NEW DYNAMIS
D-FLAME BURNER

Dynamis | Trust Matters
Dynamis is a company that offers innovative solutions to several industry areas, aiming to optimize energy efficiency and cost reduction. Dynamis offers competence with more than 40 engineers and designers with global experience in Cement, Mining, Metallurgy, Paper, etc, with over 30 years in those areas.

**DYNAMIS HISTORY**

- 2003: Start up of Dynamis as Engineering Company
- 2005: First Burner Design to VC Rio Branco
- 2007: First Calcined Clay Plant Design to CIPLAN
- 2010: First Equipment Supplied to Votorantim, a D-Gasifier
- 2016: First D-Flame Supplied to VC Rio Branco
- 2015: Calcining Plant Supplied to CMOC Niobio
- 2017: Internationalization of Dynamis: D-FLAME burners exports to US, Africa and EU
- 2019: Supplied the biggest calcined clay plant in the world, Argos Rio Branco
- 2020: Supplied first Fluidized Bed Hot Gas Generator to VC Pecém
GLOGAL DYNAMIS
Brazilian Company

HeadQuarter: São Paulo
Subsidiary: Colombia
Representation Offices: 07

Check Out Contacts in our website:
DYNAMIS TECHNOLOGY

- R&D – SOFTWARES

- Computational Fluid Dynamics – ANSYS Fluent and CFX
- Structural analysis – FEMAP and NASTRAN
- 3D CAD – Siemens PLM Solid Edge 5T
- CeSFaMB™/ CSFMB©
- Metalica 3D – Steel Structures Design
- Softwares developed in-house
DYNAMIS TECHNOLOGY

R&D – SOFTWARES

Combustion (Vulcano Dynamis)

Mass and Energy Balance (Dynamis)

Coupled simulation with Fluent CFD software and the D-RK Simulator developed by DYNAMIS
DYNAMIS TECHNOLOGY

R&D – SOFTWARES

- CFD (ANSYS and CFX)
- Kinetics and Diffusion Models
- Particle Dynamics Model
- Turbulence Models
- Radiation Model

ROCKY DEM (Particle Simulation)

FEA (finite elements analysis)
DYNAMIS TECHNOLOGY

R&D – TEAMS & PATENTS

- **D-Flame**
  - USP mentor
  - WCR article
  - Patent
  - Simulation Software

- **Fluidized Bed Combustion Gasification**
  - UNICAMP mentor
  - Simulation Software

- **Low Nox**
  - UNESP mentor
  - ICR article
  - Simulation Software

- **D-Gasifier**
  - UNESP mentor
  - WCR article
  - Patent

- **Calcined Clay**
  - Dynamis Tecnology
  - Simulation Software
  - WCR Article
  - Test Labs

- **Drying**
  - USP mentor
  - Simulation Softwares

- **Combustion Chamber (Original D-Gasifier)**

- **Gasification System for Solid and Liquid Fuels in a Compact Chamber (D-Gasifier)**

- **Improvements in an Activation Clay System**

- **Clay Color Change Method**

- **Improved Burners for Clinker Kilns**

- **Performance Improvement Method for Burners (D-Flame Method)**

- **D-FLAME Burner Equipment**

- **D-FLBED CHAMBER**
DYNAMIS TECHNOLOGY

D-TECHNICAL ASSISTANCE

- always supporting our customers
- complete set of modern tools
- excellent technical staff
DYNAMIS INTEGRATED SYSTEMS SUPPLIED

- Calcined Clay Drying and Calcining Lines
- Plant: Ciplan Sobradinho
- Scope of Supply: Scope of Supply: Engineering and Equipment Supply
Alternative Fuel (CDR) System for Calciner

Plant: VC Cuiabá

Scope of Supply: Engineering: Concept, Basic and Detailed
Alternative Fuel (CDR) System for Calciner

Plant: Supremo Secil Adrianópolis

Scope of Supply: Engineering: Concept, Basic and Detailed
New Production Line for Niobium Ore Calcining

Plant: CMOC Ouvidor

Scope of Supply: Full Engineering and Equipment Supply
DYNAMIS INTEGRATED SYSTEMS SUPPLIED

- Dryer and Production of Lignin with Acidification Process of Black Liquor
- Plant: Suzano Limeira

- Scope of Supply: Tests, Pilot Plant, Full Engineering and Equipment Supply
Calcined Clay Drying and Calcining Line – 1500tpd

Plant: Argos Rio Claro – Colombia

Scope of Supply: Tests, Full Engineering and Equipment Supply
D-FBED CHAMBER (HGG in Fluidized Bed) of 12 Gcal

- Plant: VC Pecém

- Scope of Supply: Engineering and Equipment Supply
Dynamis D-FLAME BURNERS

Dynamis has almost 110 D-Flame Burners installed and in operation.

