

Hi-Efficiency Heating Systems

Engineering Development For Steel Making Plants

شرکت کانی فرآور کاسپین

Caspian Mineral Processing Eng. Co

About Us

Caspian Mineral Processing Engineering Company (trade name MIN-TEC) established in 2009 by a group of qualified engineers with many years work experiences in copper & iron mine industries In Iran. MIN-TEC objective plans providing engineering, manufacturing and procurement services as an engineering, consultant or Integrated Project Management Solutions.



Our View

World Class Engineering Services, Best Solution for Most Efficiency with Qualified Experts and Engineers

MIN-TEC's plans have been identified in the following priority policies:

- 1 Right recognize our client requirements.
- 2 Well-organized engineers and staffs to present best services.
- 3 Continuous Improvement and development in all levels of MIN-TEC's staffs
- 4 Develop of cooperation with well-known companies around the world to share abilities

We believe to catch the above priority policies, effective cooperation and all engineers and staffs have to act in this manner. Director Manager is responsible to accede the mentioned goals and right recognize and execute the policies. Also our policies will checked and revised by management commission.

Our Steel Industries Background

MIN-TEC was working just in Mineral processing and mining project until 2017, and we just have some experiences supplying vibrating equipment for some Steel Complex in Iran. April 2017 we won a contract to supply the material handling system, vibrating feeders, Fan & De-dusting systems and some equipment for SARRALLE Group as the technology provider and general contractor for ARVAND JAHAN ARA Steel Plant .

This project lead our policy trough the steel company market by ourselves to develop special equipment for AJS as the SARRALLE trusted us before.

Finally the Client trusted us and approved our offer to supply 6 preheater and dryer in 4 separate types in 2019 December.



Heating Systems

Heating systems consisting of following machines in a Steel Making Plant:

1 Horizontal Ladle Preheaters:

Horizontal Ladle preheaters >HLP is an The equipment is designed for the purpose of preheating with thermal cycle thermo-controlled for the quick reheating of the ladle from the temperature of 400-600 °C up to 1100 °C. . In a 1.2 MTY Steel Plant usually are 2 +1 HDL.

2 Vertical & Online Ladle Dryer- Preheaters:

Vertical & Online Ladle Preheater >VLD & OLD is an equipment is using to Preheat/Dry the refractory of the Ladles when it is going to melting shop. In a 1.2 MTY Steel Plant usually are 2 VDL+ 1 OLD.

3 Tundish Dryer:

Tundish Dryer >TUD is an equipment is using to dry the refractory of the Tundish when it is in the refractory maintenance and replacing Area. In a 1.2 MTY Steel Plant usually one Tundish Dryer is in Service.



Hi-Efficiency Horizontal Preheater

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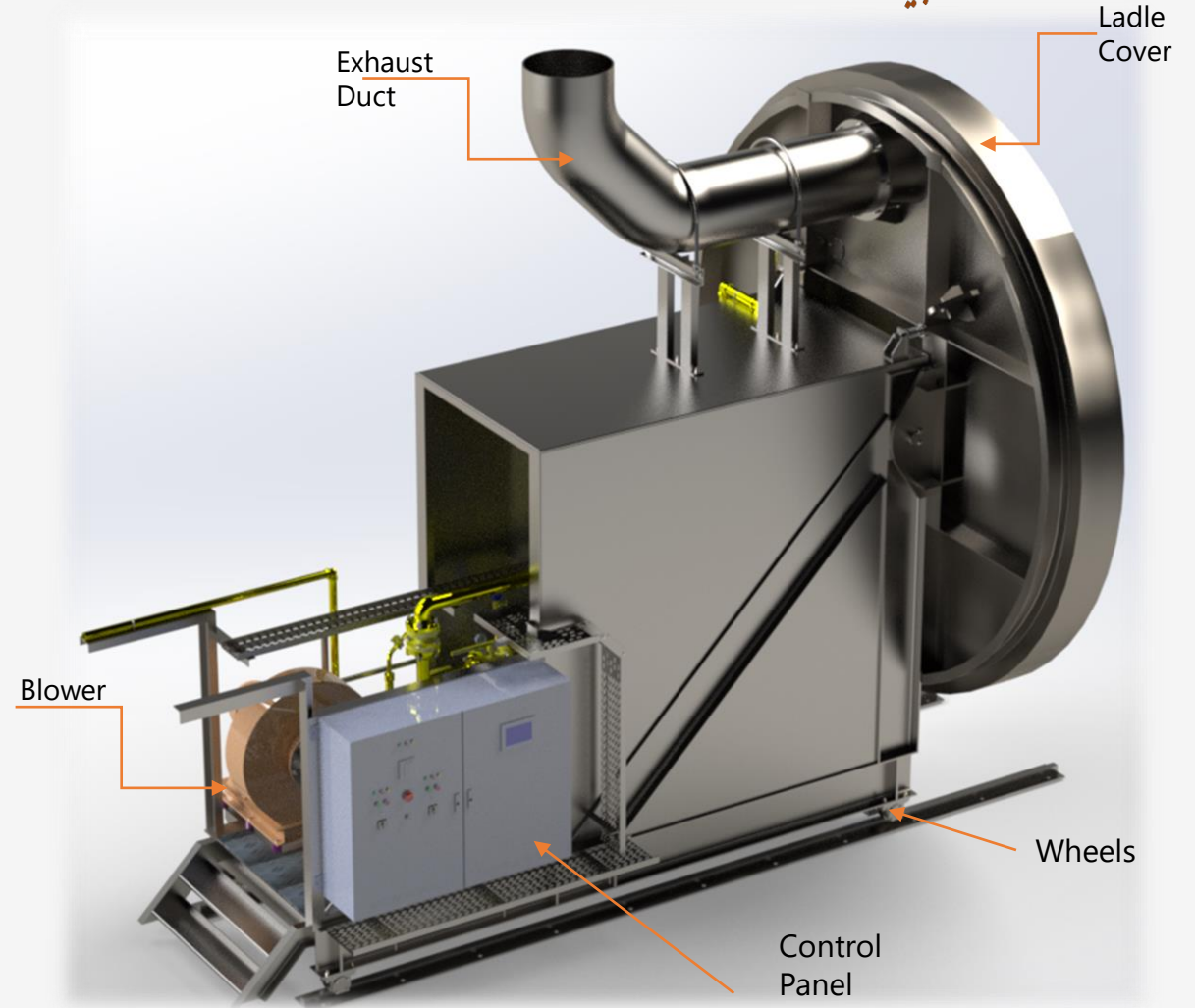
Horizontal Ladle Preheater:

Horizontal Ladle Preheater **>HLP** is mounting on a rail pad reciprocating when is under service and one is on the rest.

The heating system using a burner designed and tailored made by MIN-TEC during the know-how development. The Burner is designed for CNG but it could be redesigned for LPG, Heavy Fuel , and oil gas as well.

The machine is using two gearmotor drive to move Preheater to attach to the ladle for the service, and back to rest position also with this system.

