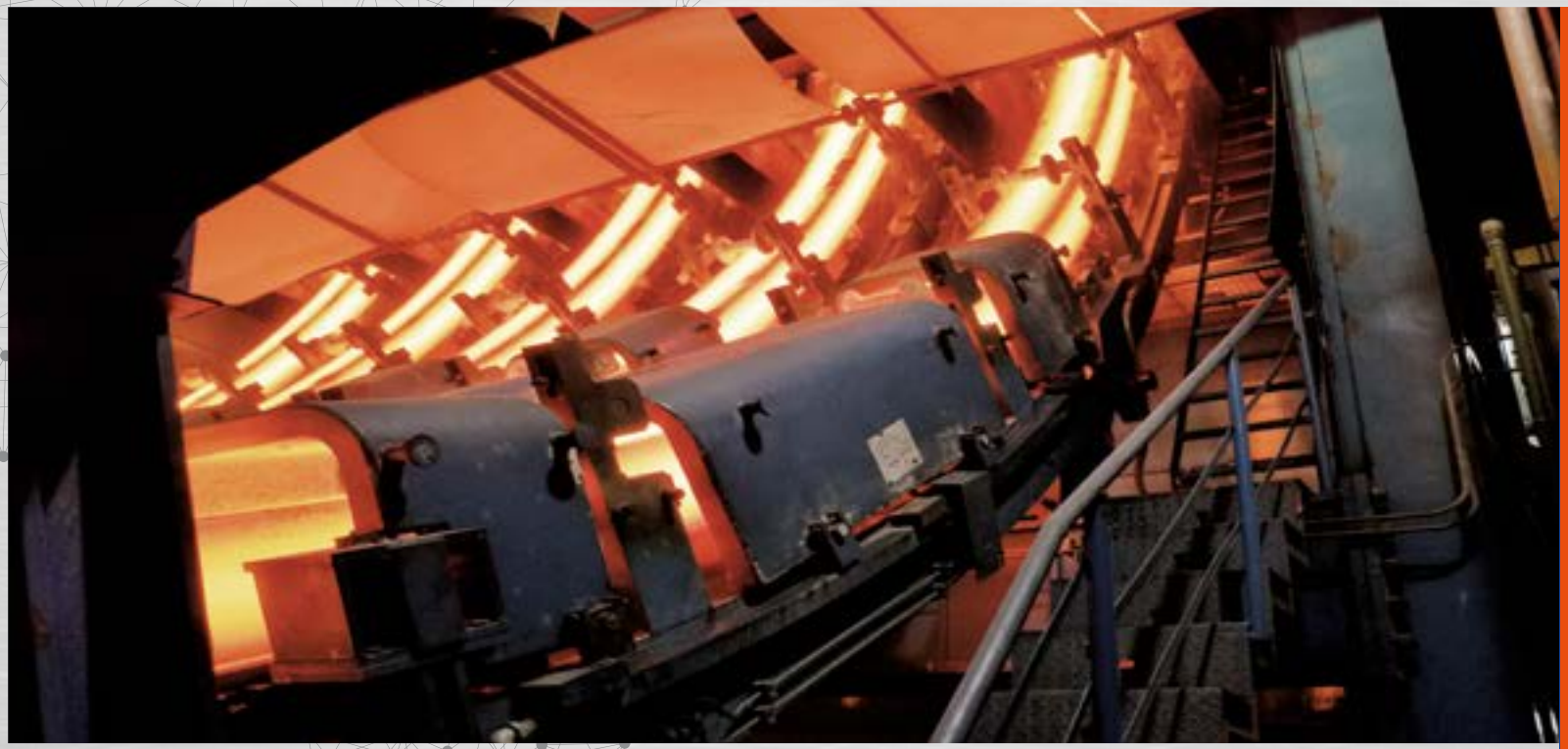
2023

INTECO



WE ARE CONTINUOUS CASTING

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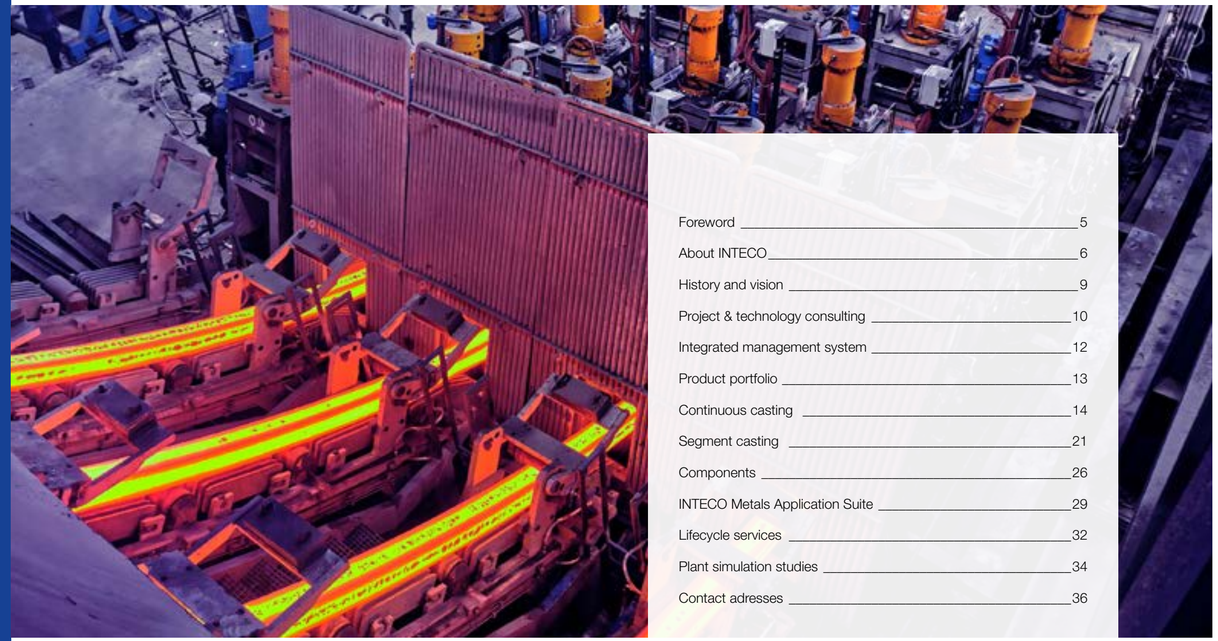


DEAR READER!

Thank you for your interest in INTECO. On the following pages we would like to give you a brief insight into our casting technology product portfolio as well as equipment features and design criteria. In 2009, the long-time cooperation between INTECO and TBR led to the acquisition of the majority shares of the latter and was followed by a step by step integration of the now called INTECO TBR casting technology competence centre into the INTECO Group.