TESTED AND APPROVED BY CLIENTS
DYNAMIS D-FLAME BURNERS

FREQUENT CHARACTERISTICS OF ROTARY KILNS

• Several applications: Clinker, Lime, Ores, etc.
• One source of heat (diff. from vertical kilns, tunnel kilns)
• Extreme importance of flame quality - radiation heat transfer at flame zone
• Only a small part of combustion air is injected through the burner (primary air)

800 - 1000 °C (Clinker)

DYNAMIS D-FLAME BURNERS

GENERAL REQUIREMENTS

• Efficiency
• Reliability
• Durability
• Stable Flame
• As Low as Possible Emissions
• Easy Operation
• Easy Maintenance
• Refractory Conservation

SOME SPECIFIC REQUIREMENTS

Lime Kilns (Pulp & Paper):
• Processing of fuels generated inside the plant: hydrogen methanol, lignin, bio-oil

Ore calcining kilns:
• Reducing/Oxydizing atmosphere on material bed

Cement Kilns:
• Short and Intense flame
• Small size of C3S crystals
• High surfur purge
• Co-processing of alternative fuels
What is necessary to design an efficient burner?

- Comprehension of specific customer process and needs
- High-skilled professionals
- High quality materials and manufacturing
- Computational modelling tools
- Intense R&D
DYNAMIS D-FLAME BURNERS

**SOME BASIC CONCEPTS FOR BURNER SPECIFICATION**

\[
\text{momentum} = \sum v_i \times PAR \\
\text{turbulence index} = \frac{\sum (m_i \times v_i^2)}{m_{\text{fuel}} \times HV} \\
\text{swirl} = \frac{\sum (m_i \times v_{\text{tang}_i} \times r_i)}{\sum (m_i \times v_{\text{axial}_i} \times r_i)} \\
\text{impulse} = \frac{\sum (m_i \times v_i)}{m_{\text{fuel}} \times HV}
\]

Image Source: Cement Plant Operation Handbook
DYNAMIS D-FLAME BURNERS

- SOME BASIC CONCEPTS FOR BURNER SPECIFICATION

Pressure Profile Close to Burner Tip

Burner Creates Low Pressure Zone Close to the Burner Tip

Velocity Vectors Close to Burner Tip

Induction of Secondary Air into the Flame
DYNAMIS D-FLAME BURNERS

STAGES OF SOLID FUEL COMBUSTION

- **Burner**

---

**Solid Fuel Particles**

- Heating and Pyrolysis, Release of volatile matter
- Increasing the concentration of volatiles
- Concentration of soot increases
- Coke particles (fuel without volatile matter). In this region, the burning of coke particles occurs

---

Products of combustion carrying coke particles (soot). These particles will be consumed up to the high temperature zone outlet.
DYNAMIS D-FLAME BURNERS

STAGES OF SOLID FUEL COMBUSTION

Estimated times of each stage of combustion on the approximate conditions of a clinker kiln:

- Fuel: Petcoke
- Kiln Temperature: 2000°C
- Particle Size: 90 μm

<table>
<thead>
<tr>
<th>Stage</th>
<th>Time</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating</td>
<td>0.1 s</td>
<td>From 800°C to 2000°C</td>
</tr>
<tr>
<td>Pyrolysis</td>
<td>0.2 s</td>
<td>Occurs simultaneously to heating</td>
</tr>
<tr>
<td>Combustion of Solid Particles (coke)</td>
<td>2.0 s</td>
<td>Heterogeneous reactions between C and O2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2.2 s</td>
<td></td>
</tr>
</tbody>
</table>
EQUIVALENT ELECTRICAL CIRCUIT OF SOLID COMBUSTION

\[
\frac{\dot{m}_c}{\dot{m}_O_2} = \frac{Y_{O_2,\infty} - 0}{R_{\text{kin}} + R_{\text{dif}}}
\]

