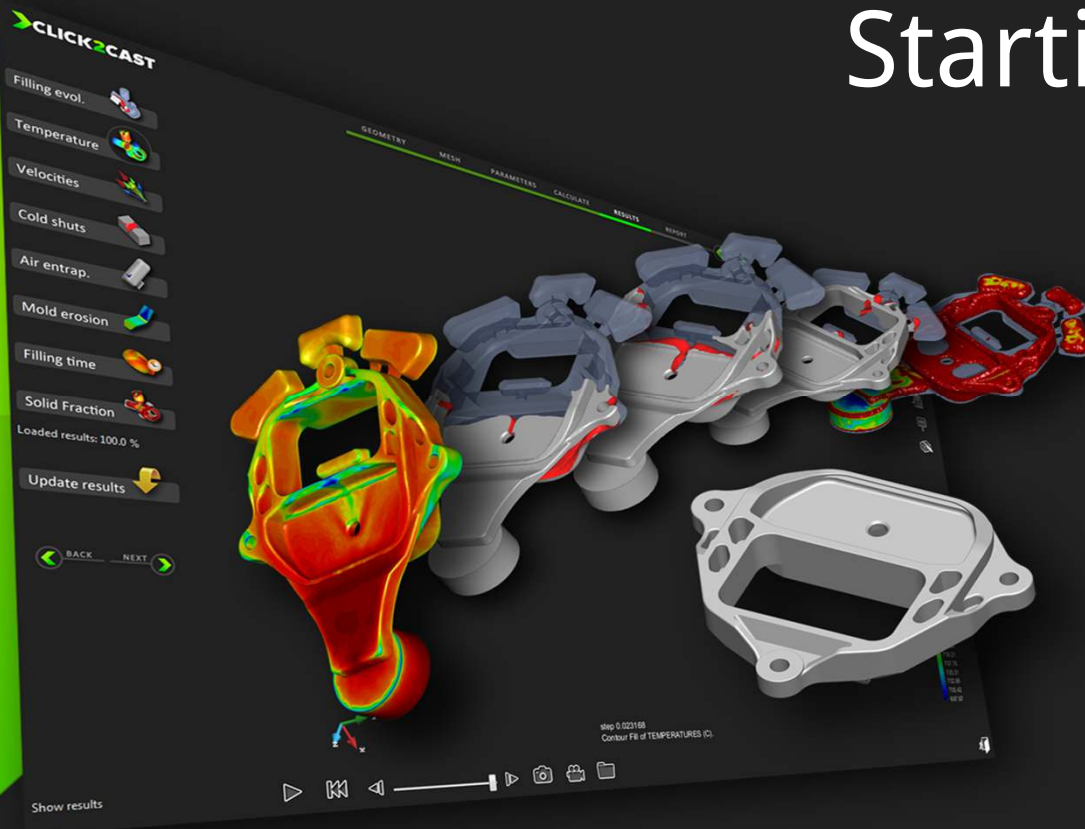


CLICK2CAST

Starting EASYmulation



QUANTECH ATZ
www.quantech.es

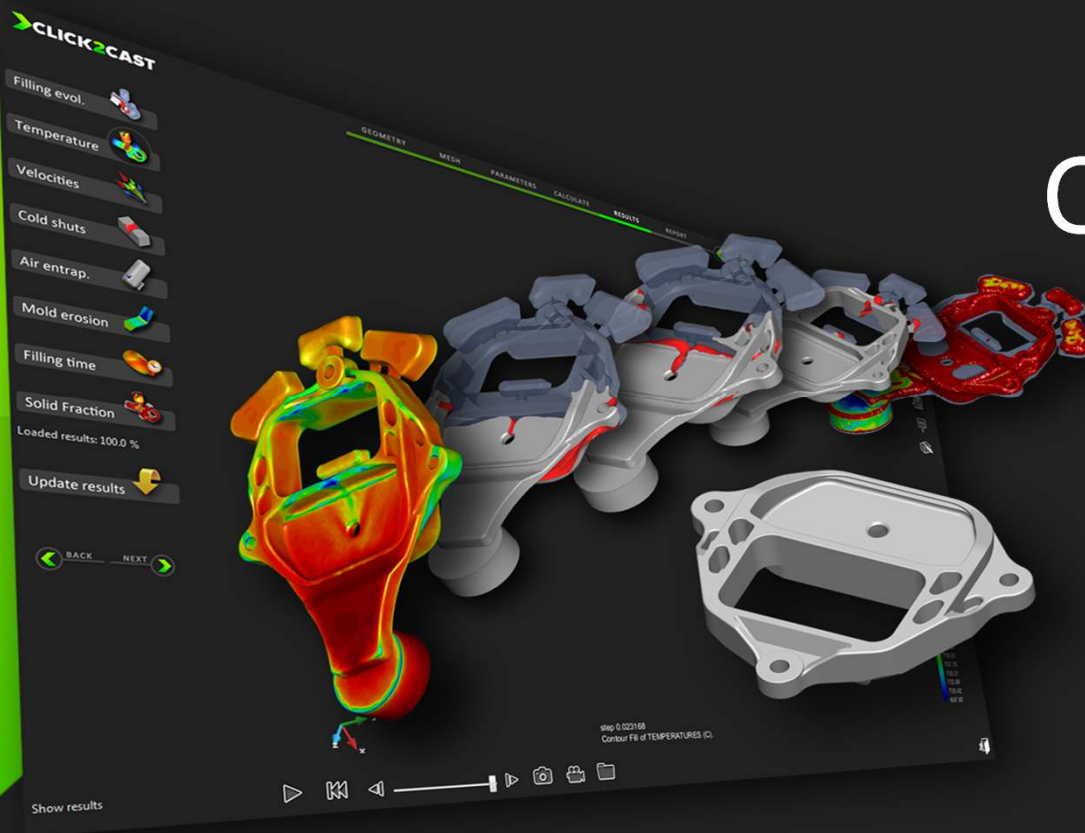


Contents

- Company Overview
- What's C2C?
- Concept
- The technology
- A deep dive on key features
- Live Demo
- Q&A Session



Company Overview



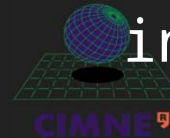
Company Overview

Quantech is Stablished on Barcelona in 1996 by a group of professors of the UPC and researchers of CIMNE.

THE MISSION of this new company is Impulse, develop and distribute simulation software solutions to manufacturing industrial processes.

