

# THERCAST<sup>®</sup> by Transvalor

3D SIMULATION SOFTWARE  
FOR METAL CASTING

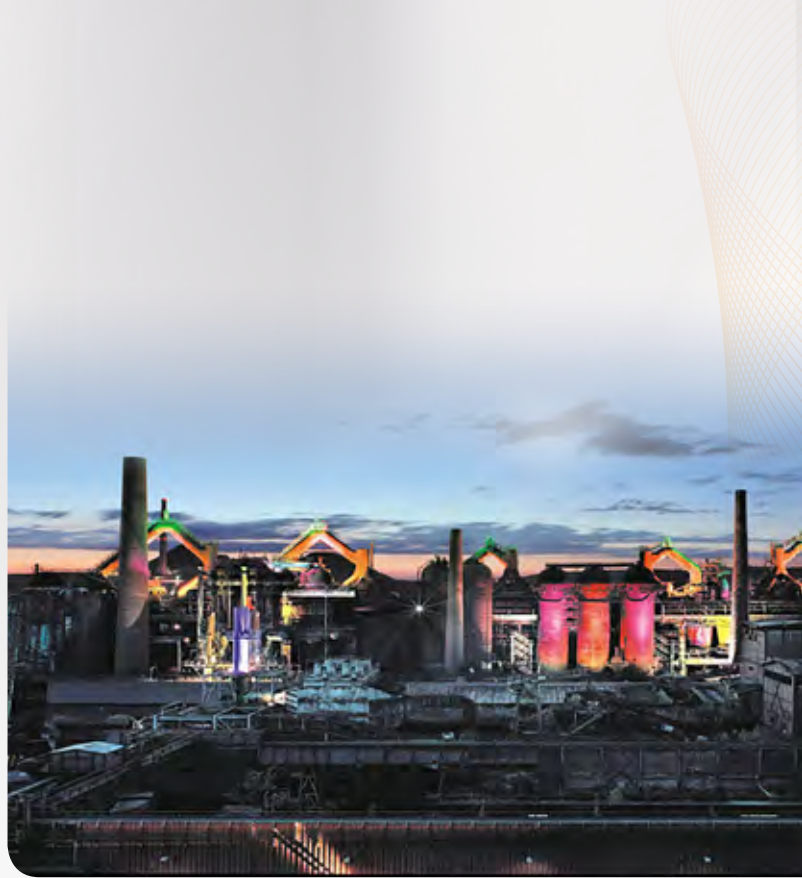


MATERIAL FORMING SIMULATION

# THERCAST®

Integrated software  
for simulating:

- Gravity casting (die casting, sand casting, lost foam, tilt casting, etc.)
- Centrifugal casting
- High/low pressure die casting
- Ingot casting
- Continuous casting