Where:

\[
R_{\text{cin}} = \frac{V_1 R T_s}{4 \pi r_s^2 M_{\text{mixt}}} k_c P
\]

\[
R_{\text{dif}} = \frac{V_1 + Y_{O_2,s}}{4 \pi r_s \rho D}
\]

Reaction Rate Coefficient:

\[
C + O_2 \rightarrow CO_2
\]

Determined by Arrhenius equation:

\[
k_c = A e^{-\frac{E_1}{R T_s}}
\]

O2 Diffusivity in the gas mixture: CO2, N2 e O2

Is related to T_s as the equation:

\[
D = \alpha T_s^{1.5}
\]

Based on Francisco Domingues de Sousa *Curso de Combustão – Combustão de Sólidos*
DYNAMIS D-FLAME BURNERS

COMBUSTION LIMITING PHENOMENON

\[
\frac{R_{\text{kin}}}{R_{\text{dif}}} = \left( \frac{v_1}{v_1 + Y_{O2,s}} \right) \left( \frac{R^*T_s}{M_{\text{mist}} * P} \right) \left( \frac{\rho^*D}{k_c} \right) \left( \frac{1}{r_s} \right)
\]

- If \( \frac{R_{\text{kin}}}{R_{\text{dif}}} \ll 1 \) - DIFFUSION-CONTROLLED Combustion
  - Large Particles, bigger than 1mm
  - High Temperature

- If \( \frac{R_{\text{kin}}}{R_{\text{dif}}} \gg 1 \) - KINETICS-CONTROLLED Combustion
  - Small Particles, less than 50μm
  - Low Temperature

- If \( \frac{R_{\text{kin}}}{R_{\text{dif}}} \sim 1 \) - BOTH MECHANISMS
  - Particles between 50μm and 1mm

Clinker Kiln
DYNAMIS D-FLAME BURNERS

How to reduce burning time?

- Increasing the particle temperature
- Increasing the turbulence
- Decreasing the particle size (diameter)
- Increasing the oxygen concentration

- Increasing the KINETIC ENERGY
- Increasing the turbulence

- Increasing the kiln temperature
- Substituting the solid fuel by other with higher volatile matter
- Bringing intermediate combustion products back to the reaction starting zone (THROUGH SWIRL)
Combustion Concepts show that a burner design can interfere in the quality of combustion acting on four main points:

- **Temperature**
- **Flow (diffusion) of oxygen through the cloud of gases toward the particle of fuel**
- **Flow of CO2 away from the particle**
- **Oxygen concentration near the fuel particle**

- **Promoting internal recirculation through swirl**
- **Promoting high secondary air entrainment (hot air) – as fast as possible**
- **Promoting better mixture through turbulence**
- **Promoting high secondary air entrainment – as fast as possible**
### Burner Development - CFD Analysis - Impact of Burner Tip Geometry

#### DYNAMIS Approach

<table>
<thead>
<tr>
<th>DYNAMIS Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface that surrounds the Conveying Airflow + Solid Fuel</td>
</tr>
</tbody>
</table>

**Input:** How much secondary air crosses this surface?

**Output:** The more the better
DYNAMIS D-FLAME BURNERS

D-FLAME R&D

RESEARCH TEAM
• How is it possible to increase secondary air entrainment?
• What are the main parameters that govern secondary air entrainment?

TECHNOLOGICAL TOOLS
• CFD Analysis
• In-house developed softwares (Vulcano, D-RK Simulator, etc.)

NEW CONCEPT
Geometrical Optimization of burner tip in order to enhance secondary air entrainment
DYNAMIS D-FLAME BURNERS

D-FLAME R&D

- Same primary and secondary air flow
- Same turbulence index and impulse
- Same swirl
- Same thermal power

<table>
<thead>
<tr>
<th></th>
<th>Flow rate [kg/h]</th>
<th>Pressure [mbar]</th>
<th>Temperature [°C]</th>
</tr>
</thead>
<tbody>
<tr>
<td>External</td>
<td>4018</td>
<td>300</td>
<td>56</td>
</tr>
<tr>
<td>Tangential</td>
<td>1100</td>
<td>60</td>
<td>33</td>
</tr>
<tr>
<td>Inner</td>
<td>628</td>
<td>60</td>
<td>33</td>
</tr>
<tr>
<td>Transport</td>
<td>2512</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Petcoke</td>
<td>6582</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Secondary air</td>
<td>87230</td>
<td></td>
<td>900</td>
</tr>
</tbody>
</table>