Founded in 1988, TBR Engineering started off as a supplier of high technology machines first for the national and later on also for the international steel industry. The vicinity to several steel plants and the experience gathered by the employees in that field have always been and still are the basis of our success. Highlights of the early TBR years were successful projects at Marienhütte Graz, as well as the step by step modernization of the 3-strand bloom caster at voestalpine Donawitz, followed by international projects at Lechstahlwerke, voestalpine Böhler Edelstahl and Arcelor Mittal Belval.

With the profound experience of TBR's experts and the extensive R&D activities of INTECO's engineers, casting today plays an important role in our product portfolio. INTECO is proud to offer you all well-established technologies such as continuous casting for blooms, beam blanks, slabs and billtes, but also machines for special casting techniques such as horizontal and vertical casting. In addition to that, you will be able to read about INTECO's latest innovation – the INTECO Segment Caster – which has already been successfully put into operation at various customer sites. Enjoy!

Dr. Harald Holzgruber
- Managing Director -

Ing. Roland Kristl
- Managing Director -

Patrick Mild
- Managing Director -

ABOUT INTECO

WHO WE ARE...

Starting out as a consulting company for the specialty steel industry, INTECO has grown to the only single source supplier worldwide that offers all production processes for liquid metal processing. Since more than 90% of our equipment and services are exported, INTECO is a global player represented by local agents and/or subsidiaries who market and service the products worldwide. Together, we form a fully dedicated team of highly skilled employees eager to plan or modernize a steel plant according to our customers' requirements.

WHAT WE DO...

Over the last decades, INTECO has grown to a reputable provider of customer-specific solutions for the specialty steel industry. The competence in engineering, management services, and technology transfer as well as strong customer dedication was and is the key to success for our customers. This in turn is the driver for INTECO to continue to develop the service and product portfolio in the future. The goal is to further strengthen the leadership in metallurgical process technology and equipment for melting, refining, casting, remelting, solidification, and atomization for high performance steels, super alloys, and titanium.

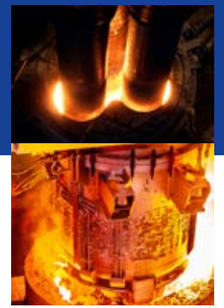
WHAT WE AIM FOR...

We continuously aim to improve the quality of the final product and to make metal production safer, easier, and more efficient. Research and development in process technology and plant design is therefore the key to success. In our opinion, success means providing excellent service for our customers. Continuous improvements of processes and operating techniques as well as design of systems and components are the result of our comprehensive R&D activities. Within our R&D process, we make sure that customer requirements as well as innovations triggered by our experienced staff will be pursued in a structured way.

Leadership in metallurgical process technology and equipment for ...

Melting

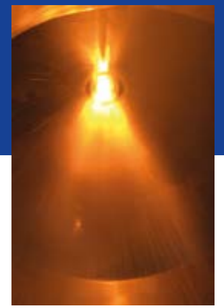
Refining



Casting

Remelting

Atomization



... high performance steels, superalloys and titanium.

OUR MISSION

„Based on decades of experience, INTECO TBR's mission is to develop and maintain leading continuous casting design and process technologies from mass production to highest quality applications and steel grades with steadily increasing section sizes using most modern design and simulation tools."

HISTORY AND VISION

TBR founded in 1988 became INTECO TBR in 2009 through the acquisition by the INTECO group. Back then INTECO TBR successfully carried out numerous projects for billet, bloom, slab and beam blank Continuous Casting projects. After the takeover and the increase of R&D activities various new plant technologies and design of equipment for horizontal and vertical Continuous Casting have been added to the product portfolio, rounded up INTECO's latest innovation – the Segment Caster.

1973

INTECO foundation: Electro slag remelting (ESR)

1988

TBR foundation: Continuous casting projects for bloom and billet, revamps, components

2009

INTECO TBR Casting beam blank, semi-continuous casting

2011

Horizontal continuous casting

2012

Vertical continuous casting, semi-continuous casting (Segment casting)

PROJECT AND TECHNOLOGY CONSULTING

_Pre-investment studies

Such consultancy assignments may involve greenfield projects, plant expansions or retrofit programs, process route evaluation as well as independent assessments and ratings for financing purposes. Typically, INTECO's consultancy starts with a conceptual study and may be expanded to full range investigations including FEED or basic engineering.

_Engineering

INTECO provides basic, and detailed design for entire plants including mechanical and electrical engineering as well as automation. All mechanical engineering is is carried out by experienced engineers using modern and state-of-the-art 3D CAD systems. All engineering services are executed in-house at INTECO.

_Project & construction management

During 50 years of operation, INTECO has executed several EPCM, or process turnkey projects worldwide. INTECO's engineers are specialized in assisting its customers with project management for new plants as well as revamping existing operations.

_Technology transfer

INTECO supplies the relevant know-how and technology, from raw material to the finished products with a focus on productivity and efficiency increase as well as quality improvement. During fact finding studies, we identify areas for improvement, evaluate cost reduction potentials, and mutually agree to specific targets. By preparing the know-how documentation, the relevant technology is documented in detail and later implemented on site during technical assistance by INTECO's experts. They also train the operating staff.

_Lifecycle services

INTECO provides all major lifecycle services for our client's equipment, such as:

- Remote support and service level agreements
- Preventive maintenance packages
- Spare parts supply
- System upgrades and retrofits

INTEGRATED MANAGEMENT SYSTEM

Since its foundation, INTECO has always focused on the quality aspects of its products and services. The quality management system of INTECO has been continuously and progressively developed and since many years we are ISO 9001 certified by an internationally recognized organization.

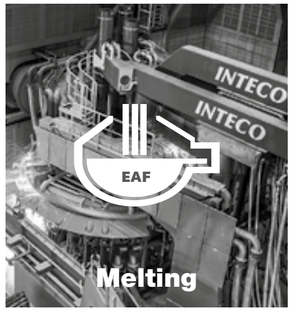
In this context our quality management system covers all business processes like (but not limited to):

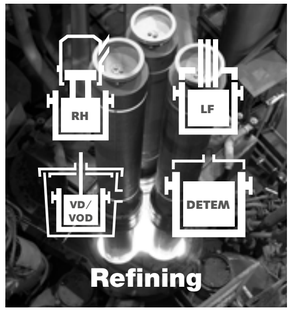
- Preparation of commercial and technical proposals
- Contract management
- All kind of engineering
- Procurement
- Marking and traceability
- Manufacturing
- Inspection, testing and corrective actions, if neccessary
- Quality inspection of components to be supplied by the buyer
- Packaging and expediting
- Erection and commissioning
- Performance testing
- Training and after sales services

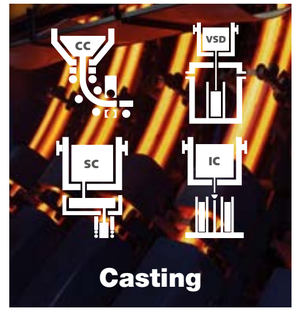
All these processes are performed according to standard procedures and regulations as well as are subject to various systematic and random inspections, testing, controls and internal audits. The quality management (QM) department is responsible for the documentation of the QM-system and its effectiveness.

