

Safety first Quality always



Casting



Grupo
THERMOJET®

Thermojet began in the **year 2000**, when the engineer and entrepreneur Ricardo Leite Passos gathered a group of colleagues to acquire the **Special Heating and Cooling Division** of the company **Brasimet**, where they worked. The colleagues became partners. They brought with them a remote history, from the **Lindberg** company, which in **1977** had introduced convective heating in South America, and had been incorporated by Brasimet.

By the time of its foundation, Thermojet primarily served glass and steel industries, offering thermal input at the start-up and shutdown, with a heating characterized by the **equalization of temperatures** over long stretches and **high thermal uniformity**, far superior to that provided by the then known methods.



Born with the excellence of the companies from which it originated, Thermojet grew at a rapid pace, **doubling annually in size** in each of its first 10 years. Meanwhile, it began to carry out major works in plants with a capacity of **tens of millions of tons per year**, which it attends in an agile way with its **more than 250 combustion sets**.

Simultaneously, Thermojet extended its portfolio to offer a variety of **solutions in Thermal Engineering**, such as the preservation of refractories, mobile system for monitored oxyfuel combustion and computer simulation, among others.

In 2005, Thermojet filed its first **patent** application. It thus formalized the innovative vocation that continues to this day, materialized in a **division specially dedicated to the development of technology**, **Aestus**, which has among its products the development of the **software**

COBRA for the management of refractory preservation in coking plants, efficient heating and cooling stations, and the consistent patent registration of burners and auxiliary devices, as a result of R&I investments amounting to 2% of revenue.

In 2014, through the incorporation of Brazilian national leader **4Pipe**, Thermojet Group's portfolio integrated products and services for **cleaning and inspection of pipelines**.

At present Thermojet features a vast history of services for industries in various segments throughout **South America, Central America and the Caribbean**, as well as operations in China and the **partnership with Glass Service**, based in the **Czech Republic**, which has developed and used since 1990 a **computational fluid dynamics software**, CFD, refined in the simulation of refractory lined equipment.

Services

Thermojet has specialized teams in several applications of Thermal Engineering, as well as consultants and **innovation** partners for the development of **tailor-made solutions**:

- Controlled drying and heating
- Accelerated or controlled cooling
- Mobile system for monitored oxyfuel combustion
- Monitored hot-hold
- Expansion and contraction control
- Monitored draining and filling of glass ovens
- Monitored thermal comfort
- Generation of hot gas at specific flow and temperature
- Refractory diagnosis
- COBRA: Management of refractory preservation
- *Jetwelding*[®] ceramic welding
- Heat treatment
- Computational simulation of heat exchange
- Tailor-made special services

Global presence



Having units in Brazil, Colombia and Argentina, Thermojet serves the whole **South America, Central America and the Caribbean**. It is also based in **China** and represents Glass Service and Flammatec companies based in the **Czech Republic** and global reference in burners, accessories and advanced solutions for the glass industry.

Casting

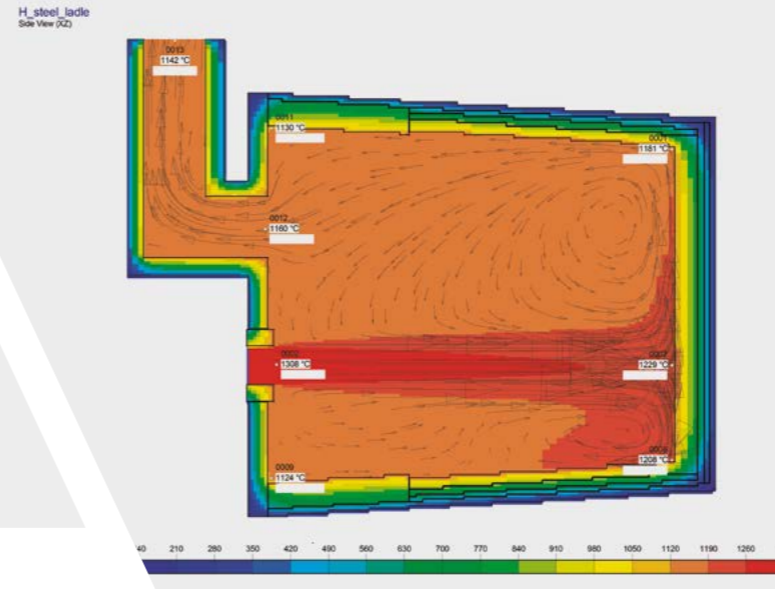
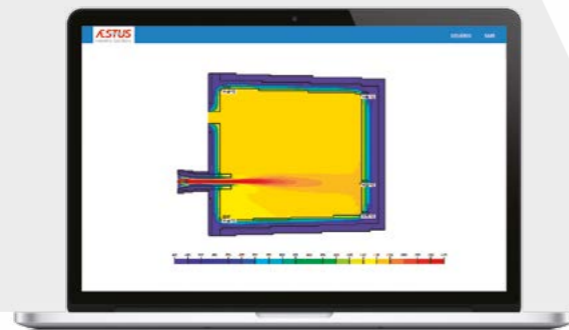