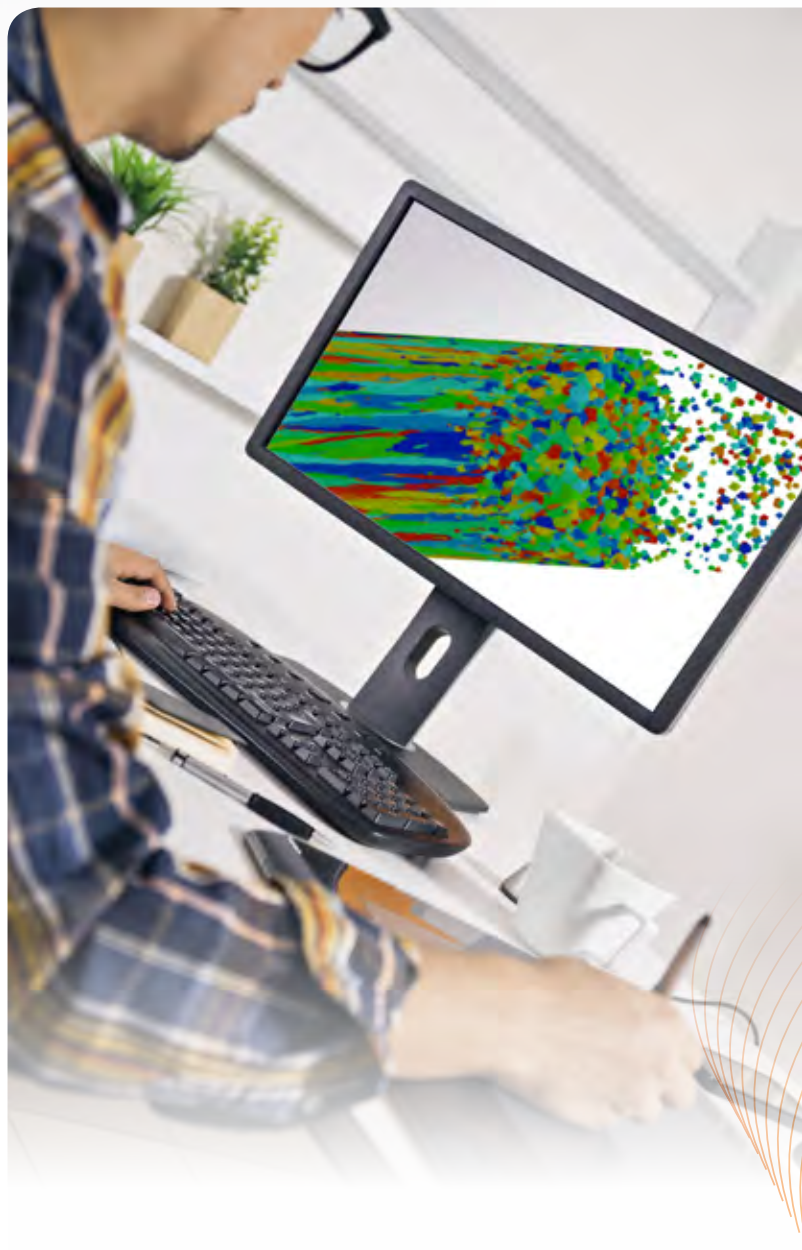


with the widest possible functional coverage

- Thermal-mechanical liquid/solid coupling
- Optimizing the riser system
- Predicting mold deformation
- Primary/secondary cooling
- Handling soft reduction
- Calculating bulging
- Predicting breakouts

- Predicting the grain structure
- Predicting primary/secondary shrinkage
- Predicting stress/distortion

- Optimizing casting systems
- Predicting segregation
- Predicting porosity
- Predicting residual stress
- Predicting solid phase distribution
- Heat treatment
- Particle tracing



# THERCAST®

An overall approach guaranteeing product quality and managing industrial risk..

Calibrating your processes

Accurately determining the specifications of your products

Predicting the microstructure and locating defects

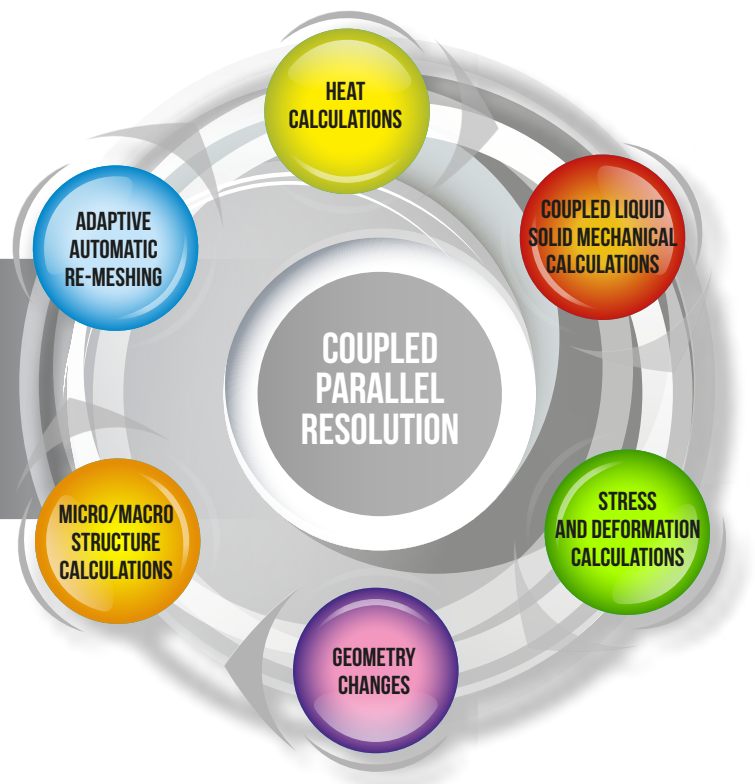
...using the TRANSVALOR integrated software suite