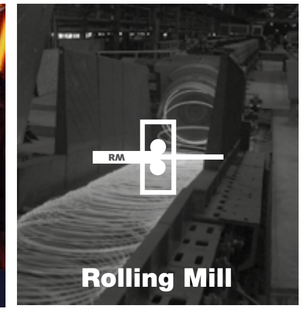
INTECO has been certified in the areas of safety and health in accordance with the standard DIN ISO 45001:2018 since 2013. The aim of this certification is to guarantee each employee a healthy and safe working environment, no matter if the employee is at the office or at a customer's plant site.

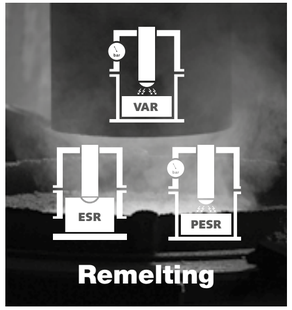
IMAS DIGITALIZATION AND INDUSTRY 4.0

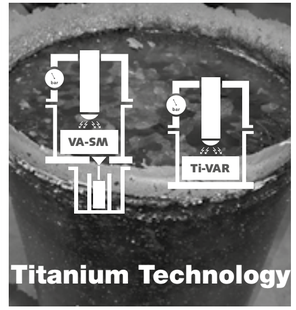


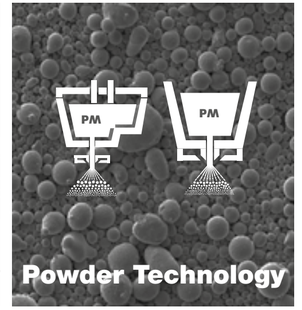












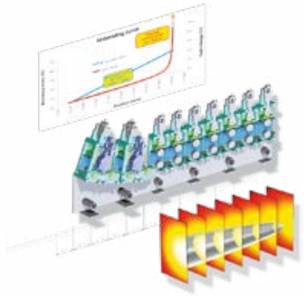
PROCESS KNOW-HOW & CONSULTING

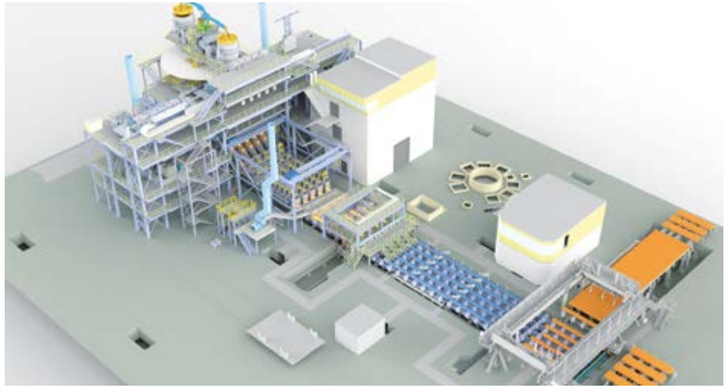
CONTINUOUS CASTING

Bloom caster

INTECO offers a wide range of solutions for bloom casters. During the design phase every aspect is carefully considered from the tundish to the cooling bed in order to meet the final products´ quality requirements. The supply ranges from new equipment to revamping where new features like mechanical soft reduction are added on existing machines.

Bloom casting can be considered the most challenging one among long products, both for steel grades and final application. The main challenge is to obtain products with a high degree of cleanliness, free from surface cracks and excellent internal quality.





Key technological features

- Tundish inertization
- Vertical bending and bow design
- Continuous bending/straightening
- Hydraulic or servo-drive oscillator
- Mould level master
- Dynamic secondary cooling control
- Dynamic soft reduction (MSR)
- Mould EMS and final EMS
- Slow cooling bed
- Quenching facility
- Solidification and soft reduction control models

In order to reduce the inclusion level as much as possible, solutions like a pouring box or tundish inertisation are used and, in order to maximize inclusion flotation, a vertical bending design can be proposed.

Good surface quality starts in the mould where the design of the copper plates ensures a uniform heat transfer, appropriate oscillating practices and good mould level stability avoids formation of deep oscillation marks. Corrrect temperature profiles are granted by the dynamic secondary cooling control and low strain levels are obtained through continuous bending and straightening. The fundamental aspect of the internal quality is covered by different technological solutions. A large equiaxed zone is the result of the correct application of the EMS. Porosity and segregation are minimized by the mechanical soft reduction controlled by an on-line solidification model.

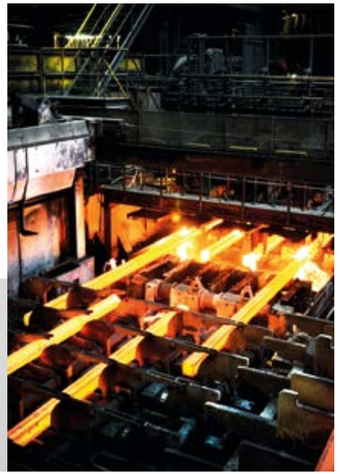
In case of alloyed steel grades, the critical part of the process does not end at the caster exit. The cooling also has to be controlled during discharge. According to the chemical composition and production cycle, different solutions can be applied: slow cooling by means of an insulated bed or hot charging with or without a quenching facility in order to obtain a finer grain size and avoid the risk of crack formation during hot rolling.

Billet caster

INTECO billet casters for submerged and open stream casting are designed in a modular and simple way. The possibility of easy maintenance and exchange of wear parts is a key factor for these working horses with a maximum plant availability. The INTECO TBR® mould tube design for minimized wear, increased product stability, geometrical accuracy and optimum cooling behaviour especially in the corners, rounds up the full billet caster package of INTECO. The continuous straightening technology optimizes actual strain. INTECO is looking forward to making tailor-made proposals for green field projects as well as for revamping studies and component solutions.