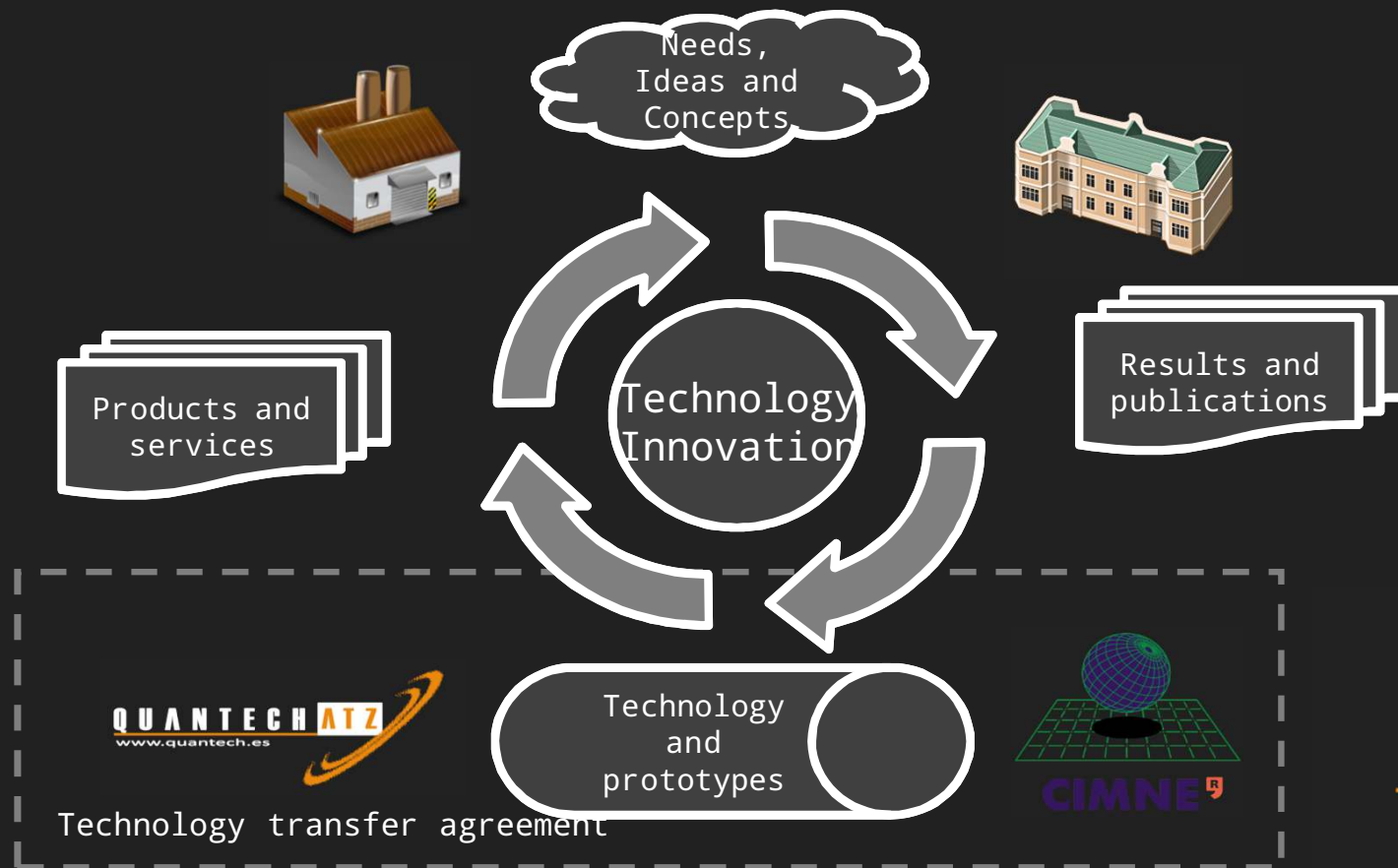


Universitat
Politecnica de
Catalunya

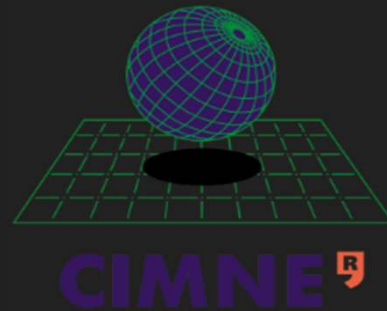


International Center
for Numerical Methods
in Engineering

Company Overview



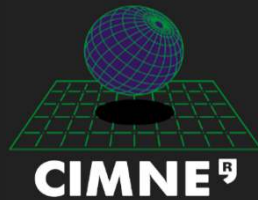
Company Overview



International Center
for Numerical
Methods in
Engineering



Company Overview



25 YEARS

EXPERIENCE IN Numerical METHODS



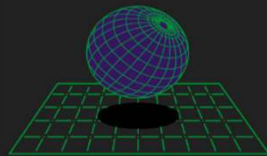
10 YEARS

EXPERIENCE IN CASTING SIMULATION



Company Overview

Scientific Societies



CIMNE[®]

International
Center
for
Numerical
Methods in
Engineering

SEMNI

Sociedad Española de Métodos Numéricos en Ingeniería

SEMNI was created in 1989 with the objectives of promoting the development, application and dissemination of numerical methods in engineering and applied sciences in Spain. The Secretariat of SEMNI is located at CIMNE premises in Barcelona.



International Association For Computational Mechanics

CIMNE holds the General Secretariat of the Spanish Association for Numerical Methods in Engineering.



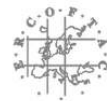
Unesco Chair of Numerical Methods in Engineering

CIMNE holds the General Secretariat of the International Association for Computational Mechanics.



European Community on Computational Methods in Applied Sciences

CIMNE holds the Secretariat of the European Community on Computational Methods in Applied Sciences.



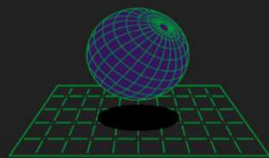
European Research Community On Flow, Turbulence And Combustion

CIMNE is a Pilot Centre for the European Research Community in Flow, Turbulence and Combustion.
ERCOTAC Spanish Pilot Centre



Company Overview

R+D Projects



CIMNE[®]

International Center
for
Numerical
Methods in
Engineering

AeroSpace
Biomedical eng.
Civil Eng.
Naval and Marine
eng
Tech. for Industry
Building and
Energy
Environment
Social and
Economical
Information and
Communication

Aerospace Engineering

CIMNE Aerodynamics is an heterogeneous group within CIMNE. We are in charge to develop new and amazing projects in the aeronautical field.

- Development of structural grid stabilized finite element and meshless methods for analysis of fluid flows.
- Development of 3D adaptive mesh refinement techniques for compressible/incompressible flows.
- Optimum shape design in aerodynamics combined with adaptive mesh refinement.
- Structural analysis of composite aerospace structures under static and dynamic load.
- Aeroelastic analysis of parachutes.
- Development of pre/post processing tools (DIC) for aerospace engineering problems.
- 3D unstructured mesh generation.
- Analysis data definition.
- Visualization of results.
- New algorithms for multidisciplinary problems in aerospace engineering: aerodynamics, thermal flows, electromagnetics, acoustics, etc.

STAFF

Team Manager:
Jordi Pass.

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Pedro Dela
Roberto Flores
Alejandro Larralde
Chris Lee
Roberto Lopez
Eduardo Ortega
Jose Perez
Miguel Serrano

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08840, Casadelella
Tel: +34 93 4334349
e-mail: jpass@cimne.upc.edu



Technology Transfer Services (TTS)

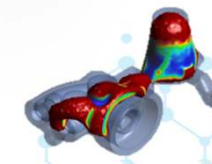
- Finite element method for analysis of sheet stamping processes.
- Finite element methods for analysis of mould filling, solidification and cooling in casting processes.
- Numerical methods for life predictions of manufactured parts.
- Optimum design methods for manufacturing processes in metal and plastic industry.
- Finite element methods for simulation of welding and joining processes.
- Decision support systems in forming and manufacturing industries integrating wireless sensor networks, databases, computer simulation methods and AI technology (neural networks).
- Numerical methods for multidisciplinary problems in the manufacturing industry.
- Development of numerical techniques for the simulation and dynamic optimisation of food preservation processes.
- Analysis, dynamic optimisation and control of processes such as:
 - Thermal sterilisation
 - Pasteurisation
 - Aseptic processing
 - Freezing
 - Emerging technologies
- Development of a virtual environment for information, e-learning and web computing in the food engineering industry.

STAFF

Team Manager:
Oscar Huélamo

Team:
Alex Castelló
Marti Coma
Mario Di Fonzo
Hector Gabriel Espinosa
Luis Jorge Fernandez
Alberto Forti
Francisco Javier Garate
Jaume Miró
Javier Roca
Gustavo Eduardo Zambrano

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C-3 del Parc Mediterrani de la Tecnologia
e-mail: ohuelam@cimne.upc.edu



Technology Transfer Services (TTS)


- Finite element method for analysis of sheet stamping processes.
- Finite element methods for analysis of mould filling, solidification and cooling in casting processes.
- Numerical methods for life predictions of manufactured parts.
- Optimum design methods for manufacturing processes in metal and plastic industry.
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Gustavo Eduardo Zambrano

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e-mail: ohuelam@cimne.upc.edu



RTD PROJECTS

SINUSUAL: Desarrollo de nuevas Tecnologías de simulación de procesos de fabricación para transición de aluminio laminado.

