



CTC CASTER TECHNOLOGY CONSULTING

EXPERT ASSISTANCE FOR IMPROVED
PERFORMANCE

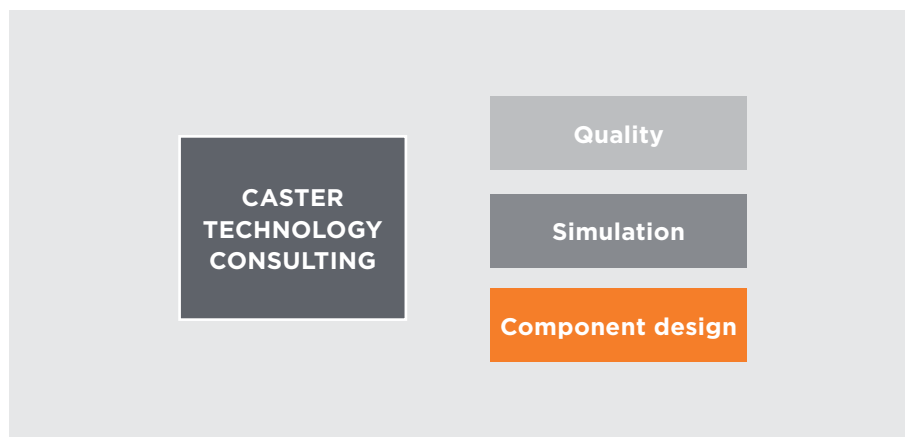
CASTER TECHNOLOGY CONSULTING IN PURSUIT OF EXCELLENCE

YOUR CHALLENGE

Because quality and productivity requirements in continuous casting are continually increasing, producers must respond and adapt in order to remain competitive. Rapidly changing market demands call for flexible plants that can be quickly adjusted with a minimum in production downtime. Sometimes producers incur additional costs because they are confronted with quality problems that can result in downgraded and even rejected products. In other cases, equipment deficiencies may result in unexpected caster standstills and additional maintenance costs. The objective is to ensure permanent production excellence on a cost-effective basis. Expert advice from a highly experienced supplier of casting technology is what is required to maximize the performance of your plant.

OUR SOLUTION

Primetals Technologies, a leading supplier of continuous casting technology, offers expert consulting services that help producers to achieve and maintain high standards in production excellence. On the basis of decades of experience in the engineering, installation, start-up and commissioning of continuous casting machines worldwide, our specialists are skilled in identifying caster deficiencies and weak spots. Detailed concepts are proposed for improving plant performance, reliability, flexibility and safety. Our expertise is available on short notice and covers all aspects of continuous casting technology for billet, bloom, beam-blank and slab casters from any supplier. Using our proposed improvement solutions helps producers to better meet their production, quality and business targets as well as to save money. Discover why - Primetals Technologies.