Key technological features

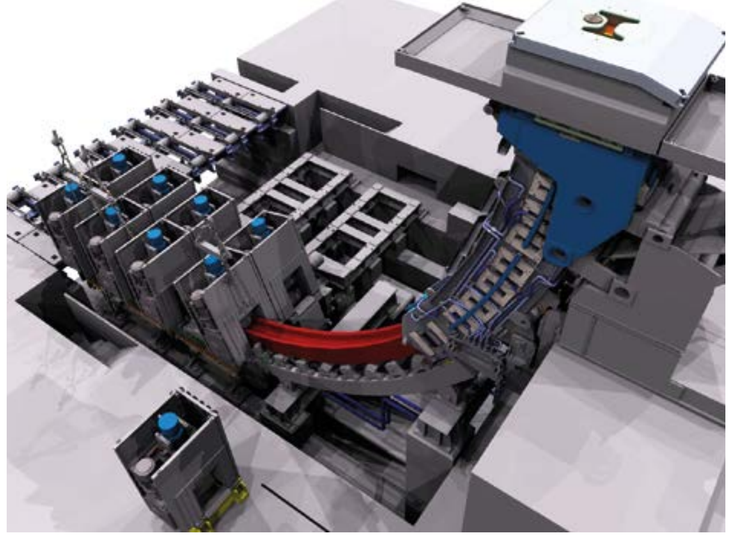
- Continuous bending/straightening
- Hydraulic or servo-drive oscillator
- Dynamic secondary cooling control
- Mould stirrer
- Final stirrer
- Level 2/ Solidification model

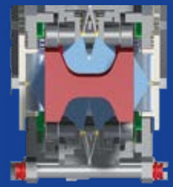


Beam blank caster

The production of beam blanks represents one of the most challenging areas in Continuous Casting. Accurate design of the key components and precise process parameters is a must. A special focus is set on the design of the geometrically complex mould, either in plate or tube design and the nozzle pattern for uniform distribution and avoidance of over- or under-cooling.

The containment section has to reliably avoid flange bulging, a complex nozzle distribution in the secondary cooling zone is the key to a smooth, defect free semi for beam production. Due to the special product geometry, the continuous straightening design helps to reduce the plant casting radius without any disadvantages in quality.





Key technological features

- Continuous bending/straightening
- Hydraulic or servo-drive oscillator
- Dynamic secondary cooling control
- Level 2/ Solidification and soft reduction control models

Horizontal continuous caster

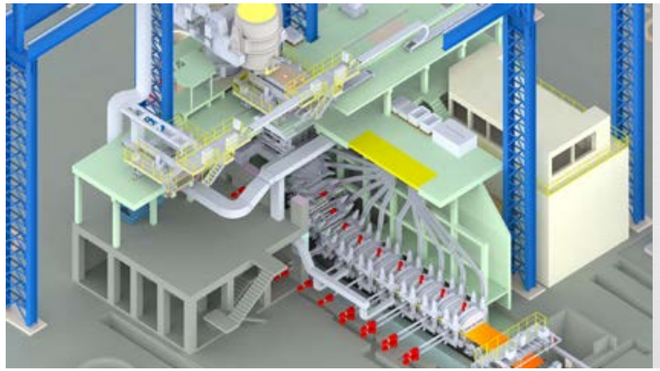
Not all steel grades can be cast in a bow machine, but this doesn't mean they can't be continuously cast. Special steel grades require special solutions.

When it is necessary to match special steel casting with good productivity, low investment cost and compact layout, a Horizontal Continuous Caster is the right choice.

The Horizontal Continuous Caster has the capability to cast any steel grade with advantage of flexible production, low investment, and good productivity. With no exposure to air of the liquid steel, re-oxidation is completely avoided and the combined use of the moveable electromagnetic stirrer allows getting a good internal quality.

Key technological features

- Sub-Mould stirrer
- Final stirrer
- Optimized withdrawal and oscillator practice
- Minimized effort for shop and foundation
- Ultra flexible production possible



Key technological features

- Optimized tundish design
- Vertical bending or bow design
- Continuous bending/straightening
- Hydraulic or servo drive oscillator
- Mould level master
- Dynamic secondary cooling control system with independent width control
- Dynamic soft reduction
- Possibility to install M-EMS
- Possibility to install S-EMS
- Online width adjustment
- Breakout prevention system
- Level 2: solidification and soft reduction control models

Slab caster

Slab casting requires all aspects of the machine to be carefully designed. INTECO incorporates dedicated technological features into each machine design to achieve the best results when it comes to quality and productivity. This applies both to new "greenfield" projects and the revamping of old projects. In order to identify a proper solution for the latter, a study must be conducted. It must take into consideration the minimum modifications that must be made to existing equipment and structures so that the desired results can be achieved.

To ensure a good surface quality and a low inclusion level, an advanced mould level control system with an electromechanical stopper rod mechanism is implemented. A vertical bending machine design is used in most cases. This vertical design allows for inclusion flotation so that the best levels of cleanliness can be achieved. In specific cases where old projects need revamping, a solution with a curved mould is also available. In this case, a hydraulic oscillator or a servo drive solution makes it possible to retrofit existing electronical oscillators without having to make a lot of modifications. This solution also allows both the frequency and stroke to be adjusted.

In order to achieve the best results in terms of surface and internal quality, the temperature of the surface must be closely monitored with a uniform temperature distribution. For this purpose, the secondary cooling system uses air mist nozzles and a control solution that changes the water distribution in the slab width.

Strand containment offers segments with robust design and optimised roll and pitch with a position control system for soft reduction. A set of technological control packages to ensure casting safety and quality is also offered. In order to minimise casting accidents, a mould breakout prevention system that uses AI algorithms is available. To improve flexibility in production, the mould can be equipped with an online width adjustment system. Surface and internal quality are ensured by a dynamic secondary cooling control system and dynamic soft reduction driven by a solidification model.

References

Customer	Type / Format	
Shagang Group China	5-strand vertical bending bloom CCM, radius 9m, heat size 120t and section size 300x390mm	
OEMK Russia	Bow type bloom CCM for blooms with MSR, section size 300x390mm	
voestalpine Böhler Edelstahl Austria	Horizontal CM, billet and round bloom	
Arcelor Mittal Belval Luxembourg	Beam blank caster for section sizes up to 483x384x110mm, radius 9m vertical bending, heat size 140t	
voestalpine Stahl Donawitz Austria	Several revamping projects on vertical bending/unbending CCM	
Confidential customer Asia	Engineering for a new state-of-the-art slab caster for section sizes of 2000x250mm	

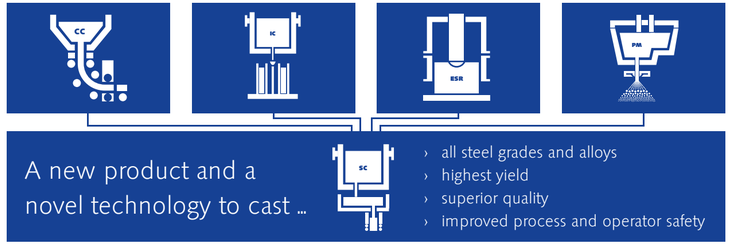
SEGMENT CASTING

Semi continuous segment casting (SC)

The demand for big round steel semi products rises continuously for further applications like forging and rolling. Traditionally, these products with a diameter of more than 600mm are produced in conventional bottom pouring or – slightly increasing – in continuous casting plants with increasing diameters.