PLAN NAC: I+D (2008-2011), MITYC-MINISTERIO DE INDUSTRIA, TURISMO Y COMERCIO
Coordinador: GRUPO ANTOIN
Participantes: INASAT, CIMNE
6/10/2008 - 31/12/2011

VIMETRI: Estudio de Viabilidad de una herramienta de simulación de procesos de fabricación por deposición láser.

PLAN NAC: I+D (2008-2011), MITYC-MINISTERIO DE INDUSTRIA, TURISMO Y COMERCIO
Coordinador: QUANTECH
Participantes: CIMNE, LETAT
3/10/2010 - 30/09/2011

MAKING: Simulación de procesos tecnológicos avanzados.

PLAN NAC: I+D (2008-2011), MITYC-MINISTERIO DE INDUSTRIA, TURISMO Y COMERCIO
Coordinador: GRUPO ANTOIN
Participantes: INASAT, CIMNE
6/10/2008 - 31/12/2011

FLUXCAST: Robot, and FLEXIBLE CAST iron manufacturing PPT, EC
Coordinator: UPC



Company Overview

Quantech Activities

1.- Impulse, develop and distribute standard software



2.- Development of customized industrial simulation software

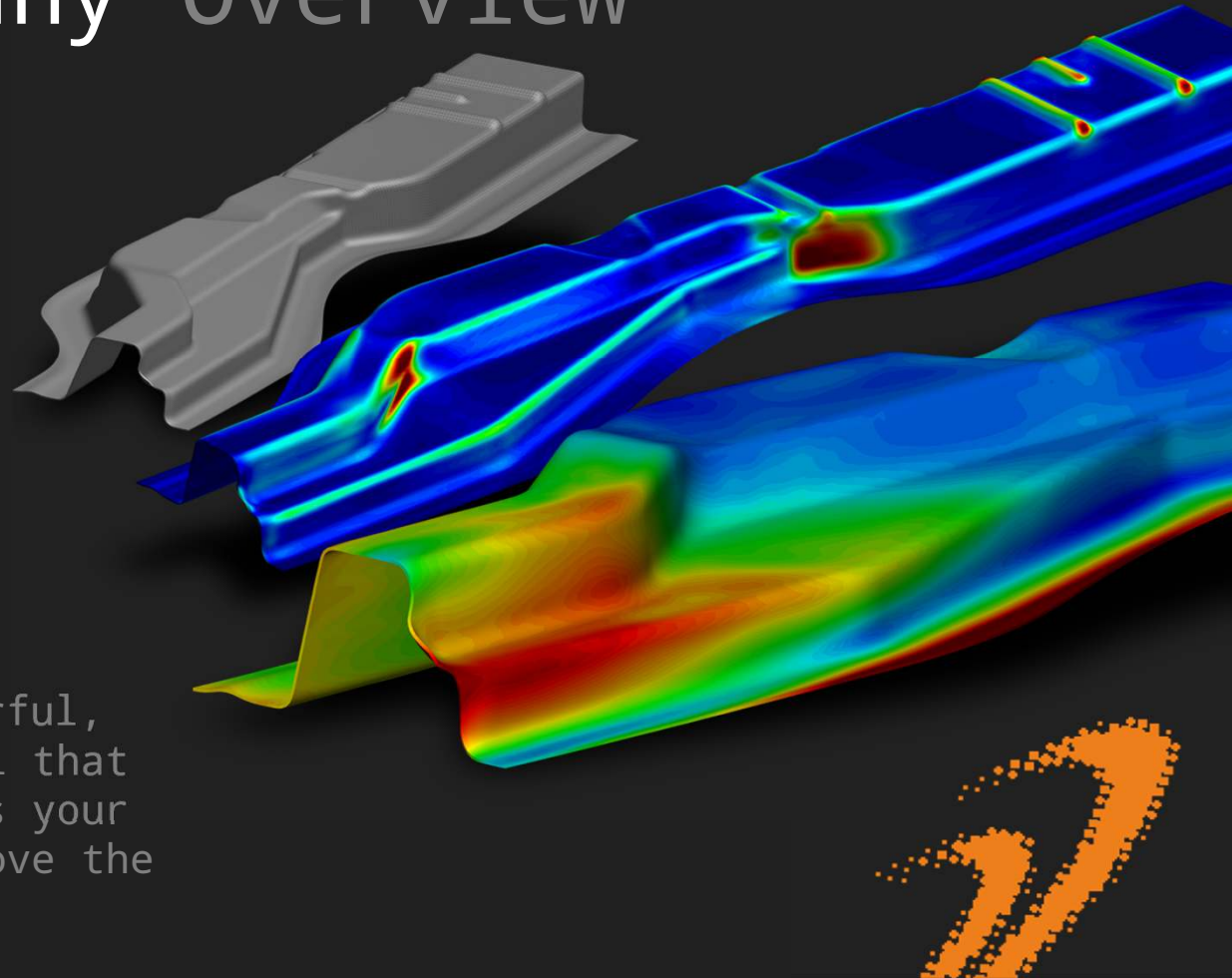
3.- High level simulation consultancy and training



Company Overview



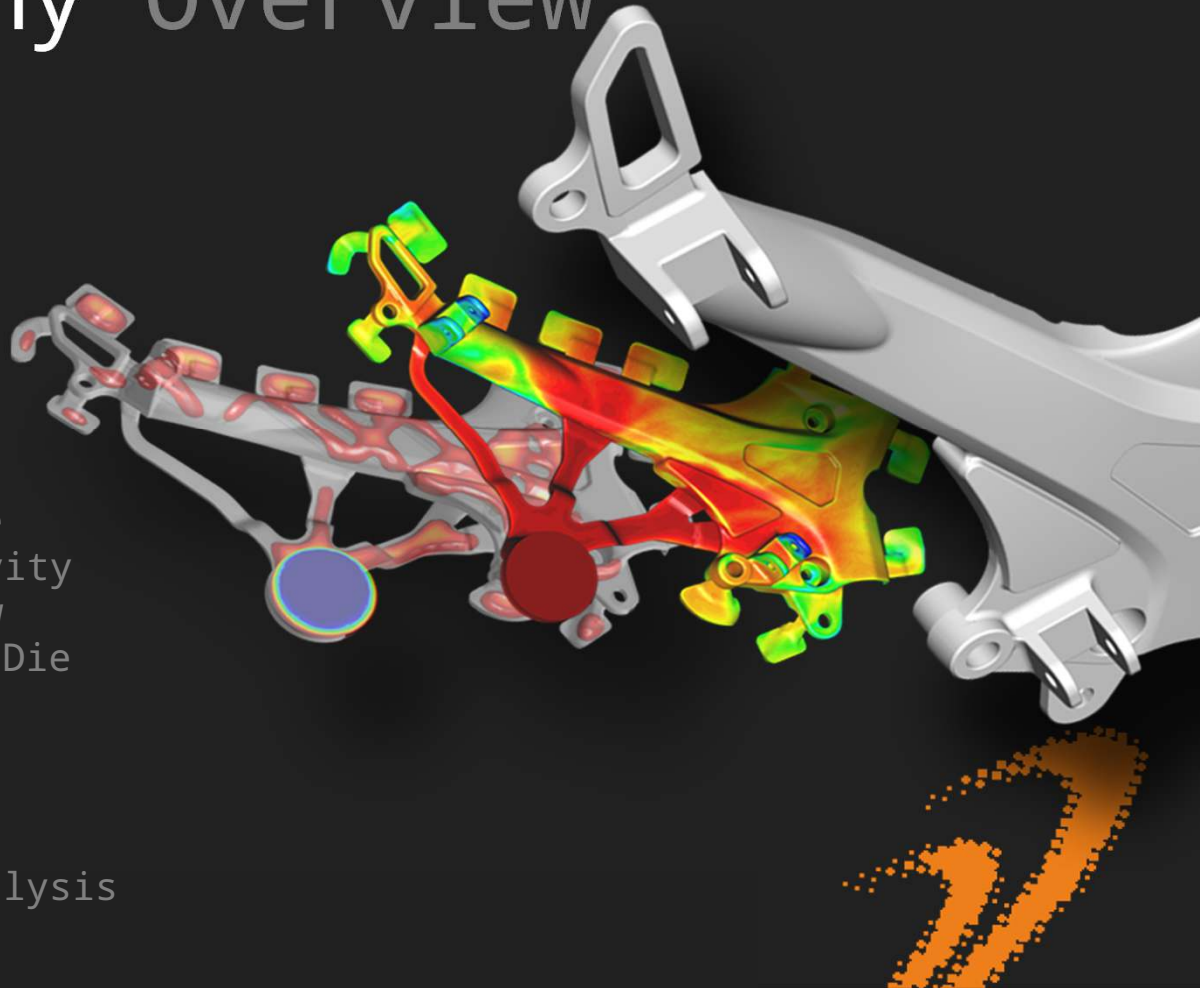
Stampack is a FEM software for the simulation of the sheet metal and tube metal forming processes found in the automotive, aeronautics/aerospace, metal packaging, home appliance, electronic instruments and other sectors. Stampack is an economical, powerful, specialized and a versatile tool that quickly and accurately optimizes your metal forming processes to improve the productivity and reduce cost.