We also conduct thermal studies of the entire ladles cycle, identifying and executing the **best reheating curves** for **increased uptime** and **reduced fuel consumption**.

Thermal efficiency for the ladles cycle.

We offer high efficiency **thermal input** for the **start, partial stop and general refurbishment** of the most diverse equipment at the casting area in steel mills:

- Steel ladles
- Pig iron ladles
- Converters
- Pig iron mixers
- Valves
- Tundishes
- RH systems



For the cleaning of ladles, we apply equipment and personnel specialized in operations with **mobile system for monitored oxyfuel combustion**.

In the **heating and drying** operations, we use stations specially developed by our **technology division, Æstus**, to solve the main problems related to refractories and their thermal changes:

- Reduction of **sequence breaks** caused by low temperature
- Stability of **tapping temperature**
- Cut in heating and reheating **times**
- Abatement of **fuel** consumption
- Increase in the refractory **campaign**
- Thermal **uniformity**
- Thermal **soak**
- Reduction of thermal shock, with **preservation of the refractory**
- **Equalization of the temperature** of ladle refractories at the bottom, baseboard and first rows with those at higher elevations



Pig iron and steel ladles

We carried out the installation and operation of **heating and reheating stations**.

Pig iron and steel ladles up to **210 tons**

Services

- Controlled drying and heating
- Accelerated or controlled cooling
- Heating and cooling stations
- Mobile system for monitored oxyfuel combustion
- Monitored hot-hold
- Controlled thermal comfort
- Computational simulation of heat exchange
- Tailor-made special services

Heating and cooling stations

Retrofit or custom manufacturing.

We have a technical and managerial team specifically dedicated to the development of cooling and heating stations, with a focus on providing the **maximum performance and durability of refractories**. **Technical Assistance available 24 hours a day.**

We retrofit and manufacture stations for the most diverse equipment:

Steel and pig iron ladles

Torpedo cars

Blast furnace runners

Tundishes

We elaborate practical and theoretical studies as well as computational simulations so that our stations can **efficiently** solve the main problems related to refractories and their heat exchange in the production units:

- Cut in heating and reheating **times**
- Cut in cooling **times**
- Abatement of **fuel** consumption
- Increase in the refractory **campaign**
- Thermal **uniformity**
- Thermal **soak**
- Reduction of thermal shock, with **preservation of the refractory**

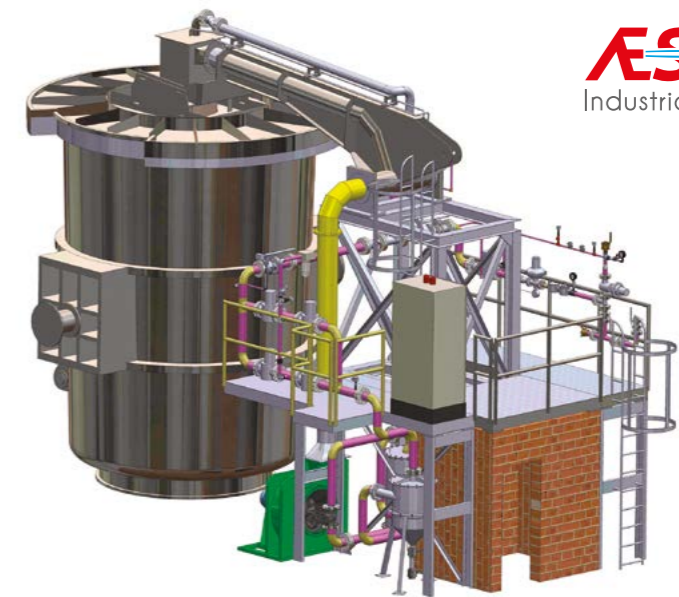
Cut in heating, reheating and cooling times