On the one hand, conventional ingot casting causes low investments, but the operating costs considering the lower yield are comparably high and on the other hand, state-of-the-art continuous casting machines call for huge investments resulting in capacities per strand and casting unit which for special applications and big sizes – are usually higher than the required annual material output. In addition, standard continuous casting is not suitable for casting high-end specialty steel grades like tool steel or demanding grades for aerospace and power plant applications.

The above circumstances were taken into account during the development phase of the Segment Casting idea. The semi-continuous casting process called segment casting (SC) has been developed to combine features and advantages from both production methods in one process, as well as process solutions to avoid the most common problems during casting of large formats. The INTECO segment casting process is protected by patents. This new process covers vertical – in most cases non-continuous – casting of blooms and ingots up to a diameter of approx. 1500mm – with no real upper limit – whereas ingot lengths of 10 to 15m seem the most suitable regarding plant height and yield.



Key technological features

- Tundish inertization
- Tundish temperature control using EPH
- Hydraulic or electromechanic oscillator
- Dynamic hybrid stirrer (patent pending)
- Hot topping practice using inductive feeder
- Slow cooling bed
- Quenching
- Level 2/ solidification and stirrer control models

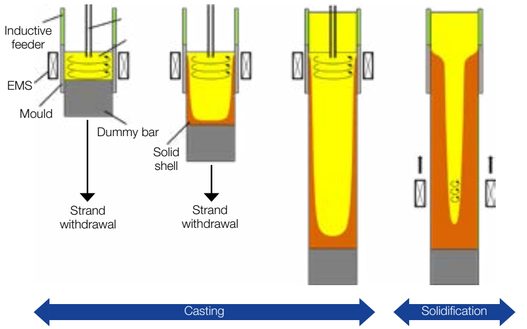
The segment casting process starts – like any other standard continuous casting process – with a ladle coming from a ladle furnace or vacuum treatment plant at a predefined superheat temperature. This ladle is placed in a casting car or casting stand above the preheated tundish of special geometry which is prepared for the respective casting mode for one or more strands. Inert atmosphere and the use of a common ladle shroud placed by a manipulator avoid the interaction with the air atmosphere and its oxygen.

The water-cooled copper mould with its oscillator – very similar to any typical bow or vertical continuous casting machine – can be additionally equipped with a heating device on top for the hot top treatment at casting end thus significantly improving the yield. An especially designed moveable mould and strand stirrer is able to stir in different orientations during the casting phase in the mould area as well as during the solidification phase along the whole ingot height. Spray cooling is applied, depending on the ingot diameter, in one or more zones below the mould.

The vertical strand withdrawal system starts actuation after the mould is filled to the foreseen level. Retraction speed and mode depends on the actual steel grade and casting parameters. After the casting phase is finished and the whole ladle content is poured to shape, the solidification phase starts. The hot topping device keeps the ingot head hot and liquid and intensive stirring over the whole ingot height is carried out.

The main focus in this stage is to eliminate bridging and allow a smooth solidification from bottom to top. Transportation or movement of the ingot should be avoided until complete solidification. Unloading of the solid ingot is then started using a manipulator which grabs the ingot, moves it out of casting position and tilts it into horizontal position on shop floor level.

Via transfer roller tables, the product is placed at a torch cutting unit for cutting top and bottom scrap and the good useable part into the predefined length.



Continuous segment casting (VCC)

For the production of smaller section sizes, a continuous process is more favorable than a semi continuous one. This design is realized in the INTECO Segment Caster VCC. In this plant type, the bloom is cut inline to final product length.

Up to 4 strands can be cast in parallel in sequences continuously. This process is using all the technological features of the Segment Caster for continuous sequence production.

Due to the absence of bending or unbending sections it is suitable for the production of high alloy and special steel grades and the vertical design allows an optimum inclusion flotation. High internal quality is granted through low superheat casting achieved thanks to heating devices at reduced casting rates of less than 100kg/min if required and electromagnetic stirring throughout the casting process. This solution allows casting of any steel grade with excellent quality, yield and productivity.

Key technological features

- Tundish inertization
- Tundish/ladle temperature control using electro plasma heating (EPH)
- Hydraulic or electromechanic oscillator
- Mould and strand stirrer
- In line cutting
- Heat insulated tunnels
- Slow cooling bed
- Level 2/ solidification calculation model

References

Customer	Type / Format	
TianMA Bearings China	Two-strand Segment Caster for section sizes Ø500mm, 650mm-octogonal, Ø1000mm, maximum bloom length 13m, heat size 60t	
Gloria Material Technology Taiwan	Two Segment Casters with in total 4 strands for section sizes Ø410, Ø550, Ø700, Ø850, Ø1000, Ø1200mm, maximum bloom length 13m, heat size 55t	
voestalpine Stahl Donawitz Austria	One-strand Segment Caster for section sizes 270x360mm, 230mm round, maximum bloom length 12m as a part of a complete R&D steel plant supplied by INTECO	
Confidential customer Europe	Segment Caster for section sizes 850x235mm, 500mm round, 140mm square, maximum bloom length 3,5m, maximum weight 10t	

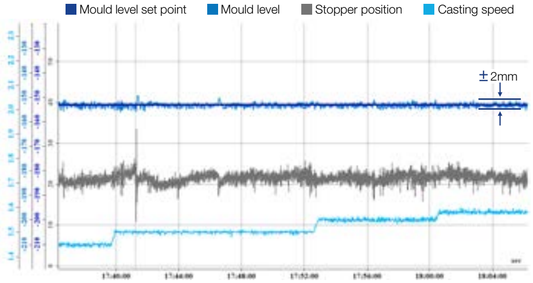
COMPONENTS

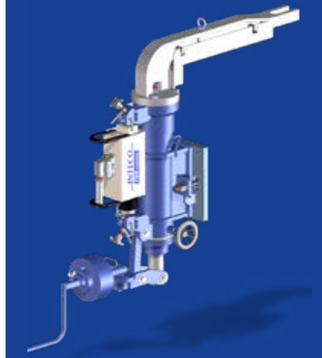
Mould Level Master

The INTECO Mould Level Control solution is an advanced control system designed to ensure exact mould level control throughout the entire continuous casting process, regardless of the conditions, variations and disturbances. All facilities use state-of-the-art technology for safe and reliable operation.