A Burner Controller Unit **>BCU** , controls all the functions of the burner and also has an overall safety system as a built-in programming. This controller is attached to a PLC to control the Performance of the drying Curve with as Doubled Safety Definitions.



Hi-Efficiency Horizontal Preheater

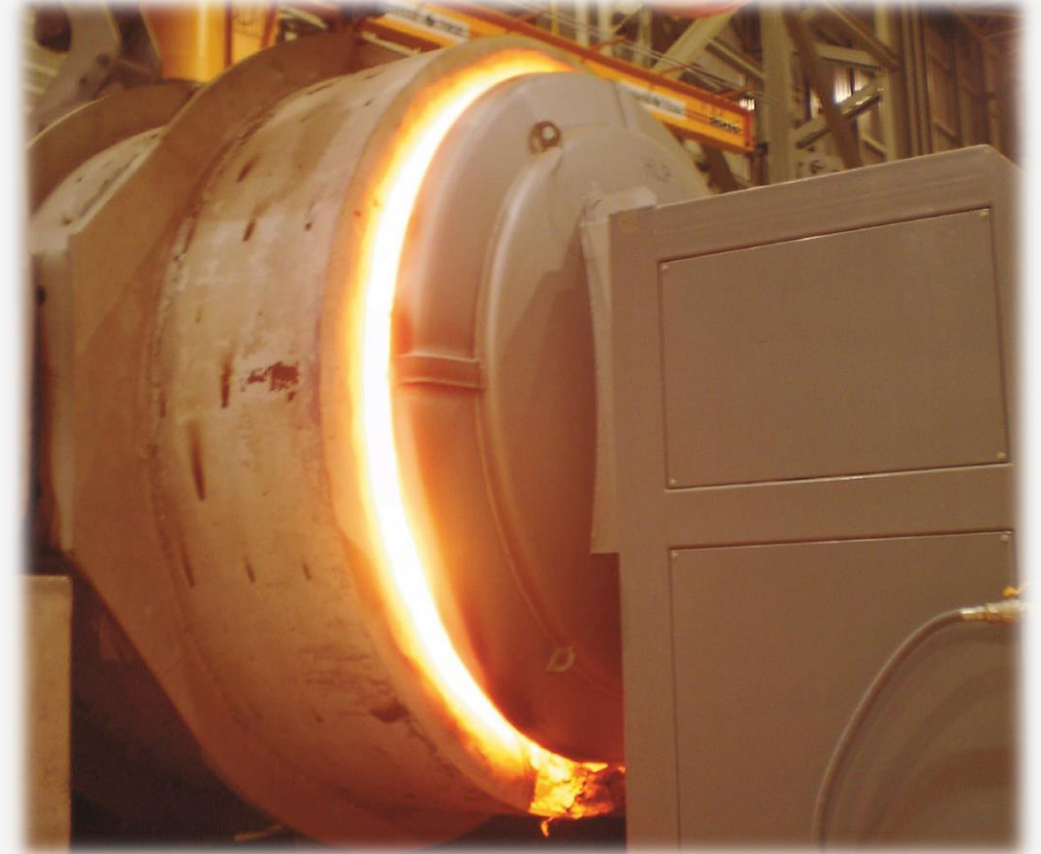
Horizontal Ladle Preheater:

Horizontal Ladle Preheater >HLP is equipped with a Ceramic Fiber refractory on the Ladle Cover to bear 1300°C temperature during drying procedure that takes about 12 hr.

The burner cover describes a translation movement to approach to the stand the ladle has been placed. There will be a safety gap between the ladle and the preheater to avoid causing damages to cover or ladle.

The burner is directly ignited by means of high voltage equipment after an automatic purging of the combustion chamber.

The ladle preheater has automatic temperature control. It is fitted with all filters, valves, pressure switches, safety devices etc. required for normal operation. Ladles will rest on metallic supports.



Hi-Efficiency Horizontal Preheater

Horizontal Ladle Preheater Specifications:

Fuel Design: CNG

Burner Power: 4500 kW

Fuel Operation Flow: 260-450 Nm³/hr

Fuel Pressure @ input: 4 bar

Combustion Air Flow Rate: 2800 Nm³/hr

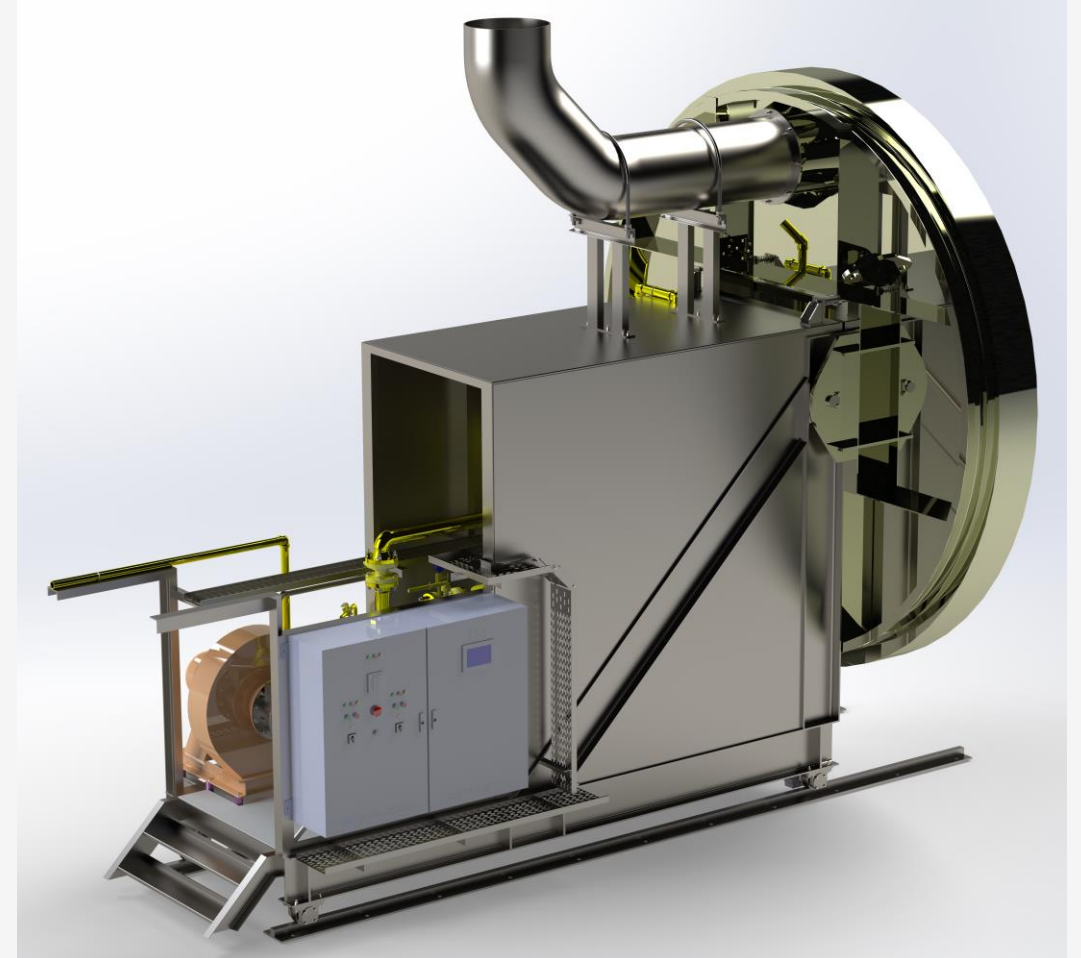
Blower Electrical Power: 15 Kw

Trolley Power: 2x0.25 kw

Reciprocating Stroke: 1000mm

Ladle Dimension: ϕ 3600x5340 mm

Maximum process temperature: 1300°C



Hi-Efficiency Tundish Dryer

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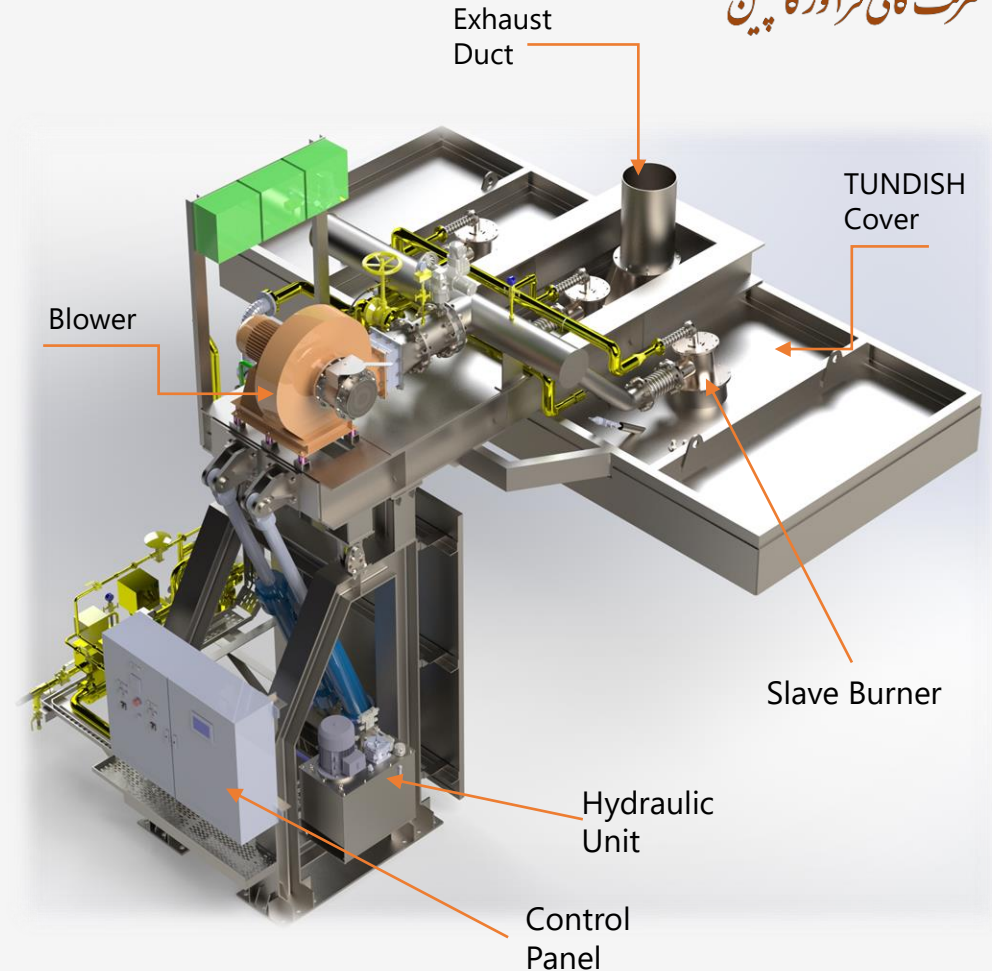
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TUNDISH Dryer:

TUNDISH Dryer **>TUD** is mounting on reinforcement foundation .

The station is self-contained and is equipped with gas-air burners with flame safety device. The burners have a high-speed flame with automatic ignition and flame sensor. High – speed flame is required to protect Tundish from the hot spots. Flame monitoring is automatic by means of an electrode inserted into the flame ionized zone of each burner. The gas and air mixture is controlled by a flow transmitter and supervised by a dedicated control regulated box. An on-board blower supplies air.

The machine is using two Hydraulic Cylinders tilting the Tundish Cover between horizontal angle 0° (at service) and Vertical 90° (On rest). A Hydraulic unit drive twin hydraulic cylinders with the a 30-35 Sec repositioning time.



Hi-Efficiency Tundish Dryer

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Tundish Dryer:

Tundish Dryer **>TUD** is equipped with a Ceramic Fiber refractory on the Tundish Cover to bear 1000°C temperature during drying procedure that takes about 12 hr.

The heating system using a 3 sets burner designed and tailored made by MIN-TEC during the know-how development. The Burners consists of a Master Burner and two Slave Burner installing on a line and are designed for CNG but it could be redesigned for LPG, Heavy Fuel , and oil gas as well.

Three Burner Controllers Unit **>BCU** , controls all the functions of the burner and also has an overall safety system as a built-in programming. As same as there is a Master **>BCU** and two Slaves. This controller is attached to a PLC to control the Performance of the drying Curve with as Doubled Safety Definitions .



Hi-Efficiency Tundish Dryer

Tundish Dryer Specifications:

Fuel Design: CNG

Burner Power: 3x1500 kW

Fuel Operation Flow: 260~450 Nm³/hr

Fuel Pressure @ input: 4 bar

Combustion Air Flow Rate: 2800 Nm³/hr

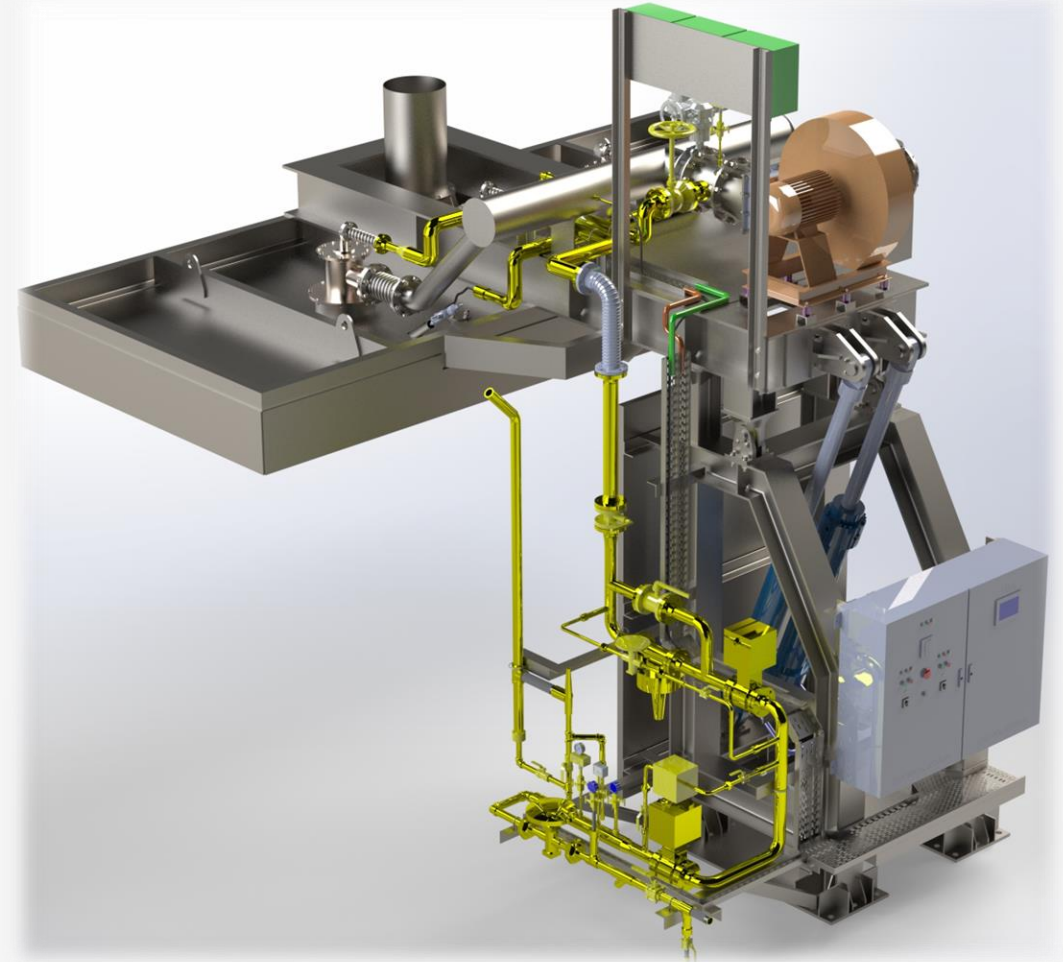
Blower Electrical Power: 15 Kw

Hydraulic Unit Power: 5.5 kw

Tilting Stroke: 90°

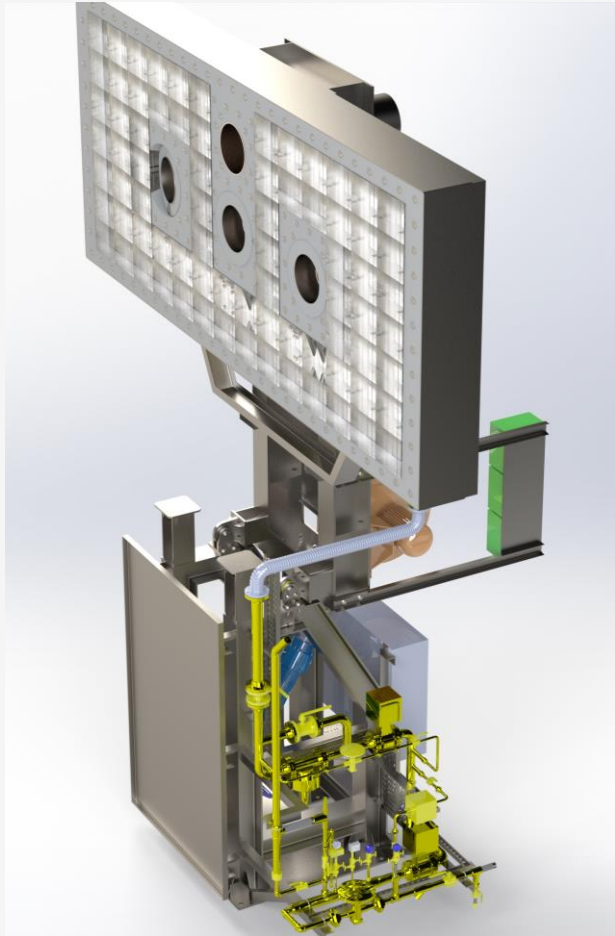
Tundish Dimension: L5500xH1600x mm

Maximum process temperature: 800°C

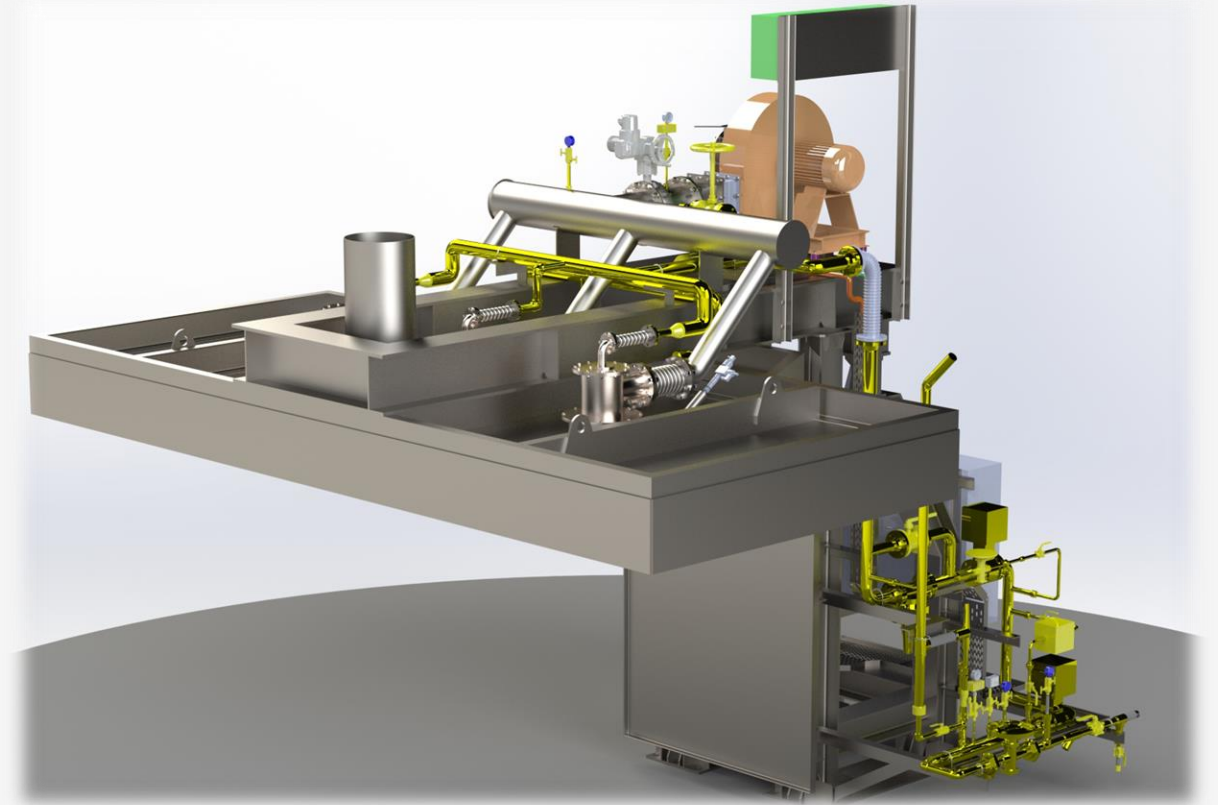


Hi-Efficiency Tundish Dryer

On Rest Position



At Service Position



Hi-Efficiency Vertical Preheater & Dryer

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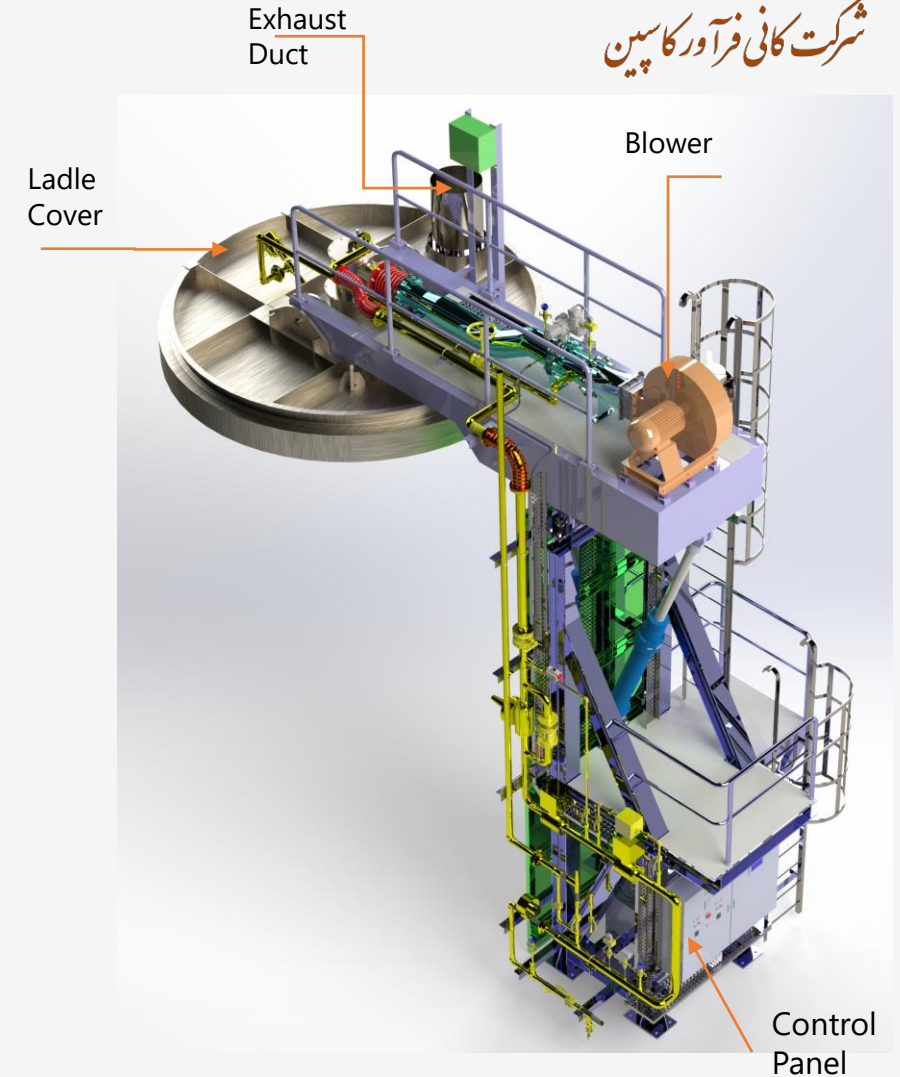
Vertical Ladle Preheater/Dryer:

Vertical Ladle Preheater/Dryer >VLP or >VLD is Self stand on a concrete foundation.

The burner is fixed into the burner shield, which is mounted Slew-able onto the vertical supporting structure.

The vertical dryer is used to heat up the new refractory in the ladle in a controlled way. The station is composed by a vertical dryer and is located on the concert foot ground.

The vertical ladle dryer consists of a circular cover with a centrally located burner. The burner develops a high-velocity, extended flame which brings the thermal energy down to the ladle bottom. The cover is lined with refractory fibers capable of withstanding temperatures up to 1000 in one hour and keeps it constant during 24 hours.



Hi-Efficiency Vertical Preheater & Dryer

Vertical Ladle Preheater & Dryer Specifications:

Vertical Preheater/ Dryer **>VLP or >VLD** is equipped with a Ceramic Fiber refractory on the Tundish Cover to bear 1000°C temperature during drying procedure that takes about 12 hr.

The heating system using a 1 central burner designed and tailored made by MIN-TEC during the know-how development. The Burner is designed for CNG but it could be redesigned for LPG, Heavy Fuel , and oil gas as well.

A Burner Controllers Unit **>BCU** , controls all the functions of the burner and also has an overall safety system as a built-in programming.

This controller is attached to a PLC to control the Performance of the drying Curve with as Doubled Safety Definitions .



Hi-Efficiency Vertical Preheater & Dryer

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Vertical Ladle Preheater & Dryer Specifications:

Fuel Design: CNG

Burner Power: 4500 kW

Fuel Operation Flow: 260-450 Nm³/hr

Fuel Pressure @ input: 4 bar

Combustion Air Flow Rate: 2800 Nm³/hr

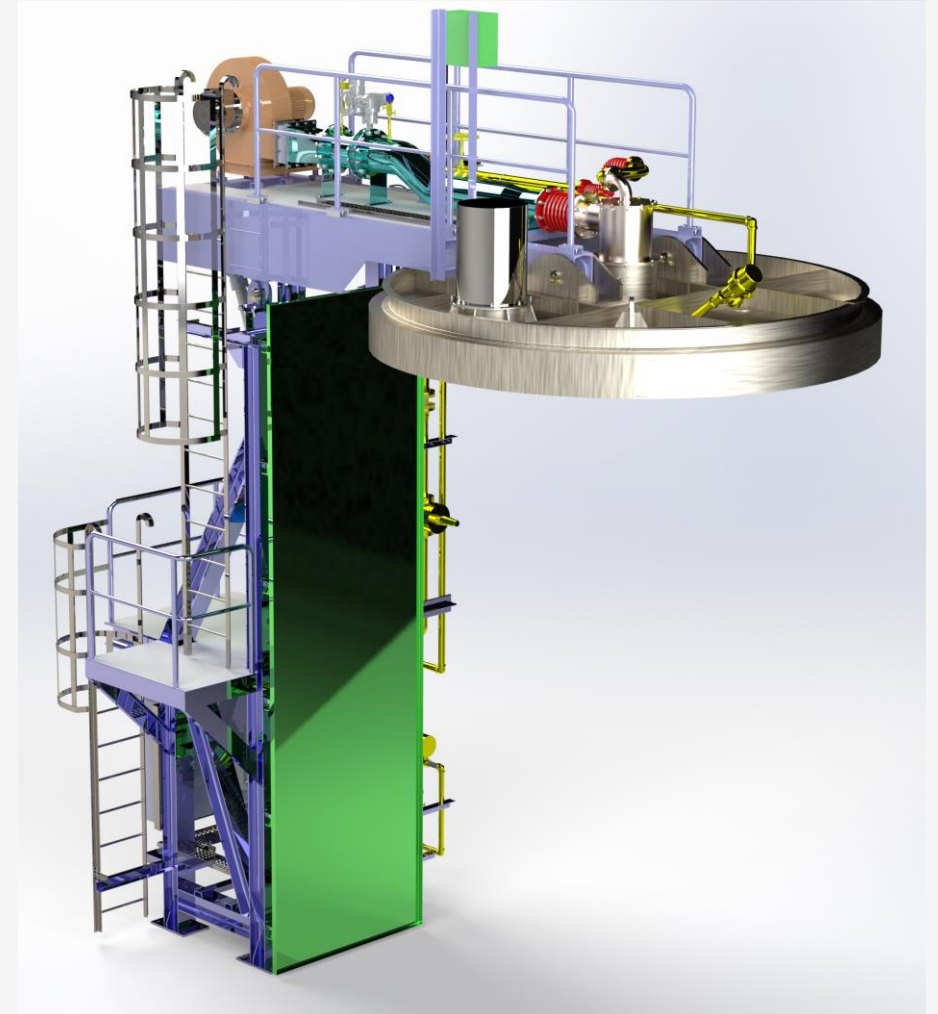
Blower Electrical Power: 15 Kw

Hydraulic Unit Power: 5.5 kw

Tilting Stroke: 80°

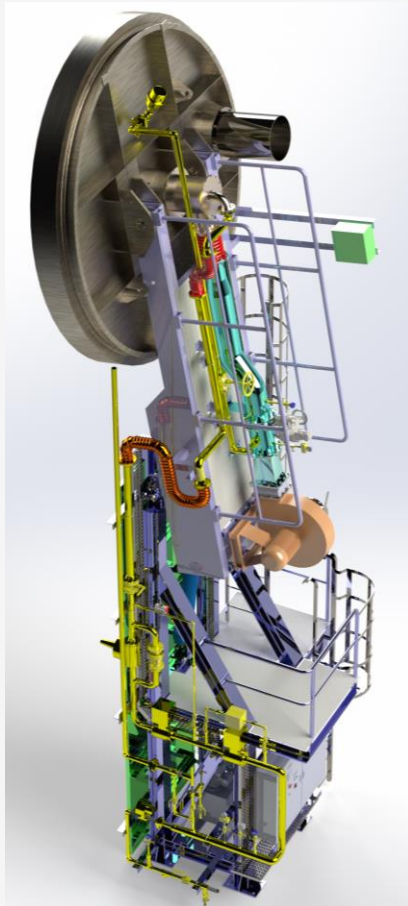
Ladle Dimension: ϕ 3600x5340 mm

Maximum process temperature: 1000°C

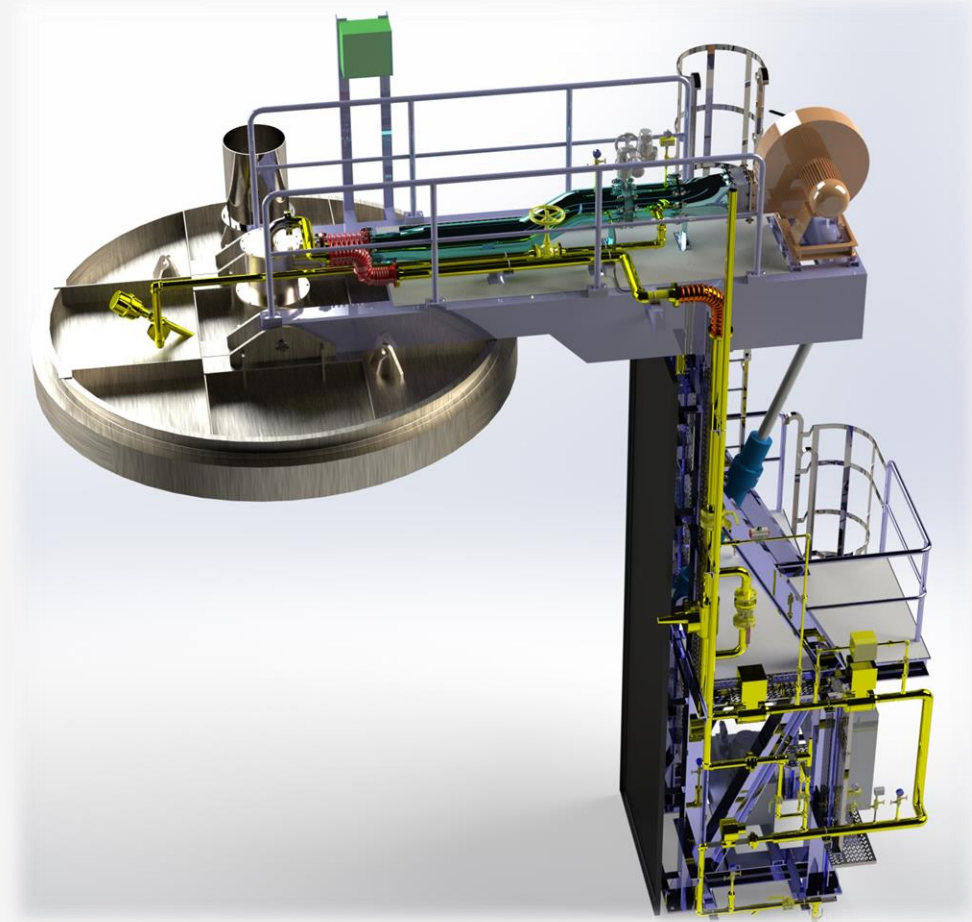


Hi-Efficiency Vertical Preheater & Dryer

On Rest Position



At Service Position



Heating Systems Know-how development

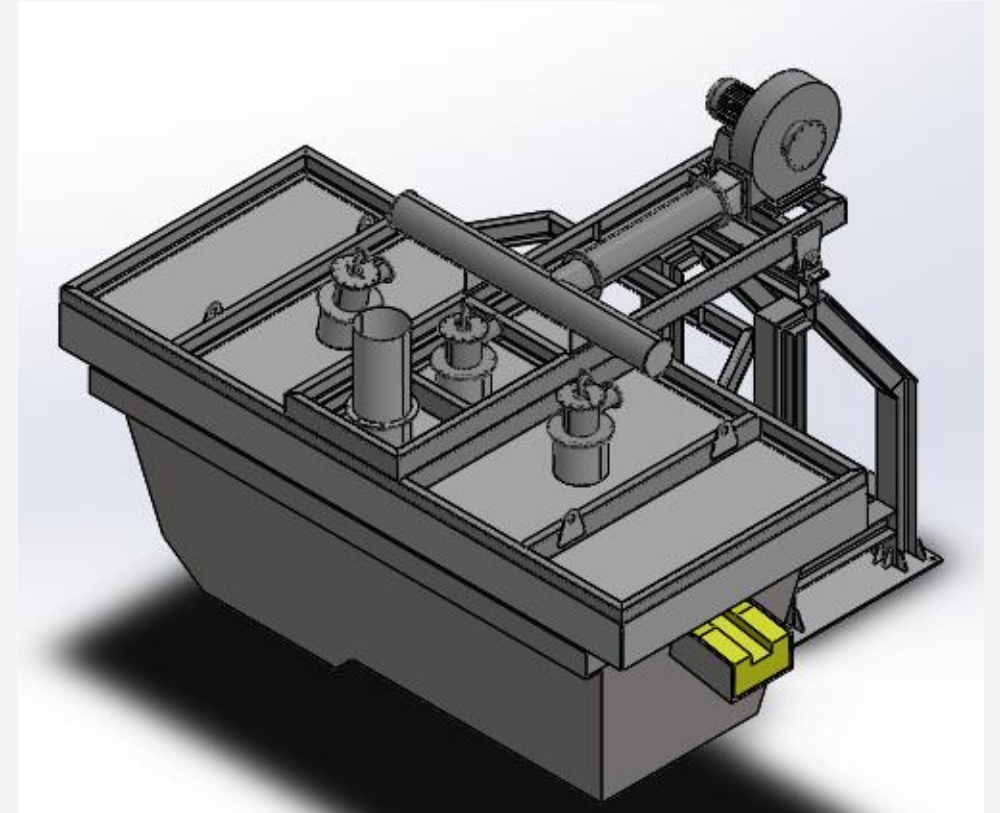
Before the engineering Developments have been started, the system concept has been divided into several items but some of them were similar in all under development systems.

The Eng. Department tried to make a logical way to develop this project in a way that make easier the future Heating Systems using modular modules and components trying to select more easy by the clients.