SAME BURNERS?
Evidence:
Cold region next to the burner tip is influenced by the number of external air orifices.
Evidence:

Beginning of char burning is influenced by the number of external air orifices
Evidence:

Radial velocity (related to flame stability) is influenced by the number of external air orifices.
DYNAMIS D-FLAME BURNERS

D-FLAME R&D

Evidence:

Temperature around the fuel injection orifices is influenced by secondary air entrainment.
DYNAMIS D-FLAME BURNERS

- D-FLAME R&D

**TURBULENCE**
- High injection velocity
- High pressure of primary air flow

**BURNER TIP GEOMETRY**
- Empty spaces allow secondary air entrainment
DYNAMIS D-FLAME BURNERS

- D-FLAME R&D

**ANNULAR SECTION**

**Lower quantity of secondary air entrainment**

**D-FLAME**

**Earlier and higher of secondary air entrainment**
Article published in World Cement magazine in its issue of November 2015
### DYNAMIS D-FLAME BURNERS

#### D-FLAME DESIGN PARAMETERS

<table>
<thead>
<tr>
<th>Flame Settings</th>
<th>Stoichometric Air</th>
<th>Static Pressure (mbar)</th>
<th>Injection Velocity (m/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Flame</td>
<td>5.0 – 7.0 %</td>
<td>250 – 500</td>
<td>190 – 280</td>
</tr>
<tr>
<td>Short and wide Flame</td>
<td>1.5 – 3.0 %</td>
<td>70 – 200</td>
<td>110 – 180</td>
</tr>
<tr>
<td>Long Flame</td>
<td>0.2 – 1.0 %</td>
<td>10 – 150</td>
<td>45 – 160</td>
</tr>
</tbody>
</table>

**Images:**
- Short Flame Settings
- Short and wide Flame Settings
- Long Flame Settings

**Diagram:**
- Internal Air
- External Air
- Tangential Air
DYNAMIS D-FLAME BURNERS

- D-FLAME AIR BURNER INLET – CFD ANALYSIS

<table>
<thead>
<tr>
<th></th>
<th>CFD (mbar)</th>
<th>Measured (mbar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P₁</td>
<td>310</td>
<td>308</td>
</tr>
<tr>
<td>P₂</td>
<td>304</td>
<td>303</td>
</tr>
<tr>
<td>P₃</td>
<td>307</td>
<td>307</td>
</tr>
<tr>
<td>P₄</td>
<td>302</td>
<td>301</td>
</tr>
</tbody>
</table>

Pressure drop at the burner external air inlet:

Δp = 7 mbar (2%)
DYNAMIS D-FLAME BURNERS

- TEMPERATURE MEASURES

Temperature of external air ➔ injection velocity

Temperature of outer pipe ➔ thermal expansion
DYNAMIS D-FLAME BURNERS

- OPTIMIZATION OF SOLID FUEL INLET

Erosion Issues to be avoided in D-Flame Development
DYNAMIS D-FLAME BURNERS

- CONCRETE LINING SHAPE OPTIMIZATION

Temperature (°C)
DYNAMIS D-FLAME BURNERS

- INJECTION OF ALTERNATIVE FUELS

**PARTICLE SHAPE FACTOR: 0.7**

- 16.3 meters in 0.6 seconds
- 26.2 meters in 1.3 seconds

**ACCELERATION AIR**  Injected at 200 m/s
DYNAMIS D-FLAME CONSTRUCTION FEATURES

- **BURNER TIP FABRICATED IN CAST STAINLESS STEEL**
- **EXTERNAL AIR PARTS** – ASTM A-297 Gr.HK, ASTM A-240 Gr310 AND ASTM A-312 TP310
- **TANGENTIAL AIR PARTS** – ASTM A-297 Gr.HK OR ASTM A-240 Gr310
- **PETCOKE INJECTION PARTS** – ASTM A-241 Gr310 AND ASTM A-681 Type 2 (SPACER PIECES)
- **INTERNAL AIR PARTS** – ASTM A-241 Gr310
- **EXTERNAL AIR PARTS WELDED TOGETHER TO PREVENT AIR LEAKAGE (BETWEEN GAPS)**
DYNAMIS D-FLAME CONSTRUCTION FEATURES