The whole system consists of the following components:

- Stopper rod mechanism
- Servo actuator
- Mould Level Master (mould level control software)
- Emergency slide gate





Key features

- Precise and robust mechanism
- Electromechanic actuator with:
  - Quick response time
  - No backlash
  - Possibility to install in any caster
- Average mould level deviation within +/- 2mm
- Software package with:
  - Automatic start feature
  - Periodic disturbances suppression (anti-bulging)
  - Automatic clogging detection and reaction

INTECO TBR-mould®

The INTECO TBR-Mould® is specifically designed for a quick change and external EMS. Thanks to its design it ensures an increased process stability through and increased heat-transfer throughout the mould length. This results in an improved surface quality and better caster performance.

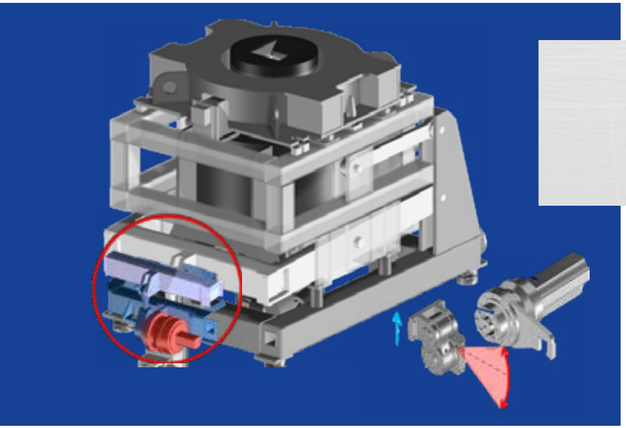
Key features

- Large corner radius (super ellipse design)
- Increased product stability
- Reduced mould wear
- Improved product geometry
- Reduced bulging

INTECO servo-drive oscillator

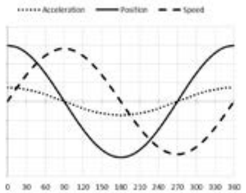
The INTECO servo-drive oscillator is designed for a hydraulic free casting platform. It allows to perform any kind of oscillation with variable stroke and frequency and has a compact design and the possibility to upgrade the existing electromechanical oscillator.

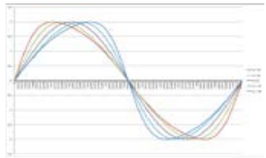
The INTECO servo-drive oscillator is available for any type of caster: billet, bloom or Segment Caster.



Key features

- Hydraulic free
- Possibility of any kind of oscillation practice
- Easy installation and maintenance
- Adjustable frequency, stroke and curve (sinus or non-sinus)





INTECO METALS APPLICATION SUITE (IMAS)

Introduction

Industrial production of high performance materials requires precise tracking and transparency of all production steps to ensure highest reproducibility for high-demanding industries. Starting from the very beginning with simple manual data logging in excel sheets or printed melt logs the first basic database systems (Level 2 systems) were developed. As the requirements on data storage and the amount of data continuously increased over the years, the potential of these systems was already on the limit.

Modern production management systems require vertical and horizontal integration of all production processes and shall cover not only process tracking and reporting but also include planning and optimization tools for the entire production route, which are necessary to meet customer and end-user specific requirements.

INTECO as a world leading supplier for specialized production technologies offers a powerful process and production management solution called “INTECO Metals Application Suite (IMAS)”. IMAS was developed to combine several levels of automation and is intended to close the gap between machine data (Level 1) and the enterprise IT landscape (Level 4). State-of-the-art software development combined with the process know-how of INTECO are the fundamentals of IMAS.

IMAS INTECO Metals Application Suite

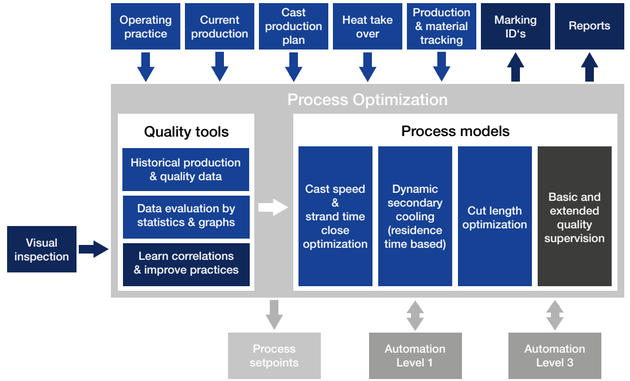
Our technology – Your advantage

- Quality improvement due to standardized and centralized know-how
- Modular design
- Online production monitoring and supervision
- Data processing and analysis for continuous know-how improvement
- Seamless integration into any existing IT landscape
- Low to high operator guidance
- Highest availability and reliability due to modular state-of-the-art software development
- Easy-to-use operation interface dedicated to office and pulpit operations
- Production reporting from detailed melt report to monthly recaps
- Business intelligence integration for advanced analytics

Process and technology

INTECO Metals Application Suite (IMAS) was designed as a flexible framework in contrast to a single developed application. It is designed to cover all special metallurgical processes under one roof, which makes IMAS to an holistic application suite.

The integrated automation concept of INTECO covers the following functionalities:



(1) Plant Management and Supervisory Functionalities

On top of all processes within the production plant is the superior plant management application. The plant management unites all the process automation apps under one roof. The major responsibilities are the overall production planning, raw material distribution as well as review and analyses to close the cycle at the end of production.

(2) Shop casting floor Integration for Production and Auxiliary Equipment

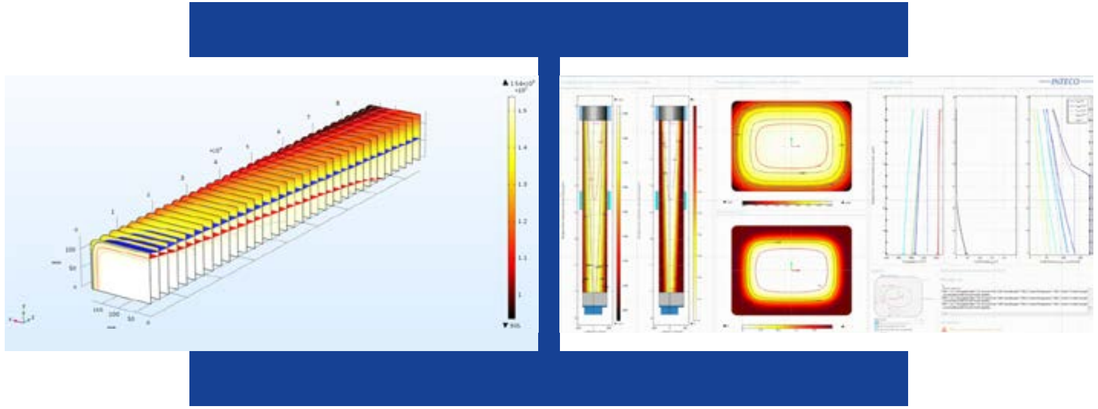
These modules are responsible for data recording, supervision and control. The process automation apps are designed for operators at the pulpit to provide bottom-up process guidance, allowing operation personnel to observe all recorded sensor-data in real-time. Moreover, IMAS provides instant information and alarms, based on which the operators can control and steer the process just-in-time.