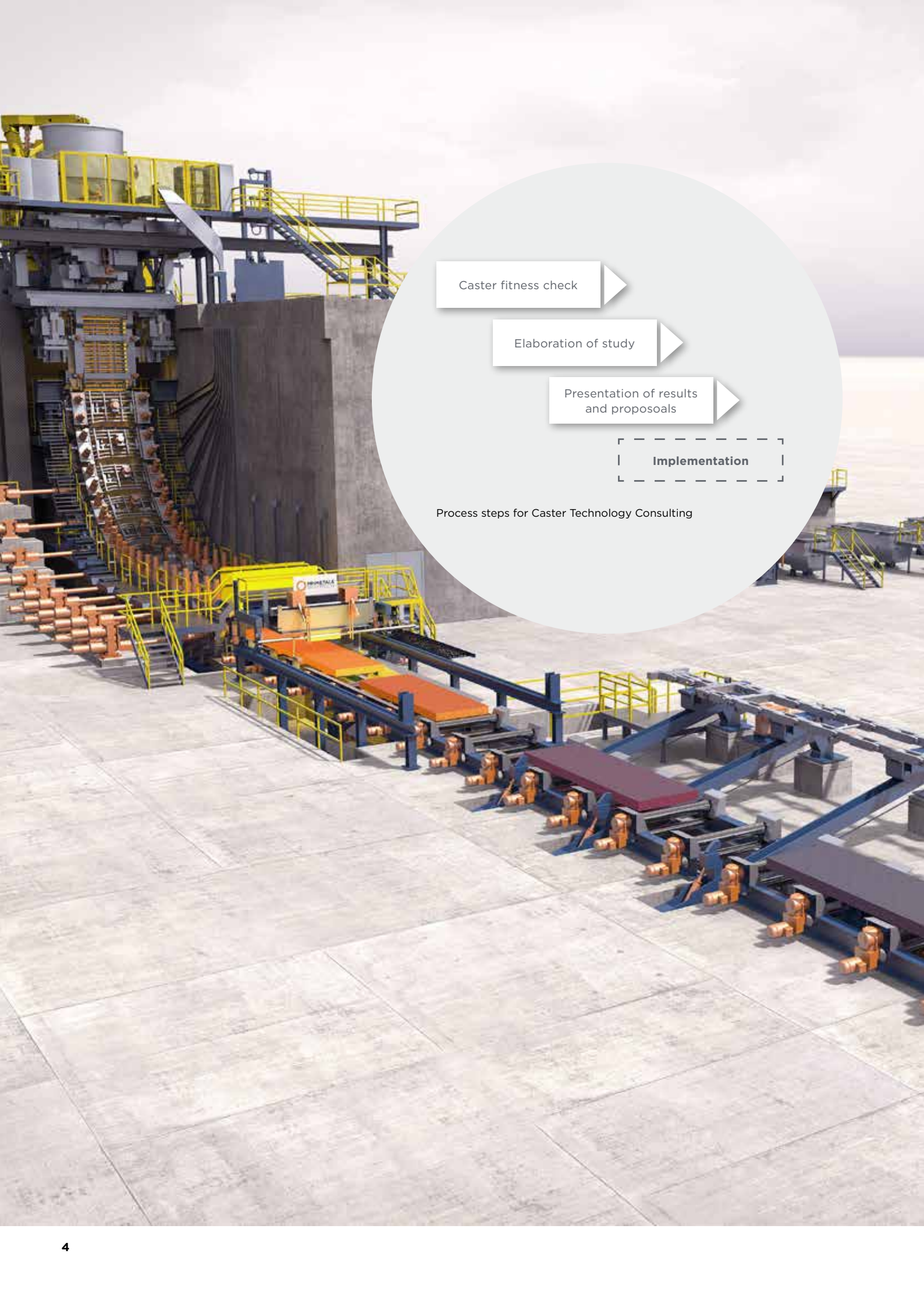


Our competencies for every job



ADVANTAGES OF CASTER TECHNOLOGY CONSULTING:

- **Immediate support** – fast proposal of solution concept
 - **More than 150 references** – including non-Primetals Technologies supplied continuous casting plants
 - **Comprehensive technological training** – for qualified personnel
 - **Major improvements** – in productivity, process stability, product quality and yield
 - **Expert advice pays off** – proven fast return on investment (ROI)
-



Caster fitness check

Elaboration of study

Presentation of results
and proposals

Implementation

Process steps for Caster Technology Consulting

CASTER TECHNOLOGY CONSULTING GET IN SHAPE TO EXCEL IN THE MARKET



First step: questionnaire



Second step: on-site inspection

CASTER FITNESS CHECK

This fitness check is comprised of two modules: An questionnaire is first completed by the customer in advance of a visit. That's followed by a thorough on-site evaluation of the plant by Primetals Technologies experts. Weak spots are identified in the casting process in addition to the installed equipment and systems.

ELABORATION OF STUDY AND PRESENTATION OF RESULTS AND PROPOSALS

Plans for a detailed investigation are discussed with the customer and areas of deficiency are addressed with proposals for solutions as well as a presentation of the expected costs and benefits..



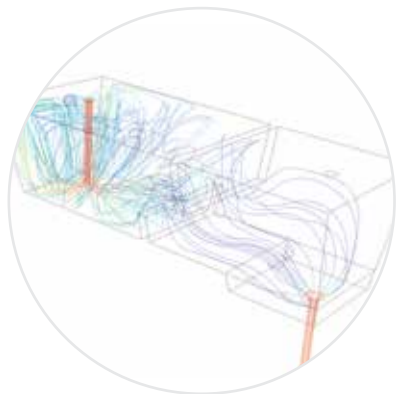
SCOPE OF CONSULTING CAPABILITY

GOOD ADVICE IS WELL WORTH THE PRICE

Caster Technology Consulting from Primetals Technologies stands for expertise in quality improvement, numerical simulation and special component design. In order to provide the ideal solution to meet the specific requirements of each producer, we can call on our disposal caster experts and access our comprehensive metallurgical and operational database. By taking even small steps towards a solution, you can achieve dramatic improvements in cost-effective and reliable production.