For End-to-End simulation...

...and a premium service based on 30 years' experience

## A unique package

integrating all of the modules needed to ensure accurate results





## Calibrating your processes

### From integrated continuous casting simulation...

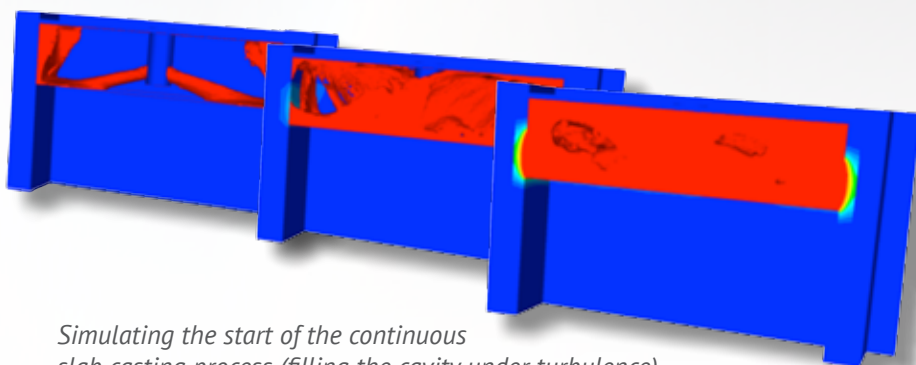
From ladle to cutting the cast product, through the primary and secondary cooling stages, you can:

- Optimize ingot mold taper/conicity efficiency,
- Predict the quality of the solid shell,
- Check bulging and avoid breakouts...

... thanks to a unique module that is dedicated to studying complex phenomena like the interaction between the turbulent liquid metal and solid shell shrinkage.



*Illustrating liquid metal paths and checking mold temperatures using cooling channels during the process*



*Simulating the start of the continuous slab casting process (filling the cavity under turbulence)*

Finely model the actual machine to realistically predict the quality of the product using the module dedicated to building the virtual casting machine.

Different spray models are available for the consideration of the secondary cooling including Gaussian and parabolic distributions.