Company Overview



Vulcan is a Finite Element software designed as a defect-prediction tool for the foundry engineer, in order to correct and/or improve the entire casting process, even before prototype trials are produced. Every pouring technology used in the foundry industry is considered: Gravity sand and permanent mold Casting, Low Pressure Die Casting, High Pressure Die Casting, as well as every working processes: filling of the mold, temperature field analysis, flow turbulences, evolution of the solidification. Thermomechanical analysis modules are also available.

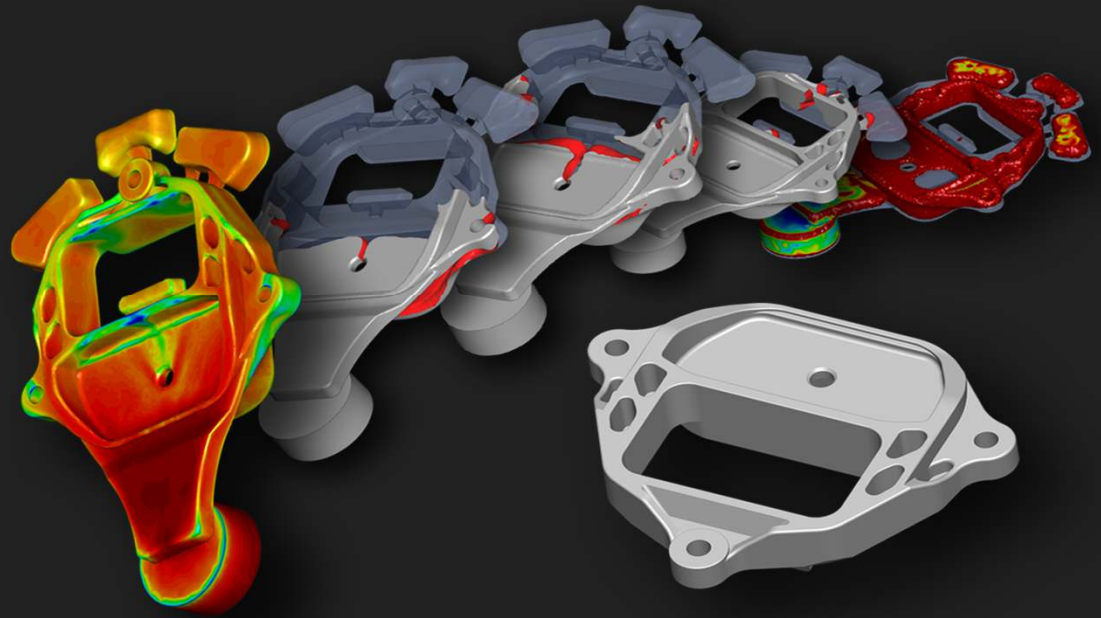


Company Overview

CLICK2CAST

Click2Cast is a casting process simulation software developed around the concept of EASYmulation that allows the user to enhance and optimize their manufactured components avoiding typical casting defects such as air entrapment, porosity, cold shots, etc. thanks to the simple and quick mould filling simulation.

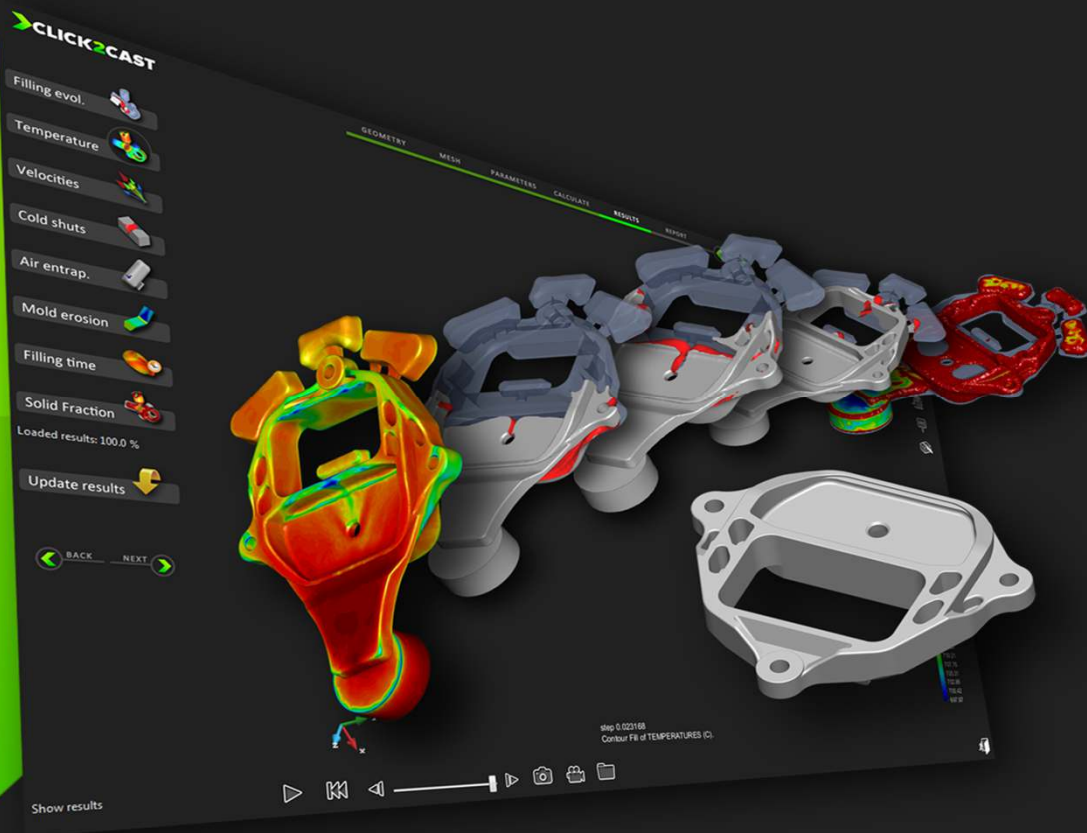
Click2Cast offers an innovative user experience allowing the complete simulation to be done in 5 simple steps and through a completely new and user-friendly interface.