- External air
- Tangential air
- Spacing
- Solid fuel
- Internal air
- Guide pipe
DYNAMIS D-FLAME CONSTRUCTION FEATURES

- INTERNAL EXPANSION JOINT

- USED TO COMPENSATE THE THERMAL DILATATION DIFFERENCE BETWEEN THE TWO MORE EXTERNAL PIPES OF THE BURNER

- WELDED TO THE EXTERNAL TUBE FLANGE AND TANGENTIAL TUBE, FACILITATING THE DISASSEMBLY OF THE BURNER FOR MAINTENANCE
DYNAMIS D-FLAME CONSTRUCTION FEATURES

- COAL/PETCOKE INLET

- GEOMETRY DEFINED AFTER CFD SIMULATIONS Aiming Better Fuel Distribution and Erosive Wear Reduction
DYNAMIS D-FLAME CONSTRUCTION FEATURES

- OPENING HATCH FOR INSPECTION
- INTERNALLY COATED WITH ANTI-ABRASIVE CERAMIC COATING
YEAR: 2016

APPLICATION: MAIN BURNER FOR CEMENT ROTARY KILN

PLACE: RIO BRANCO DO SUL – PR

EQUIPMENT: MAIN BURNER RETROFIT D-FLAME TECHNOLOGY

POWER: 51 GCAL/H

FUELS: PETCOKE, OIL 1A, SAF (RT 25), LIQUID WASTE
DYNAMIS RBS CASE

- RETROFIT OF EXISTING BURNER TO D-FLAME TECHNOLOGY
- LOWER COST COMPARED TO A COMPLETELY NEW BURNER
- ASSEMBLY DONE AT THE CLIENT'S SITE WITH DYNAMIS SUPERVISION
DYNAMIS RBS CASE

- FASTER OPERATION RETRIEVE THAN USUAL, ACCORDING TO OPERATORS

- KILN HEATING AND RESPONSE TO HEATING STIMULI (STABILIZATION OF 4 HOURS FOR 3.800 TPD)

- D-FLAME PROVIDED BETTER BURNING PERFORMANCE IN THE KILN

- PRODUCTIVITY INCREASE

- C3S CRYSTALS 14% SMALLER
GOOD PERFORMANCE OF THE BURNER WHEN OPERATING WITH PETCOKE OF HIGH SULFUR CONTENT (ONE OF THE PLANT'S Needs)

HIGHER BURNER MOMENTUM WAS ENOUGH TO COMPENSATE FOR THE NEGATIVE EFFECTS OF THE SULFUR, MAINTAINING THE SIZE AND THE FORM OF THE CRYSTALS

DECREASE IN ELECTRIC ENERGY CONSUMPTION OF THE MILL
DYNAMIS RBS CASE

Article published in World Cement magazine in its issue of July 2017
DYNAMIS ADRIANÓPOLIS CASE

- YEAR: 2019
- APPLICATION: MAIN BURNER FOR CEMENT DRY ROTARY KILN
- PLACE: ADRIANÓPOLIS – PR
- EQUIPMENT: NEW D-FLAME BURNER
- POWER: 48 GCAL/H
- FUELS: PETCOKE, DIESEL, SAF (RT 25), LIQUID WASTE
DYNAMIS ADRIANÓPOLIS CASE

■ REPLACED BURNER

■ SUBSTITUTION OF EXISTING ANNULAR BURNER FOR A NEW DYNAMIS D-FLAME BURNER

■ EXISTING BURNER WITH LIMITED OPERATIONAL FLEXIBILITY – ONLY ONE INLET FOR BOTH AXIAL AND SWIRL AIR, WITH CHANNEL DISTRIBUTION MADE BY TIGHTENING OR LOOSING A FLEXIBLE JOINT, AND NO SOLID ALTERNATIVE FUEL CHANNEL

■ PLANT NEEDED A BURNER WITH IMPROVED FLEXIBILITY THAT MUST BE 100% REMOTELY CONTROLLED FROM THE CONTROL ROOM AND A NEW CHANNEL FOR SOLID AF FUTURE USE
DYNAMIS ADRIANÓPOLIS CASE