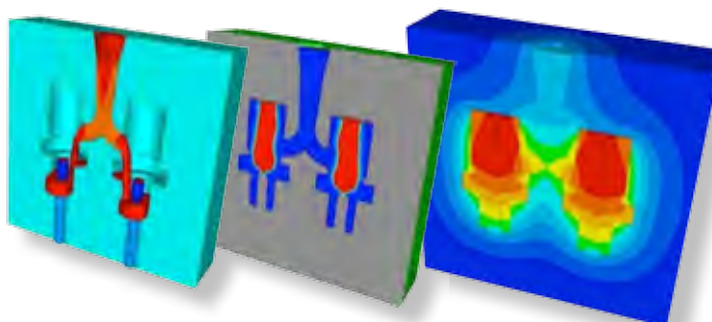
### ... To foundry processes



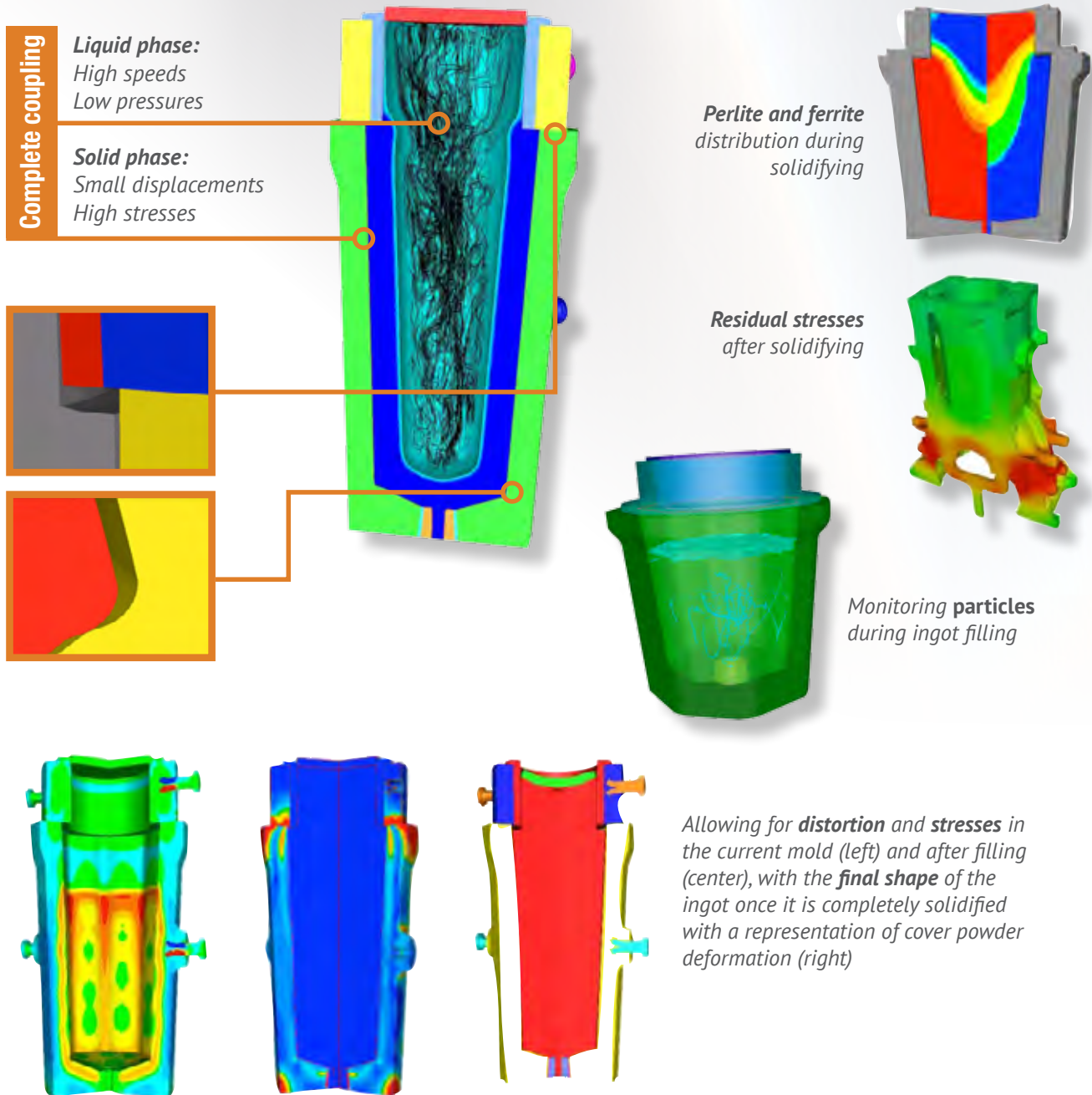
*Housing of an industrial passing machine*

THERCAST® allows the representation of the complete multi-phase metal behavior during the casting process, as shown on the right:

- Liquid state filling under turbulence
- Solidifying and primary shrinkage allowing for the mushy zone
- Primary and secondary shrinkage after complete solidification.