The

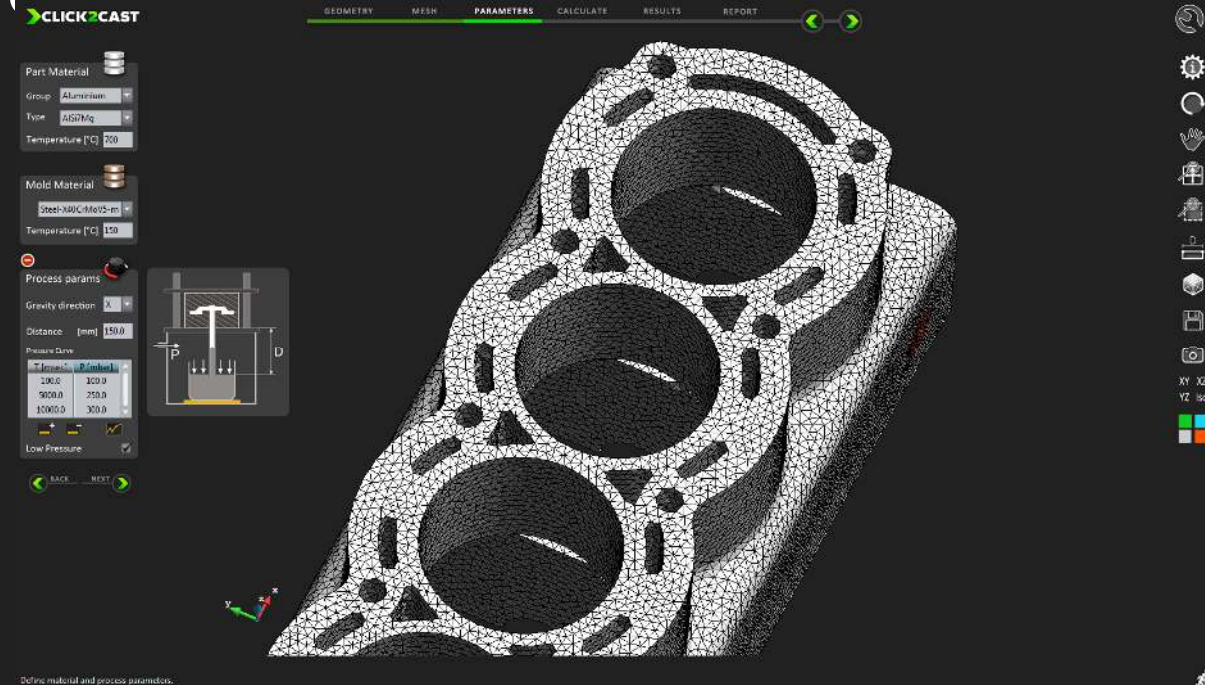


What is C2C



What is C2C

SIMULATION-Driven Design software for
casting



HPDC – LPDC
GRAVITY SAND
PERMANENT MOLD
CASTING



What is C2C

What's new?

- Move the simulation process closer to design stage.
 - Avoid iterations between Design and Production
 - Limited investment □ High ROI
 - **Easy-to-use**: Starting simulations avoiding complex trainings



What is C2C

Traditional:

- How good is my shot design?

It's when I'm start designing that I need

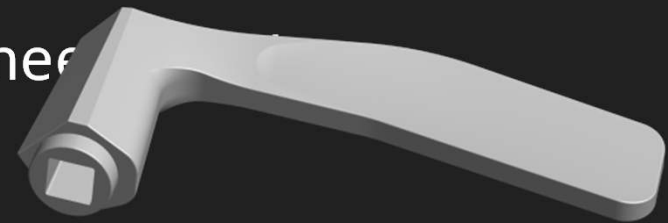
- ...where: **Ingate** positioning.

- ...where: Feed and Risers and wich size?

- ...how large: Continuous ingate or fan ingate

- ...where it vents: **Overflows**

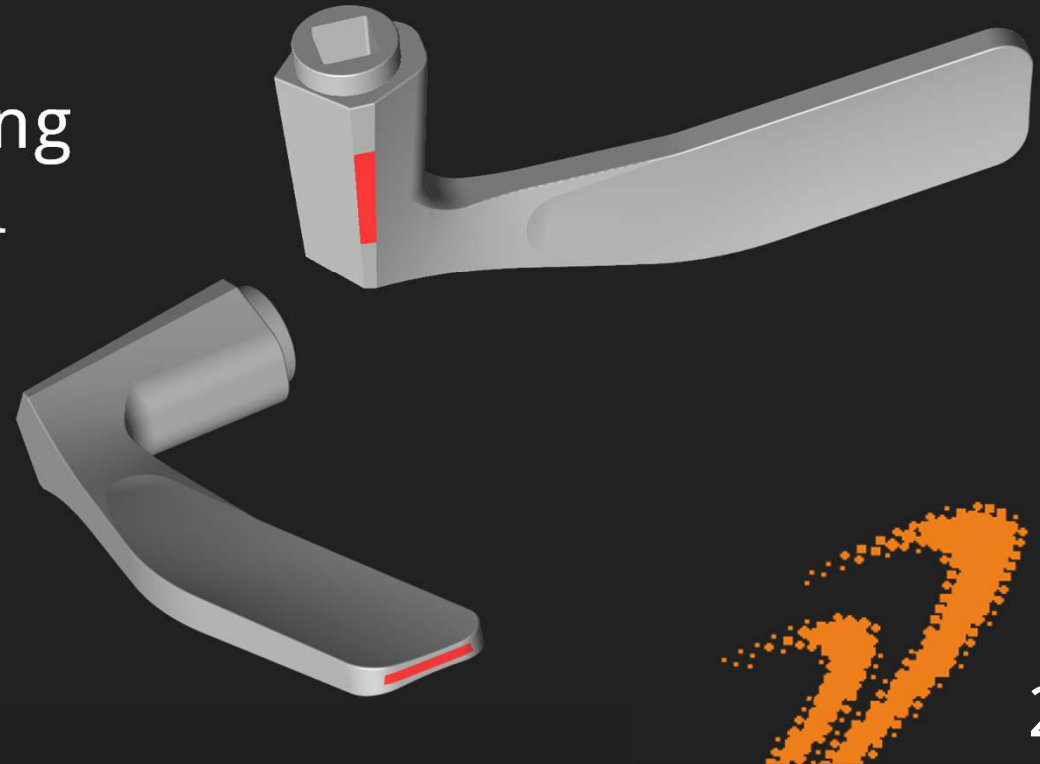
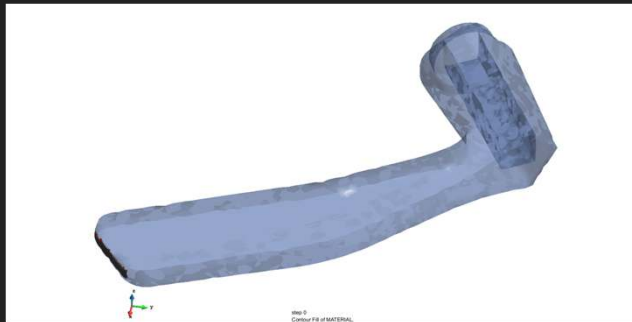
- ...balance: **multicavity** mold