- NEW DYNAMIS D-FLAME BURNER
  - FULLY AUTOMATED D-FLAME BURNER WITH 3 INDEPENDENT SHAPING AIR CHANNELS (EXTERNAL AIR, TANGENTIAL AIR AND INTERNAL AIR)
  - POSSIBILITY TO CONTROL EACH SHAPING AIR CHANNEL INDEPENDENTLY IN ORDER TO HAVE MULTIPLE FLAME CONFIGURATIONS FOR DIFFERENT KILN OPERATION MODES (STARTUP, NORMAL OPERATION, ALTERNATIVE FUEL BURN, ETC)
  - NEW SOLID ALTERNATIVE FUEL CHANNEL WITH ACCELERATION AIR (“SMILE”) FOR LONGER SUSPENSION TIME AND INCREASED BURNING
  - D-FLAME PROVIDED BETTER BURNING PERFORMANCE IN THE KILN
  - C3S CRYSTALS 29% SMALLER
DYNAMIS ADRIANÓPOLIS CASE

- D-FLAME AUTOMATION

- DYNAMIS SUPPLIED A NEW SHAPING AIR MANIFOLD SPLIT IN 2 PARTS (ONE FOR EXTERNAL AIR SUPPLIED BY A NEW BLOWER AND ANOTHER FOR TANGENTIAL AND INTERNAL AIR SUPPLIED BY THE EXISTING AIR FAN)

- SHAPING AIR SUPPLY FULLY CONTROLLED FROM THE CONTROL ROOM USING THE NEW ELECTRIC ACTUATED BUTTERFLY VALVES SUPPLIED BY DYNAMIS

- SUPPLY OF NEW PRESSURE TRANSMITTERS, DIFFERENTIAL PRESSURE TRANSMITTERS AND FLOW METERS FOR SHAPING AIR MONITORING FROM THE CONTROL ROOM
DYNAMIS ADRIANÓPOLIS CASE

- DYNAMIS supplied: D-FPUMP (Pump Skid) for liquid residue (and HFO or diesel if necessary)

- DYNAMIS supplied: D-RACK (Valve Rack) for liquid residue (and HFO or diesel if necessary)
DYNAMIS CLINCHFIELD CASE

- YEAR: 2019
- APPLICATION: MAIN BURNER FOR CEMENT ROTARY KILN
- PLACE: CLINCHFIELD – USA
- EQUIPMENT: NEW D-FLAME BURNER
- POWER: 91 GCAL/H
- FUELS: NATURAL GAS, PEANUT SHELLS, PECAN SHELLS, DIESEL
DYNAMIS CLINCHFIELD CASE

NEW DYNAMIS D-FLAME BURNER

- EXISTING BURNER OPERATING WAS A COAL/PETCOKE DIRECT FIRING SYSTEM
- CLIENT NEEDED TO IMPROVE THE FLAME FLEXIBILITY OF THE BURNER
- NECESSITY TO INCREASE THE SOLID ALTERNATIVE FUELS USE (UP TO 100% THERMAL SUBSTITUTION BURNING PEANUT SHELLS)
DYNAMIS CLINCHFIELD CASE

- DYNAMIS SUPPLIED A NEW NATURAL GAS VALVE RACK
- NATURAL GAS MAX. FLOW: 8.650 KG/H
- INLET PRESSURE: 3.5 TO 8.0 BAR
- OUTLET PRESSURE: 300 MBAR TO 2.0 BAR
  - OUTLET PRESSURE – IGNITER: 200 MBAR
- FIRST CLASS COMPONENTS: BRAY, JAMESBURY, PIETRO FIORENTINI, DUNGS AND JEFFERSON
DYNAMIS CLINCHFIELD CASE

- Thermal power: 45 kW
- Flame relay/Flame detection
- High temperature rubber silicone Air cooling
- LPG or NG
- 110 or 220 V

D-IGNITER

Gas Valve Train and Burner Management System with light up sequence in automatic control
DYNAMIS CLINCHFIELD CASE

- DYNAMIS SUPPLIED A BURNER MANAGEMENT SYSTEM WITH SAFETY PLC TO CONTROL THE NATURAL GAS D-RACK

- RESPONSIBLE FOR STARTUP SEQUENCE CONTROL AND NATURAL GAS OPERATION CONTROL

- BMS CABINET WITH HMI INTERFACE RIGHT AT THE BURNER PLATFORM

- COMMUNICATION WITH THE PLANT PLC
The Dynamis BMS Safety PLC 100% programmed

Fully compliant with NFPA 85, 86 and EN 298, or other standards
DYNAMIS CLINCHFIELD CASE