Practical and theoretical studies as well as computational simulations



In tailor-made projects, and using the resources of our **Aestus technology division**, we **finely adjust operational variables** such as burner positioning and inclination, combustion products injection speed, path of the combustion products inside the equipment, positioning and exhaust diameter, for **maximum efficiency of heating or cooling**, in the various activities in which the stations are applied:

- Total relining
- Localized repairs
- Slag line replacement
- Replacement of plugs
- Reheating due to losses in the operational cycle
- Controlled or accelerated cooling



AESTUS
Industrial Solutions



Our technical assistance is swift, acting with agility in any emergencies. We maintain backup burners as an **interim system that is readily operative**, aiming at **high availability** and **thermal stability** of the equipment to the operation.



THERMOJET

Mobile system for monitored oxyfuel combustion

Experience. Safety.

We have specialized equipment and personnel to carry out operations with **Mobile System for Monitored Oxyfuel Combustion** to meet the demands for **high temperature portable thermal supply**, such as:



Operation with mobile system for monitored oxyfuel combustion

Thermojet performed the **removal by fusion of the pig iron solidified in the hearth**.

Blast furnace
2,8 million
tons of pig iron per year

Bringing obstructed blast furnaces back into operation

Thermal support to the start-up of blast furnaces

Removal by fusion of the pig iron solidified in the hearth

Cleaning of torpedo cars

Cleaning of ladles



Dedicated software

During these activities, we perform the **operation, monitoring and recording of data**, as well as controlling parameters such as temperature, oxygen flow and fuel gas. Processed in **dedicated software**, the data is made available for **real-time consultation**.

THERMOJET

Thermal comfort



Regulatory compliance and productivity

To meet strict regulation of working conditions, our technology division, Æstus, developed **Mobile Units for Thermal Comfort (MUTCs)** with high capacity of directed cooling.

Our equipment is presented in portable modules, directing high flows of fresh and cooled air to the work fronts, with streams that reach **long distances**, deepening in closed environments.

As a result, we provide adequate **health, safety and productivity** conditions to operational teams.



Fresh and cooled air at long distances



As a result, we provide adequate **health, safety and productivity** conditions to operational teams.



Health



Safety



Productivity

Reheating furnaces

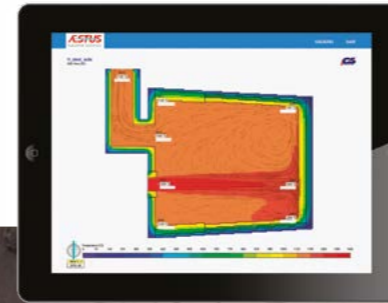
We performed **thermal comfort services at the Rolling Hot Strip**, passing to the modality of contract given the success of the operations

Rolling Hot Strip with capacity of

4 million
tons of hot rolled coils
per year



Computational simulation of heat exchange



Refinement of processes and equipment

We offer the **detailed assessment** of thermal processes by modelling and simulation of industrial equipment.

Using a computational fluid dynamics (CFD) software developed and implemented since **1990** by our partners of Glass Service, based in the **Czech Republic**, we carry out scenario studies for heating or hot-hold activities, in search of the **optimal operational parameters** that result in the desired outputs for each process, whether contributing to the **reduction in fuel consumption** or to obtaining a **high level of thermal soak**, for example.



Computational Fluid Dynamics

CFD

Using computational fluid dynamics software, **CFD**, developed and implemented since **1990** by our partners of Glass Service, based in the **Czech Republic**, we carry out scenario studies for heating or hot-hold activities, in search of the **optimal operational parameters** that result in the desired outputs for each process, whether contributing to the **reduction in fuel consumption** or to obtaining a **high level of thermal soak**, for example.

The studies also allow the evaluation of the **design of furnaces and regenerators** to **select the most efficient scenario**.