C2C Concept

A different approach to simulation

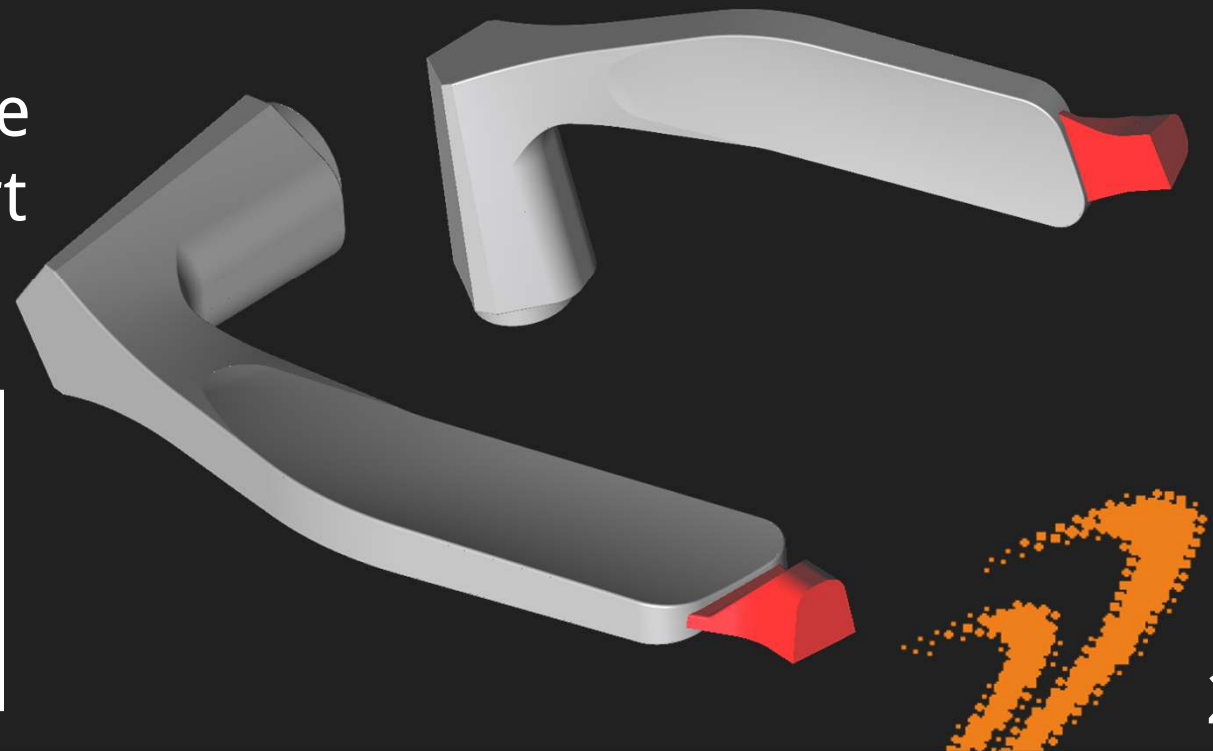
InGate Position testing
based on the initial
component.



C2C Concept

A different approach to simulation

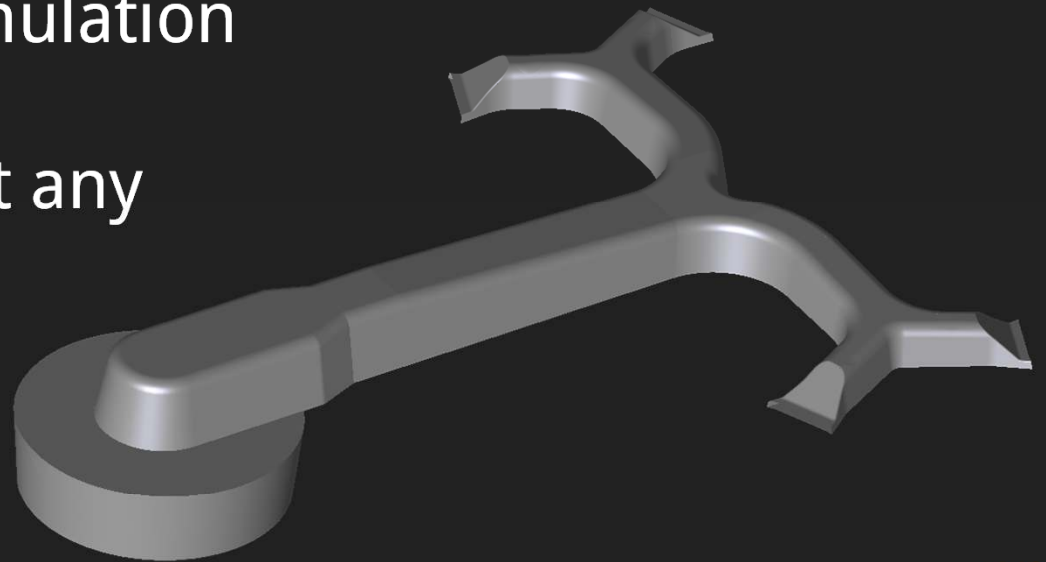
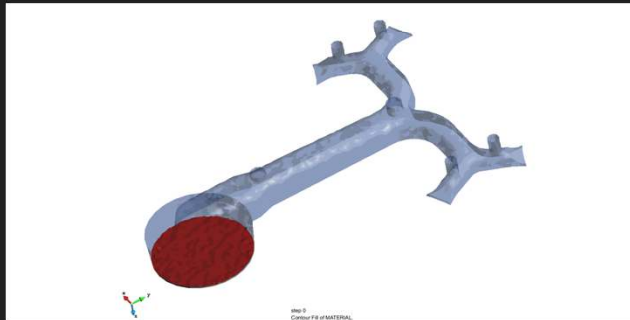
Validation of the InGate position by using a part of the runner



C2C Concept

A different approach to simulation

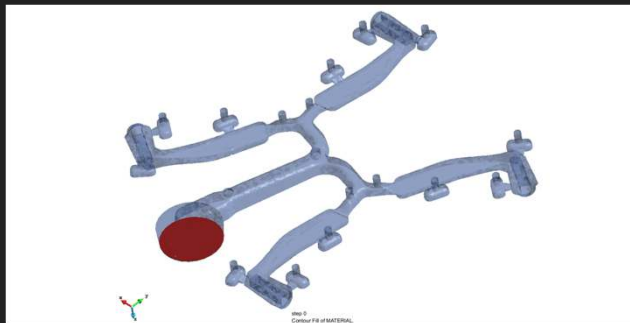
Testing the **Runner** without any component.



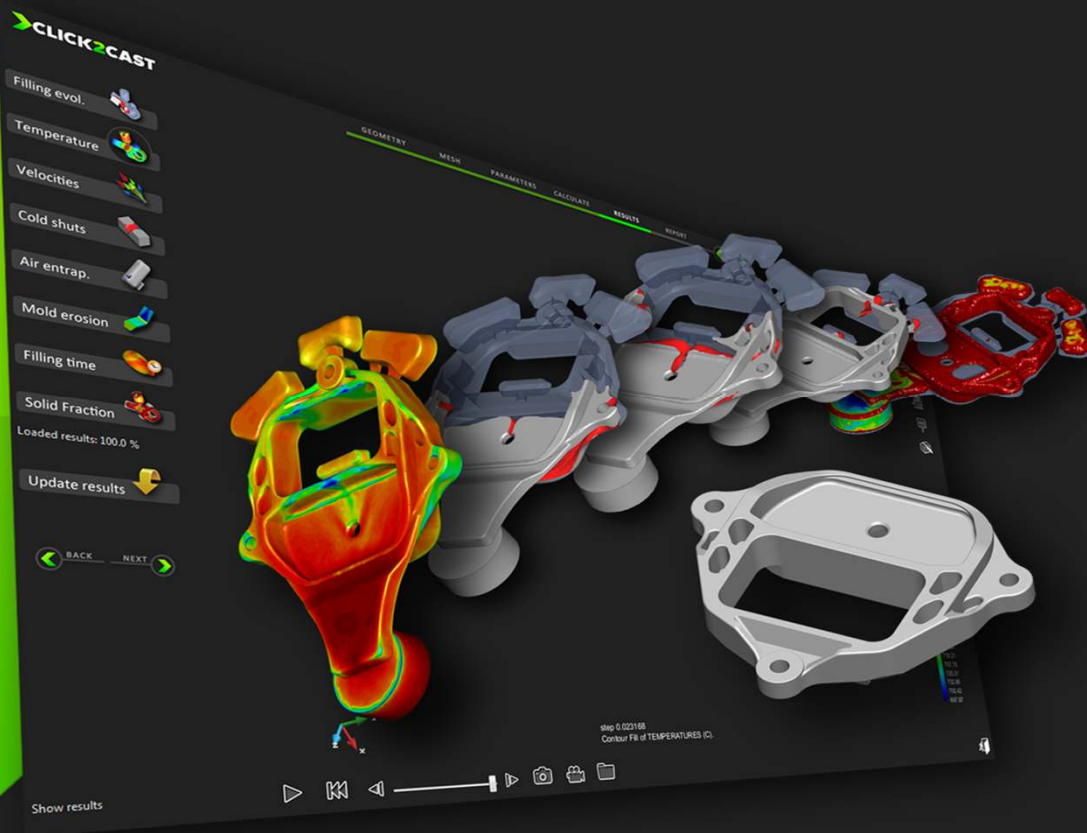
C2C Concept

A different approach to simulation

Validating the full design
considering 4 cavities, runner
and overflows.