1 BURNER >CFD Analysis

2 Refractory Re-Engineering

3 Control System



TUNDISH Analytical Model

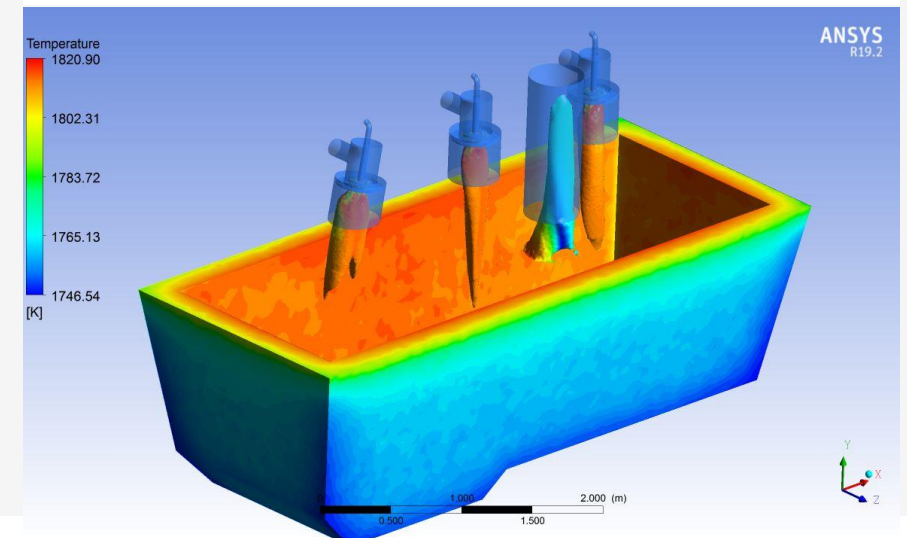
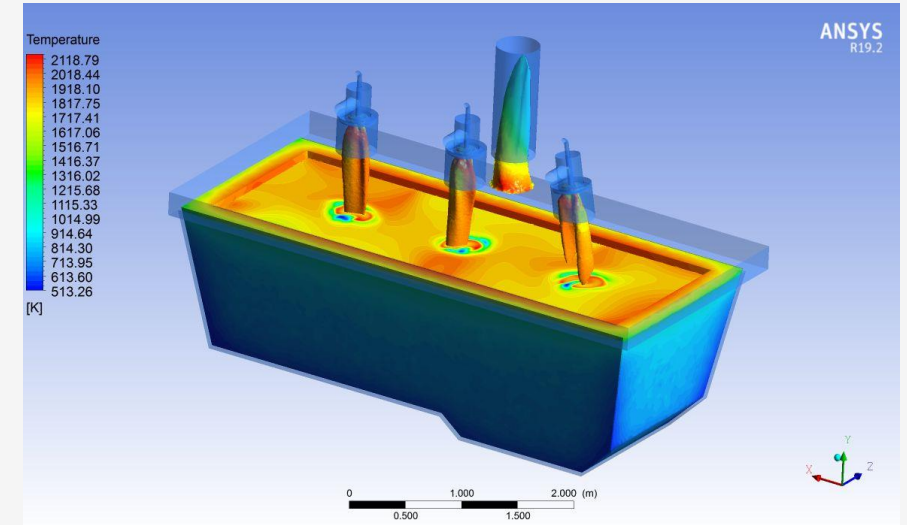
Heating Systems Know-how development

BURNER Computational Fluid Dynamics Analysis

1 Thermal conductivity calculation (Ladle & Tundish) to determine and Solve essential equation.

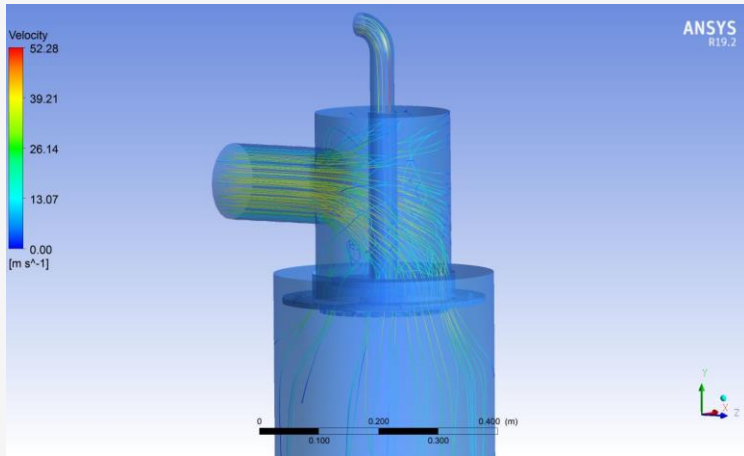
2 The Results:

- Temperature Distribution
- Velocity Distribution
- Tundish and Ladle inner Hot Spot & Cold Spot
- Chimney Temperature Distribution
- Orifice Sizing modifications
- Flame Lengths modified according to type of ladle or Tundish
- Fuel Consumption decreased compare to European References
- Refractory Specifications determination based on the existing material