Detailed assessment

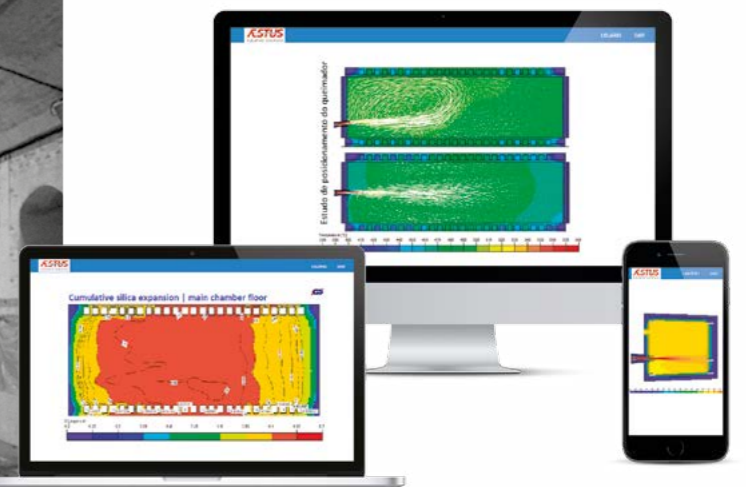
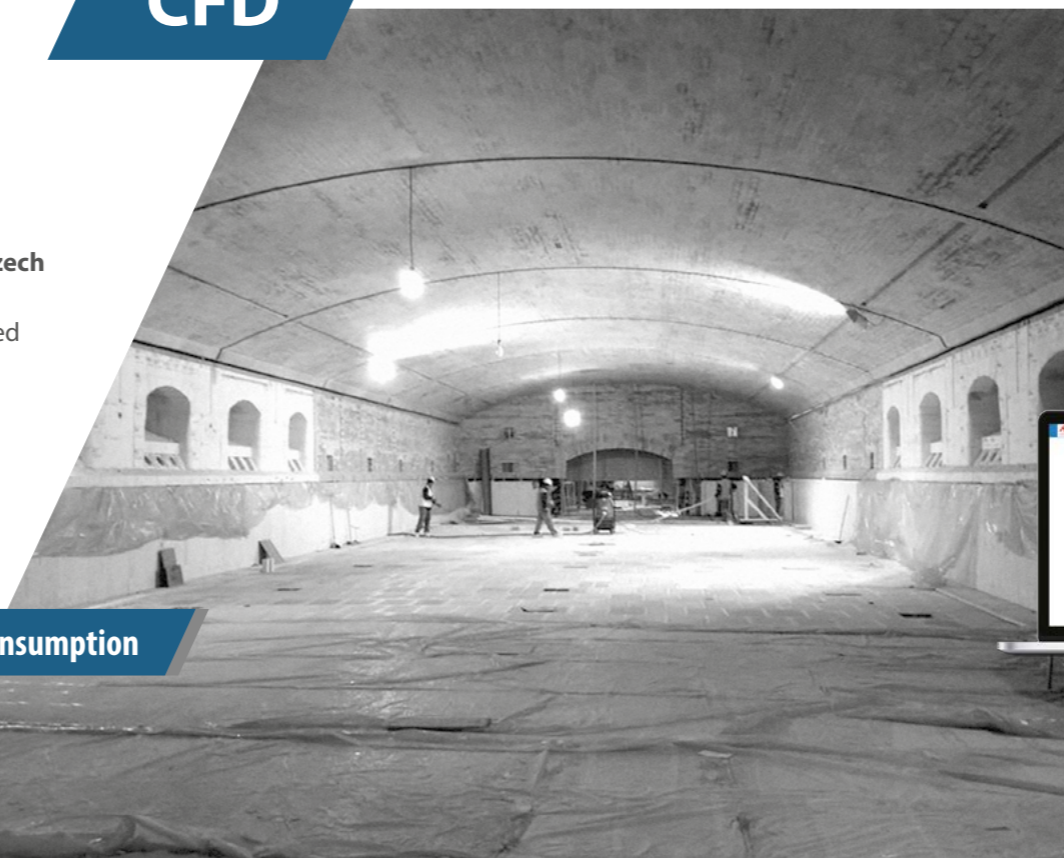
Reduction in fuel consumption



CFD simulation of heating up a float furnace

We developed a study to determine the most efficient **burner configuration** resulting in **uniformity of temperatures** in the melting zone, with **reduced fuel consumption**.

Furnace capacity **900** tons/day





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Global presence

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