C2C Technology



C2C Technology

What is EASYmulation?

EASYmulation is a new concept developed to increase the usability of simulation software in this case, apply to casting industry

EASYmulation means easy to use simulation, with no training needed, no high technical complexity and no needs of qualified staff.

EASYmulation allows saving time and money, moving the current complex simulation processes to only 5 simple steps from opening the model to analyze the results

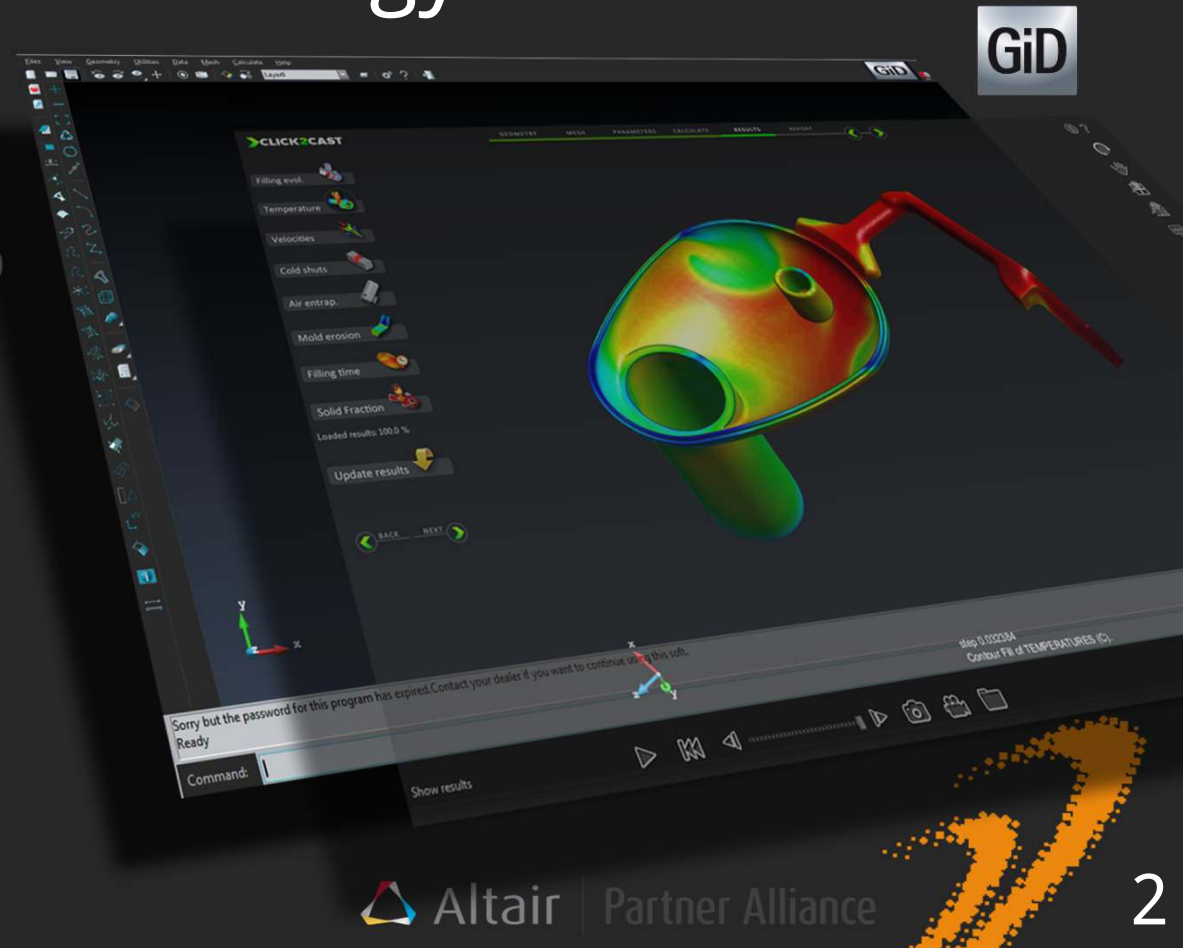


C2C Technology

What is under Click2Cast?

Click2Cast interface was developed over the Pre and Post processor GiD v11, taking profit of all the possibilities that GiD provides in the very last version.

Solvers inside click2cast are the most advanced technology developed in CIMNE for Fluid Dynamics and Thermal simulation by using FE methods.



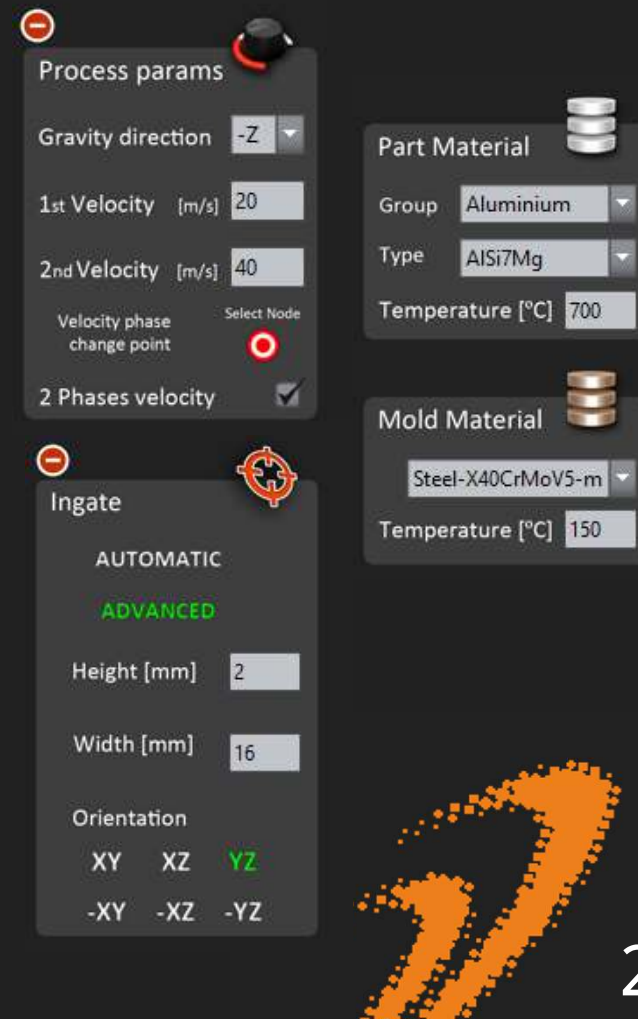
C2C Technology

What is On Top Of Click2Cast?

Click2Cast interface was created for the industry.
It is not developed in Fortran or C++... it was developed in “Casting language” .

Even this is a High-tech FE software simulation, in any stage the user needs to interact with unknown parameters such as Courant number or Convergence tolerances.

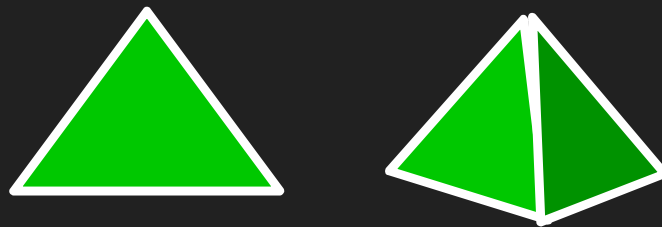
Every word in the interface comes from the casting process world.



C2C Technology

Why FEM...