## Accurately determine the specifications of your products



### Testimony from a major metallurgical industry player

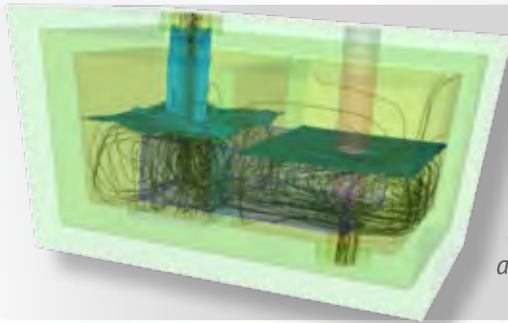
Industeel France, a subsidiary of the ArcelorMittal Group, supplies premium alloys and products for a wide range of markets including energy, offshore drilling, molds and tooling, depollution... The products delivered can reach thicknesses of up to 900 mm. Consequently, a large part of the manufacturing is based on ingots weighing 2 to 260 tons in a wide variety of shapes (flattened, cylindrical, square or even ring shaped sections). Striving to continually improve the quality of its products, Industeel has used THERCAST® from the outset, to cast its ingots while taking into account every aspect relating to emptying the ladle, filling the ingot mold, right out to when the metal solidifies and cools.

## Predicting the microstructure and locating defects

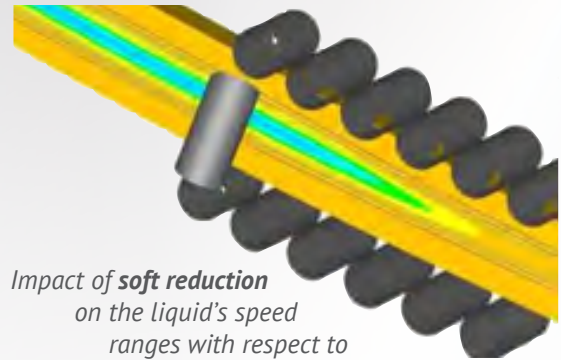
**Thanks to the dedicated fluid dynamics module in THERCAST®,**

you can analyze the:

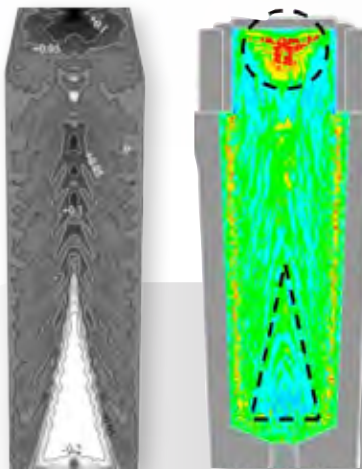
- Paths of any inclusions within the liquid metal,
  - Ladle behavior and the efficiency of any tundish,
  - Microstructures,
- and you will optimize the cleanliness of your product.



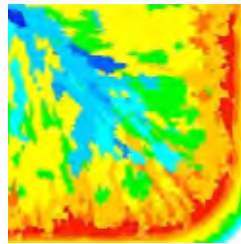
*Studying the paths of the fluid in a tundish*



*Impact of soft reduction on the liquid's speed ranges with respect to the solids*



*Comparing the distribution of carbon segregations between the measurement (left) and the calculation (right)*



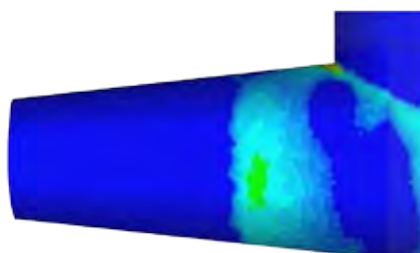
*Grain structure in cross section within an ingot*



*Grain structure in volume under driven solidification conditions*

## THERCAST®, a high performance and effective tool for perfecting casting

- Predicting metal flows within the mold along with its thermal and mechanical history
- Anticipating metal shrinkage during the process
- Estimating underfilling phenomena
- Predicting secondary shrinkage