Slab quality improvement



CFD Simulation of tundish flow



Check of spray nozzle

QUALITY

THE BASIS FOR CASTING EXCELLENCE

When a customer is faced with quality-related problems, experts from Primetals Technologies are available for support. Investigations begin with a comprehensive evaluation of all factors that have a potential effect on product quality. This begins with steelmaking, and includes the entire continuous casting process. Statistical evaluations as well as detailed metallographic defect analyses are carried out on-site. Additional support can be provided by external laboratories and universities with which we have a long-term working relationship. This way quality-related influences are identified. Improvement recommendations are then made with respect to, for example, optimization of the casting process, use of alternative consumables (e.g., casting powder, refractories), modifications to the automation system and the related training for operators and metallurgists.

METALLURGICAL INVESTIGATIONS

- Optimization of casting parameters
- Recommendations for secondary metallurgy
- Metallographic sample analyses
- Chemical analyses of ladle and mold slag

SURFACE-QUALITY OPTIMIZATION

- Advanced mold-plate design and adjustment
- Optimized SEN design
- Precise mold-level control
- Selection of optimum mold powder
- Check of secondary cooling

AUTOMATION SETUP OPTIMIZATION

- Modifications to produce new steel grades
- Adjustments to individual casting situations

TECHNOLOGICAL TRAINING

- Strand solidification in mold
- Secondary cooling requirements
- Casting control
- Slab defects

INTERNAL QUALITY IMPROVEMENTS

- Steel temperature
- Steel composition
- Settings for DynaGap SoftReduction
- Electromagnetic stirring (EMS)

SIMULATION

“THE TOOLS TO SEE INSIDE THE STRAND”

To optimize the casting process and to achieve a high level of product quality within the shortest possible time, simulation techniques were developed by Primetals Technologies in the late 1970s. Thanks to the enormously expanded computer capacity and improved software algorithms, our technologists can simulate even complex processes and conditions in real time. Advanced simulation models make it possible to acquire a deeper insight into the steel solidification process. The additional expertise provides the basis for superior equipment design and casting operations. The applied simulation techniques include FEM (finite element method) and CFD (computational fluid dynamics).

COMPUTATIONAL FLUID DYNAMICS

- Simulation of steel flow in tundish
- Simulation of steel flow in mold

THERMOMECHANICAL SIMULATION

- Secondary cooling strategy
- Strand mechanics
- Liquid-core reduction, soft reduction, hard reduction
- Adaption of casting speed

EQUIPMENT QUALITY SIMULATION

- Load calculations (segments, rollers, etc.)
- Mold temperature distribution and taper

THERMODYNAMIC SIMULATION

- Phase transformation
- Material parameters to produce new steel grades

EXPERIMENTAL SIMULATION

- Water models for tundish and mold
- Spray nozzles

COMPONENT DESIGN

PROFIT FROM OUR EXPERIENCE

The highest machine performance, flexibility and reliability is only achieved when the installed equipment, components and systems are thoroughly designed and fully integrated with each other. When our experts make a “fitness check” of your machine, we identify the weakest links in the process chain, and propose quick and effective replacement solutions. We can offer special components or develop them to enhance machine availability. That way, when it comes to new steel grades and product dimensions, we can help you meet the increasing market demands. The installation of long-lifetime components will also significantly reduce maintenance expenditures. Solutions and services can be implemented in casters of any size, of any type and from any supplier.

ON-SITE PLANT ANALYSIS AND OPTIMIZATION

- Improvement of operational reliability
- Fine-tuning of casting parameters
- Maintenance recommendations

CUSTOMIZED ENGINEERING SOLUTIONS

- Advanced mold-plate cooling-slot design
- Solutions for higher uptime
- Improved strand-guide concepts
- New bender design to prevent scale build-up
- Improved straightener geometry
- Water treatment considerations

EQUIPMENT FAILURE ANALYSIS

- Metallographic investigations of failure parts
- Reduction of breakouts with improved oscillator accuracy
- Stabilization of mold level with improvements of BB caster pinch rollers

LABORATORY SPRAY-NOZZLE TESTING

- Arrangement and checking of cooling nozzles, including water-spray pattern in modern testing facilities

EQUIPMENT CHECK

- Checking of mold-level control, oscillator and strand-guide system, etc.

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