In order to achieve highest flexibility together with a maximum in reliability, IMAS was developed based on the latest technology and developments with respect to its software architecture, fulfilling all requirements for **Industry 4.0.** The latest generation of IMAS breaks with old software paradigms like monolithic applications or client/server infrastructure. Instead, the IMAS framework follows the microservice concept to ensure scalability in modern steel shops. By the use of Microsoft® technology stack and C# as development language, a consistent and state-of-the-art software architecture and development framework is ensured. The distributed architecture of the latest IMAS generation allows not only to cover all individual customer specific processes, but also to **interact bi-directional with any existing IT landscape** in an extremely flexible way. Whatever ERP/Level 4 system is in place, a dedicated communication agent will do the job.

IMAS does not only care about real-time operational data, it also provides comprehensive archiving functionality and long-term storage of any process related data. Current researches in **big data** and **machine learning** will further improve operator guidance and processes with advanced analytics. Researches in deep learning technology, also known as **artificial intelligence**, will make IMAS capable of decision recommending or even making.

The best way to do this is a model-driven approach. For this reason the solidification model plays a central role, starting from the simulations that are the basis for the design to the on-line control of the secondary cooling, mechanical soft reduction or stirrer position in the case of the Segment Caster.

Starting from these considerations INTECO has developed its own models covering two different fundamental aspects: the calculation of the materials' thermos-physical properties and the solidification. Thanks to the combination of these two packages it is possible to have a dynamic calculation based on actual data not only regarding the main casting parameters as casting speed superheat, but also for the chemistry. This kind of approach is particular suitable where many different grades are cast.



LIFECYCLE **SERVICES**

The successful production ramp up and the final acceptance is an important milestone for us. This milestone marks the end of the project, but it is also the beginning of our lifecycle services. The basis is already delivered at this point. Based on our spare parts list, TECTRADE is your ideal partner when it comes to spare parts delivery. Our service conditions, issued automatically at the end of your warranty period provide a clear and easy framework for a needless continuation of our support. Our clear commitment here is: we will never leave you alone if you are in trouble. But our offered services provide more, they help you to ensure a healthy and working machine of software throughout the whole lifetime that typically exceeds 30 years.

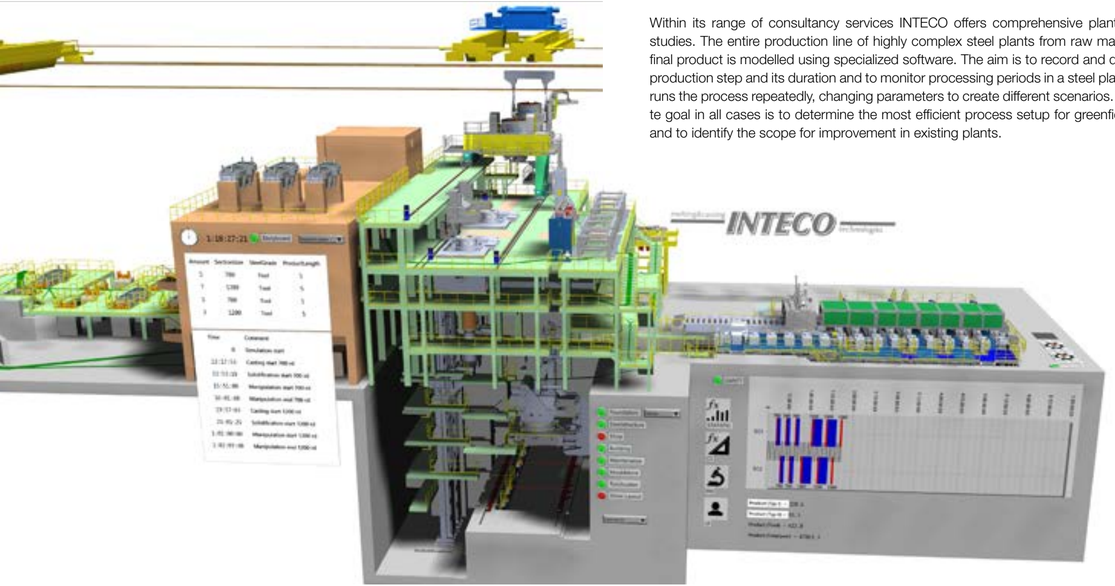
At a fixed price we are offering, what we call "system health check" in two different variations. The remote check consists of an analysis of your automation and software to ensure proper operation of both. In cyber-physical systems small things can sometimes accumulate to major issues if they are not witnessed or even ignored. Besides software and hardware diagnosis, we also check machine and alarm logs in order to identify potential risks. With our structured analysis of alarm messages and machine data, we can anticipate and thus prevent downtimes. The full on-site evaluation additionally includes a visual inspection of all electrical and mechanical components, a checkup of safety functions and emergency features and necessary metering like earthing or short circuit test. This holistic evaluation of the machine allows us to identify issues that cannot be detected by the automation. The result of both is a detailed action plan for keeping your plant healthy and up-to date.

For our software solutions we are offering service level agreements up to next business day support. This type of contract does not only cover incident. It also covers minor modifications that are related to normal software lifetime, for example an additional information at a certain place in the software. Per request it can also include an update agreement making sure that your software stays compliant with external technological evolution such as new operating systems. Ultimately, selected solutions also available as software as a service.

High sophisticated technological components also rely on periodical maintenance. For sure our products, such as the smart electrode controller ISEC, offer all the features to adjust or auto-adjust all the parameters related to furnace wear, instrument change or a changed production mix. But if you are busy with other work, we will offer you such service at a fixed price. This includes a performance evaluation of our furnace operation, readjustment of valve scaling and electrical parameters. Optionally we can also offer optimization of power profiles by one of our process experts or a fine tuning of the rule-based optimization.

And for sure we are always happy to help you realizing larger retrofit projects such as version upgrade of the automation system or increasing the machines capability by use of our smart components or our powerful engineering services

PLANT **SIMULATION** STUDIES



Within its range of consultancy services INTECO offers comprehensive plant simulation studies. The entire production line of highly complex steel plants from raw material to the final product is modelled using specialized software. The aim is to record and display each production step and its duration and to monitor processing periods in a steel plant. INTECO runs the process repeatedly, changing parameters to create different scenarios. The ultimate goal in all cases is to determine the most efficient process setup for greenfield projects and to identify the scope for improvement in existing plants.