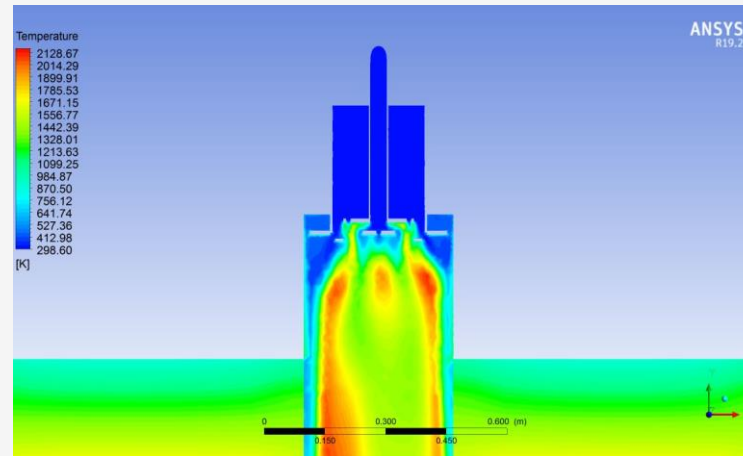


Heating Systems Know-how development

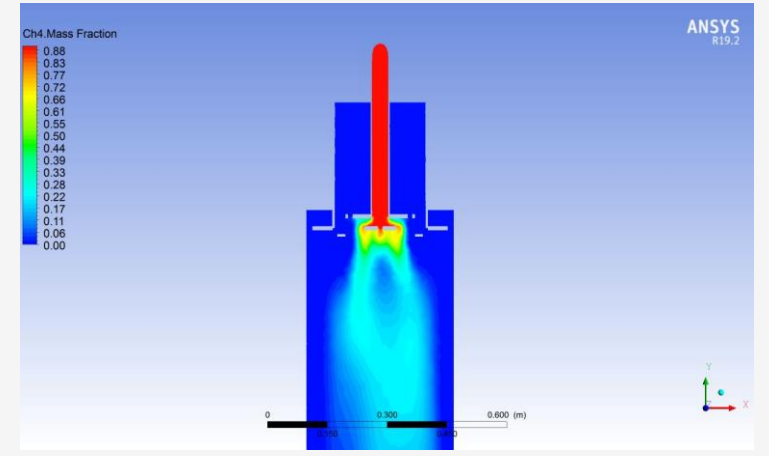
BURNER CFD (Computational Fluid Dynamics) Analysis



1 Burner Stream Line

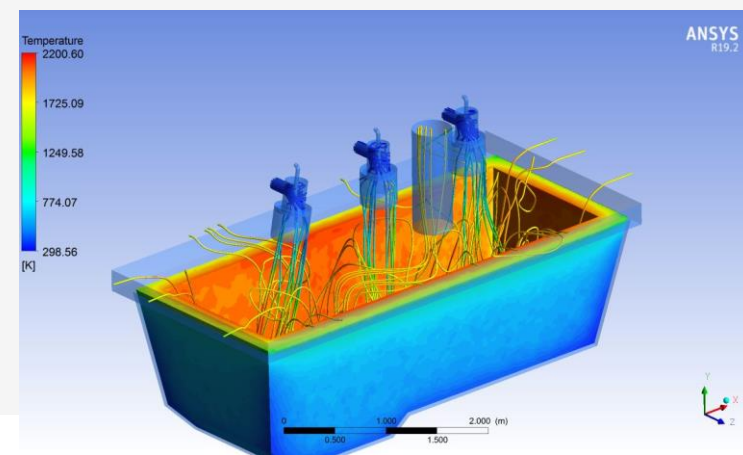
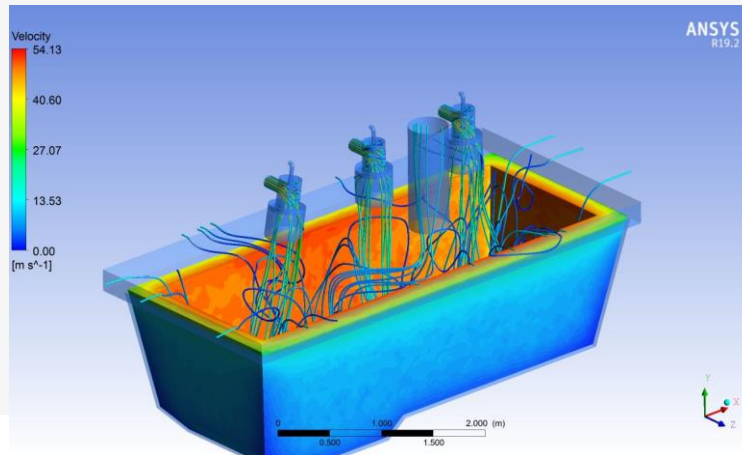


2 Burner Flame Temperature



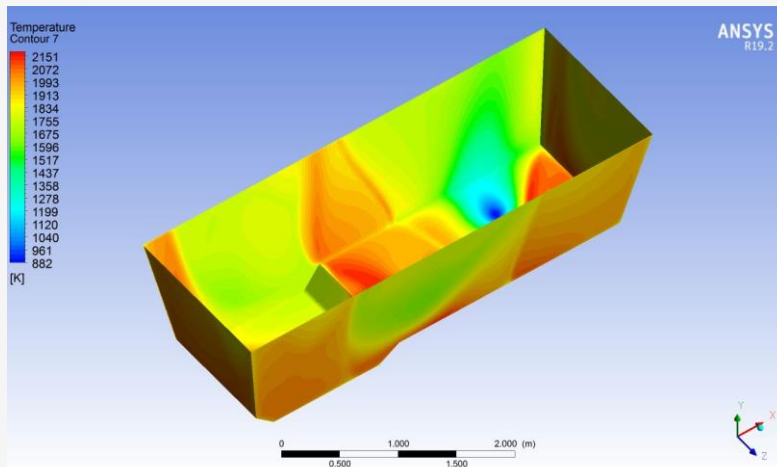
3 CH4 Distribution

4 Streamlines



Heating Systems Know-how tests and Validations

Data Validation has been started when the Burneres manufactured, a pilot tets facilities and the Burners has been tetsed in several operational conditions. The tests have been done under **CFD** team supervision and the results used as a feed back for our recalculations. Finally these tests, recalculations and computational analysis made some modifications on the Burners , Tundish and Laddle cover Refractorie's Engineering & Design.



Our Partners

To meet the most accurate process control ;A group of the bests and well-known first class manufacturer have been used to supply the components of the Preheaters & Dryers.

- 1 Burner Controller 
SIAD Group
- 2 Safety Valves 
The-Safety-Valve.com
- 3 Control Valves 
- 4 Instrumentation Valves 
- 5 Flame & UV Detectors 

- 6 Gage & Indicators
- 7 Flame Control Special Instrumentations



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Thanks for your Attentions