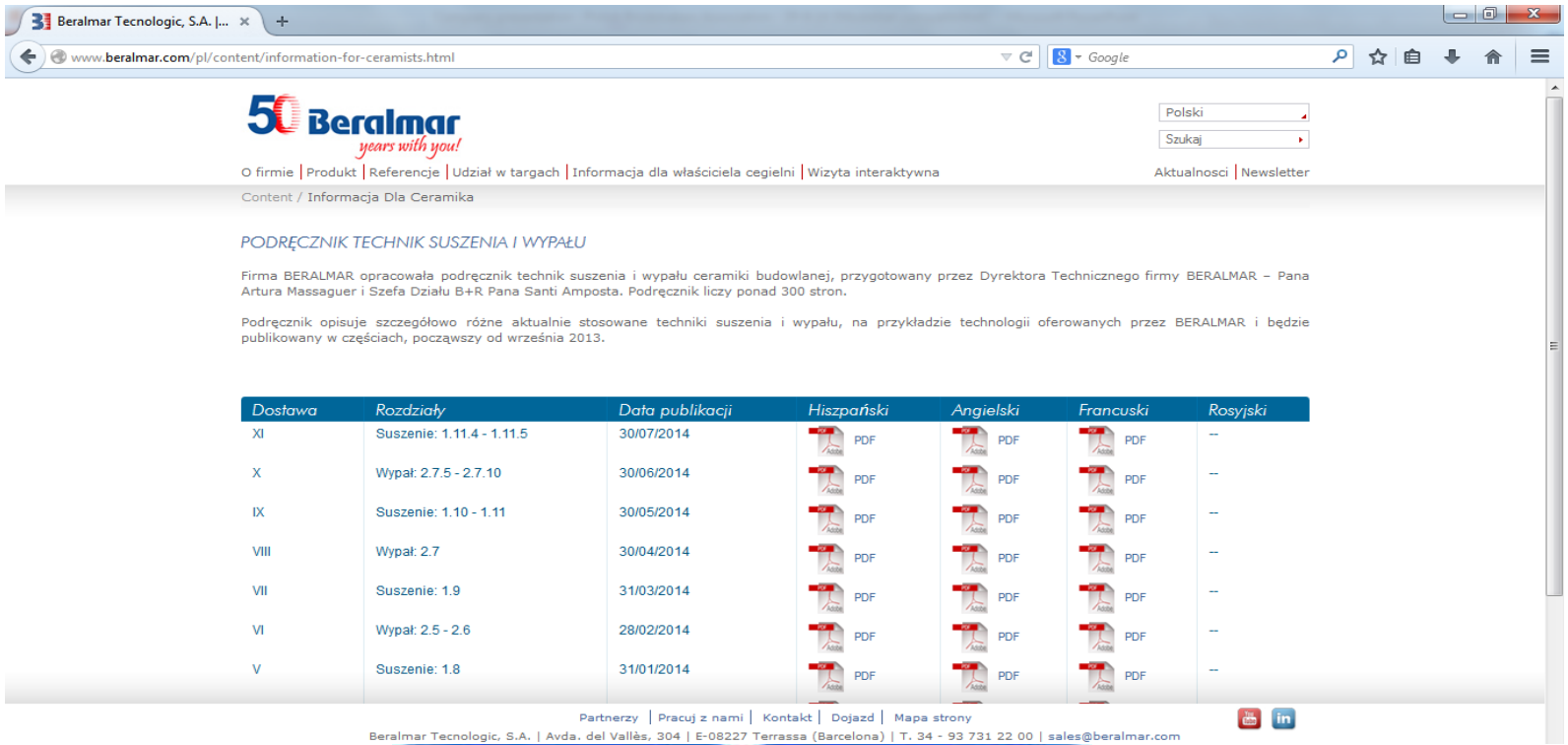
CONCLUSIONS

- BERALMAR is a complete supplier for the brick industry.
- BERALMAR has experience with many type of fuels.
- Natural gas is the best fuel there is, but not the cheapest nor the most environmentally friendly: let's keep an open mind about alternatives.
- Alternative fuels are not just about their price: added costs and benefits must also be considered.
- If you find another alternative fuel, BERALMAR is willing to develop the right firing technology for you.

WEB SITE

www.beralmar.com

Site full of news and technical information



NEWSLETTER

Monthly NEWSLETTER since 2006

Distributed in 11 languages – English included

Beralmar
Engineering and Machinery for Estructural Ceramics

Newsletter 85 - September 2014

Approximate reading time: 5 minutes

Corporate

HISTORY OF BERALMAR, 7/10: 2003-2009 – CONSOLIDATING AROUND ENGINEERING AND SOLID FUELS

This period does not stand out for any remarkable organisational leap forward, but rather for steady growth based on consolidation and exploitation of the groundwork that had been previously laid.

CONTACT

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Thank you for your kind attention!