The ability to evaluate the feasibility by considering all possible scenarios up-front of any new investment, prevents the customer from unpleasant surprises in retrospect, like unplanned expenses. As you can simulate numerous different scenarios, it is also the perfect tool to compare concepts and subsequently facilitates to choose among them. INTECO not only conducts plant simulation studies for greenfield projects but also for plants in operation to optimize material flow, performance, or cycle times, to only mention some. Moreover, such study can detect bottlenecks and can help to find a solution to eliminate those. Therefore, it can be seen as a tool to improve the throughput in general.

Benefits in advance of investments, either greenfield or brownfield:

- Digital twin provides a better understanding of requirements and feasibility
- Material flow optimization
- Detecting and eliminating bottlenecks
- Identifying measures to improve throughput
- Easy comparison of different concepts
- Production planning and optimization

CONTACT ADRESSES

EUROPE

INTECO melting and casting technologies GmbH
Wiener Straße 25
8600 Bruck/Mur, AUSTRIA
Phone: +43 3862 53 110-0
inteco.austria@inteco.at

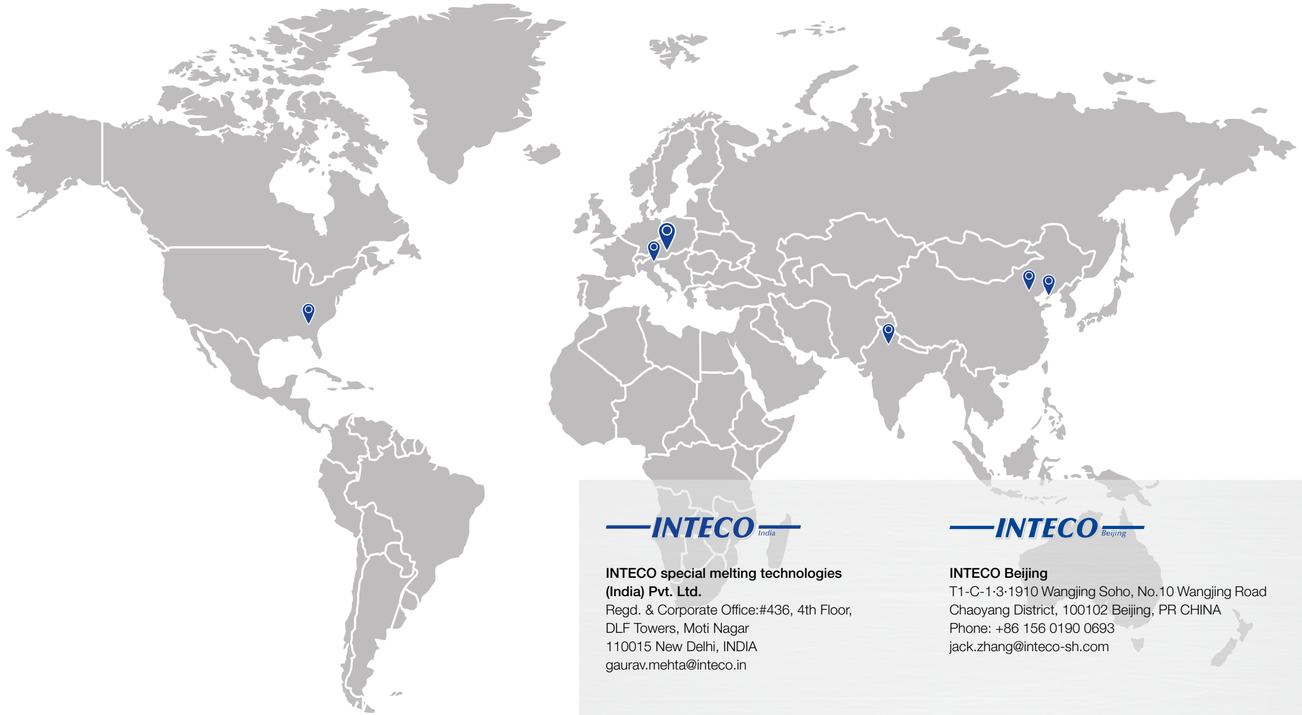
INTECO melting and casting technologies GmbH
Dr. Auner Straße 20/5.OG
8074 Raaba, AUSTRIA
Phone: +43 316 49 1000-0
inteco.austria@inteco.at

ART advanced refractory technologies GmbH
Wiener Straße 25
8600 Bruck/Mur, AUSTRIA
Phone: +43 3862 53 110-165
office@ART-reftech.at

TECTRADE Handelsgesellschaft mbH
Wiener Straße 25
8600 Bruck/Mur, AUSTRIA
Phone: +43 3862 53 110-0
tectrade@inteco.at

INTECO TBR casting technologies GmbH
Wiener Straße 25
8600 Bruck/Mur, AUSTRIA
Phone: +43 3862 53 110-0
inteco.austria@inteco.at

INTECO
Via Nazionale 42
33010 Tavagnacco, ITALY
Phone: +39 432 1901183
inteco.austria@inteco.at



NORTH AMERICA

INTECO PTI process technology int., LLC.
4950 S Royal Atlanta Drive, Suite A
Tucker, Georgia 30084, USA
Phone: +1 770 934 9502
sales@intecopti.com

ASIA

INTECO special melting technologies (India) Pvt. Ltd.
Regd. & Corporate Office:#436, 4th Floor,
DLF Towers, Moti Nagar
110015 New Delhi, INDIA
gaurav.mehta@inteco.in

INTECO Beijing
T1-C-1·3·1910 Wangjing Soho, No.10 Wangjing Road
Chaoyang District, 100102 Beijing, PR CHINA
Phone: +86 156 0190 0693
jack.zhang@inteco-sh.com

INTECO Dalian
Room A401-A411 , Building A
JinPu International Building, ChiFeng Street
DDA, 116600 Dalian, LiaoNing Province, PR CHINA
Phone: +86 411 3924 7266 201
inteco.china@inteco.com.cn

IMPRESSUM

Party responsible for content, layout and printing

INTECO melting and casting technologies GmbH
Wiener Straße 25
A-8600 Bruck an der Mur
Austria - Europe

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INTECO

INTECO MELTING AND CASTING TECHNOLOGIES GMBH

Wiener Strasse 25
A-8600 Bruck an der Mur
Austria - Europe

T: +43 3862 53 110 - 0 | F: +43 3862 53 844
E: inteco.austria@inteco.at

www.inteco.at