- DYNAMIS SUPPLIED A NEW MAIN BURNER D-TROLLEY
- CARBON STEEL STRUCTURE
- FRONT AND BACK HEIGHT ADJUSTMENT (VERTICAL)
- BACK HORIZONTAL ADJUSTMENT
- ASSEMBLED WITH GEAR MOTOR, SPUR GEARS AND ROLLER CHAIN FOR TRANSMISSION
- ALLOWS BURNER TO OPERATE IN HORIZONTAL POSITION OR ALIGNED WITH THE KILN AXIS
DYNAMIS TOLU CASE

- YEAR: 2019
- APPLICATION: MAIN BURNER FOR CEMENT ROTARY KILN (DIRECT FIRING SYSTEM)
- PLACE: TOLUVIEJO – COLOMBIA
- EQUIPMENT: NEW D-FLAME BURNER
- POWER: 36 GCAL/H
- FUELS: COAL (DIRECT FIRING) AND NATURAL GAS
DYNAMIS TOLU CASE

- REPLACED BURNER
  - EXISTING BURNER HAD PROBLEMS WITH THE FLAME SHAPE
  - LONG AND WIDE FLAME, NOT SUITABLE FOR THE KILN
  - NO SHAPING AIR, LOW FLAME MOMENTUM
  - DIFFICULTY IN CONTROLLING THE FLAME
NEW DYNAMIS D-FLAME BURNER

- DYNAMIS SUPPLIED A BURNER TAYLOR MADE SPECIALLY FOR A DIRECT-FIRING SYSTEM

- TWO NEW SHAPING AIR CHANNELS (EXTERNAL AND TANGENTIAL) FOR BETTER FLAME CONTROL, HIGHER FLAME MOMENTUM AND AIR ENTRAINMENT

- USE OF HIGH PRESSURE AND HIGH VELOCITY AIRFLOW AT THE EXTERNAL CHANNEL, PROVIDING A SHORT AND NARROW FLAME
DYNAMIS MARACÁS CASE

YEAR: 2020

APPLICATION: MAIN BURNER FOR VANADIUM ROTARY KILN

PLACE: MARACÁS – BA

EQUIPMENT: NEW D-FLAME BURNER

POWER: 25 GCAL/H

FUELS: CHARCOAL, OIL 1A AND LPG
DYNAMIS MARACÁS CASE

- DIFFERENT FROM CEMENT, THIS CASE IS OF AN OXIDANT KILN, WITH A DIFFERENT LEVEL OF O2 DUE TO THE REACTIONS THAT MUST OCCUR INSIDE OF IT

- HIGH FLAME TEMPERATURES MAY CAUSE UNDESIRABLE MELTING OF THE SILICA, PREVENTING THE VANADIUM TO REACT PROPERLY

- PRESENCE OF CHARCOAL ON THE MATERIAL BED IS ALSO NOT DESIRED

- DYNAMIS PROVIDED A TAYLOR MADE SOLUTION THAT DEVIATES FROM THE USUAL CEMENT KILN BURNER APPLICATION

- SPACER COATED WITH TUNGSTEN CARBIDE TO AVOID EROSION BY HIGH ABRASIVE CHARCOAL
THE D-FLAME BURNER FOR THE MARACÁS PLANT WAS DESIGNED WITH THE HELP OF IMPORTANT TOOLS SUCH AS THE D-RKILN SIMULATOR (DEVELOPED BY DYNAMIS) AND MULTIPLE CFD ANALYSIS OF THE PROCESS

- TWO OPERATION MODES, ONE FOR CHARCOAL USE AND THE OTHER ONE FOR LPG OR OIL USE

- EXTERNAL AND TANGENTIAL AIR CHANNELS FOR AIR ENTRAINMENT WHEN OPERATING WITH COAL, BUT AT LOWER PRESSURE

- TWO ANNULAR AXIAL AIR CHANNELS TO ENCAPSULATE THE LIQUID/GASEOUS FUEL AND PROVIDE A LONGER FLAME (ONE OF THE AXIAL AIR CHANNELS IS THE CHARCOAL CHANNEL)
Learn about our solutions