*Predicting the cracked area using THERCAST® and comparing it with the actual part*



## TRANSVALOR - A software suite for End-to-End simulation

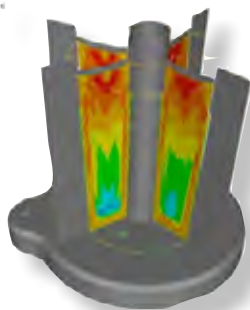
### A unique advantage

The closely linked THERCAST®/FORGE®\* combination forms a software suite that is unique in the marketplace for End-to-End simulation of the entire free casting/forging (ingots) and/or casting/rolling (continuous casting) process.

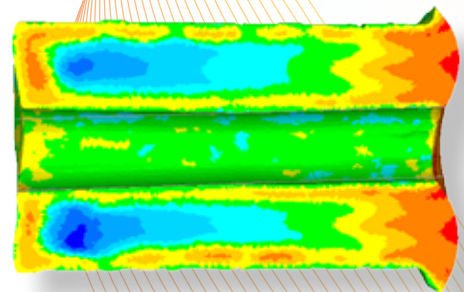


*"The direct THERCAST®-FORGE® link is another plus for planning the forging and rolling of modeled ingots."*

*I. Poitrault, Manager, Steel Process Section,  
Research Center, Le Creusot (France).*



Complete casting to forging sequence  
including monitoring segregation steps and  
their influence on residual stresses.



\*FORGE® NxT, forging simulation software for metal forming processes

### Parallel computing performance

THERCAST® and FORGE® have a powerful parallel processing capability so that they can benefit from the power of a large number of core processors. Simulation performance is considerably improved when additional processors are used, while at the same time reducing the execution time, bringing users unmatched precision in simulation results.

### Flexibility in use and easy to analyze results

- A powerful and intuitive user interface that reduces training time required
- Unlimited access to pre- and post-processors to run and analyze your simulations on as many computers as needed
- A license manager that lets you run calculations on a number of machines simultaneously

# TRANSVALOR - Products and a premium service based on 30 years' experience

## Products on the cutting edge of research and technology

TRANSVALOR is a world leader for simulation software in the field of material forming. Thanks to an ongoing R&D policy and a partnership with CEMEF, Center of Material Forming (Mines ParisTech), TRANSVALOR software is always on the cutting edge of technology.

Over 500 customers worldwide, including the major automotive, aeronautical and energy players as well as prestigious universities, trust TRANSVALOR and its software products, thereby guaranteeing their efficiency and reliability.

## A team of experts at your service to perform your simulations



### Your requirements effectively translated

Based on exchanges with your specialists, TRANSVALOR will translate your industrial requirements in terms of digital simulation to accurately describe our proposed service.

Our offer will match your requirements as closely as possible in terms of lead times, budget and expected results.



### Unique resources at your disposal

For the delivery of your service, we provide you with:

- TRANSVALOR's expertise in simulation
- the most recent software versions
- latest hardware technology



### Analyzed and interpreted results

Throughout the study, we maintain contact with you to keep you informed of the project's progress. On completion of the study, we present our main conclusions to you via a Web conference.

At your request, we can also provide you with the resulting files and the means with which to analyze them.



### Advice and training

TRANSVALOR can also provide you with support to allow you to gain proficiency in the aspects highlighted during the execution of your study.

You can benefit from tailored thematic training either on your company premises, on TRANSVALOR premises, or via Web conference.

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TRANSVALOR HAS BEEN CERTIFIED ISO 9001: 2008 BY THE BUREAU VERITAS CERTIFICATION FOR THE DEVELOPMENT, INDUSTRIALISATION AND LICENSING OF COMPUTED-AIDED ENGINEERING SOFTWARE AND RELATED SERVICES. THIS CERTIFICATION SHOWS THE WILL OF TRANSVALOR TO PROGRESS AND TO ANSWER BETTER ITS CUSTOMERS' EXPECTATIONS.