- Click2Cast is based on Finite Element technology (FE)
 - Geometry approximation is done by using 3 nodes triangles and 4 nodes tetrahedral elements

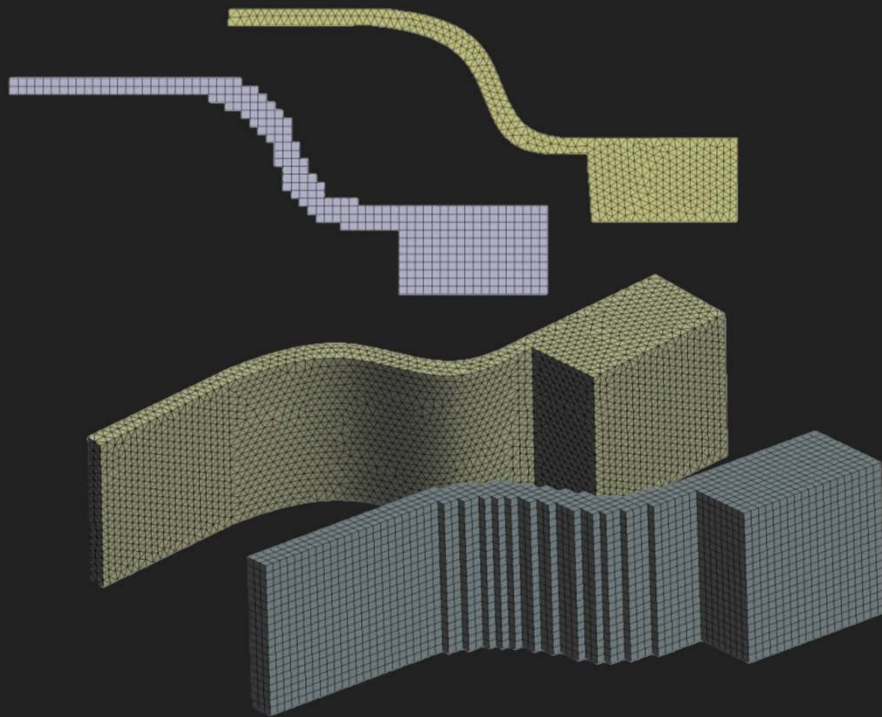


Accurate for any kind of geometry, allowing local refinement



C2C Technology

Why FEM...?



FE allows local
Refinement

FE Mesh allows the
contact simulation (Thermo-
mechanical Analysis)

FE mesh gives better
accuracy by using the same
element size

FD Mesh generation
is faster and
easier.
No need to repair
Geometry

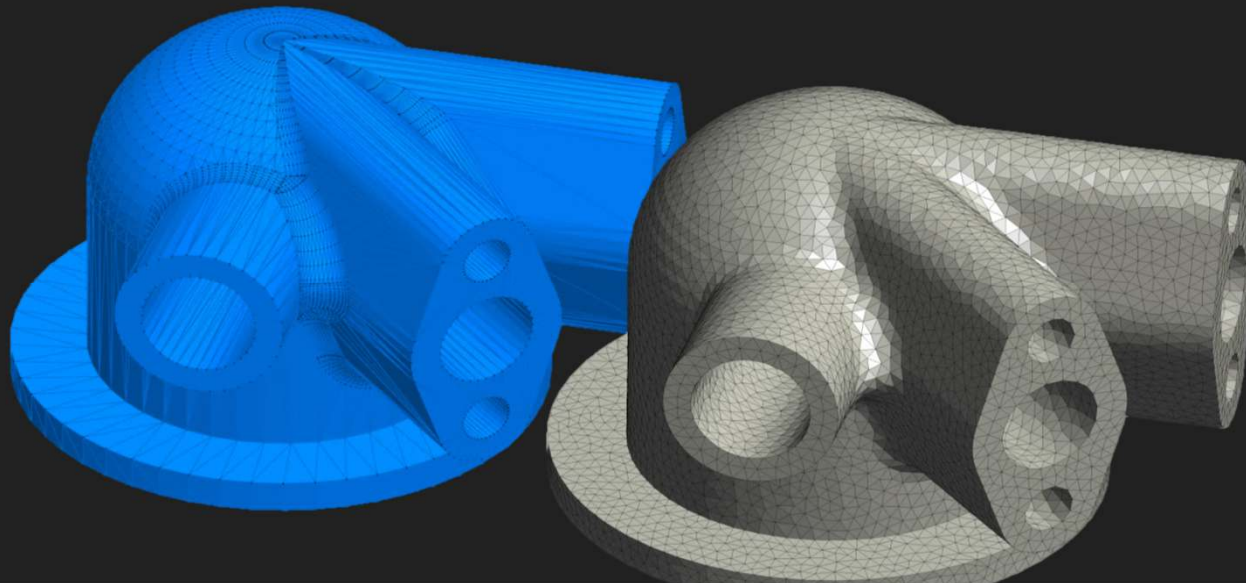
If C2C is using FE,
It is necessary to prepare/repair the Geometry?



C2C Technology

Why FEM...?

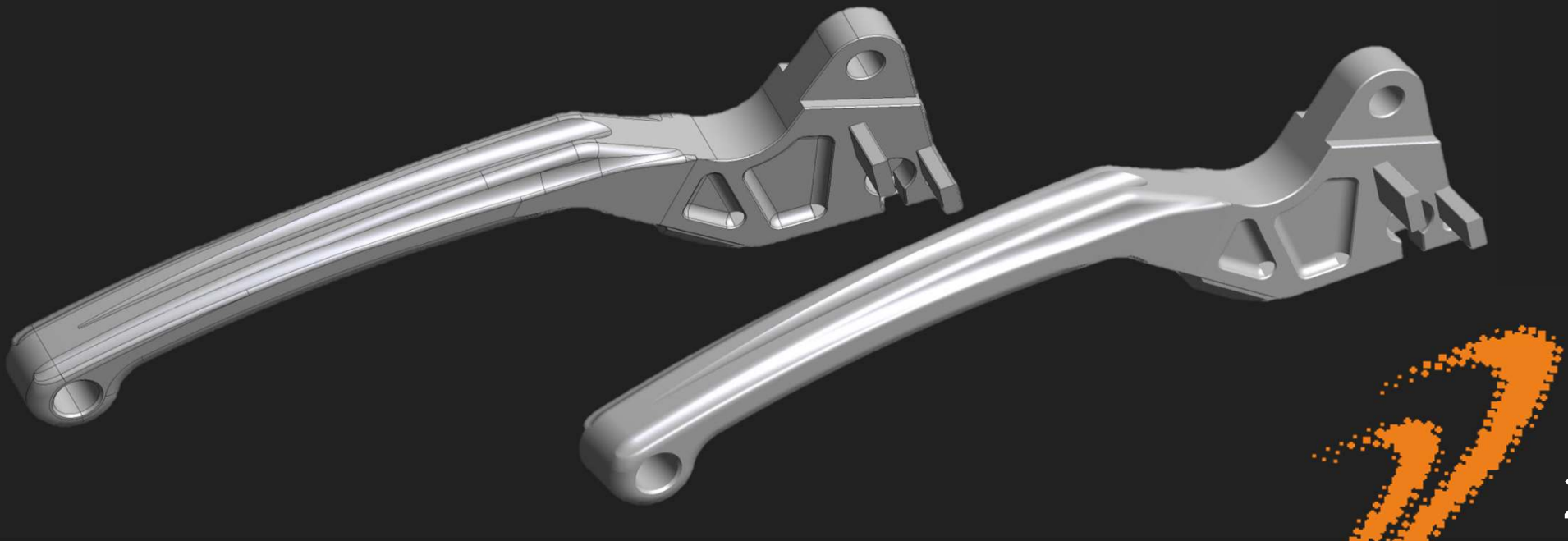
Click2Cast integrates a new and innovative mesher that allows the user to forget about complex operations to mesh the model using FE. The user only needs the geometry in STL format and Click2Cast will do the FE mesh automatically.



C2C Technology

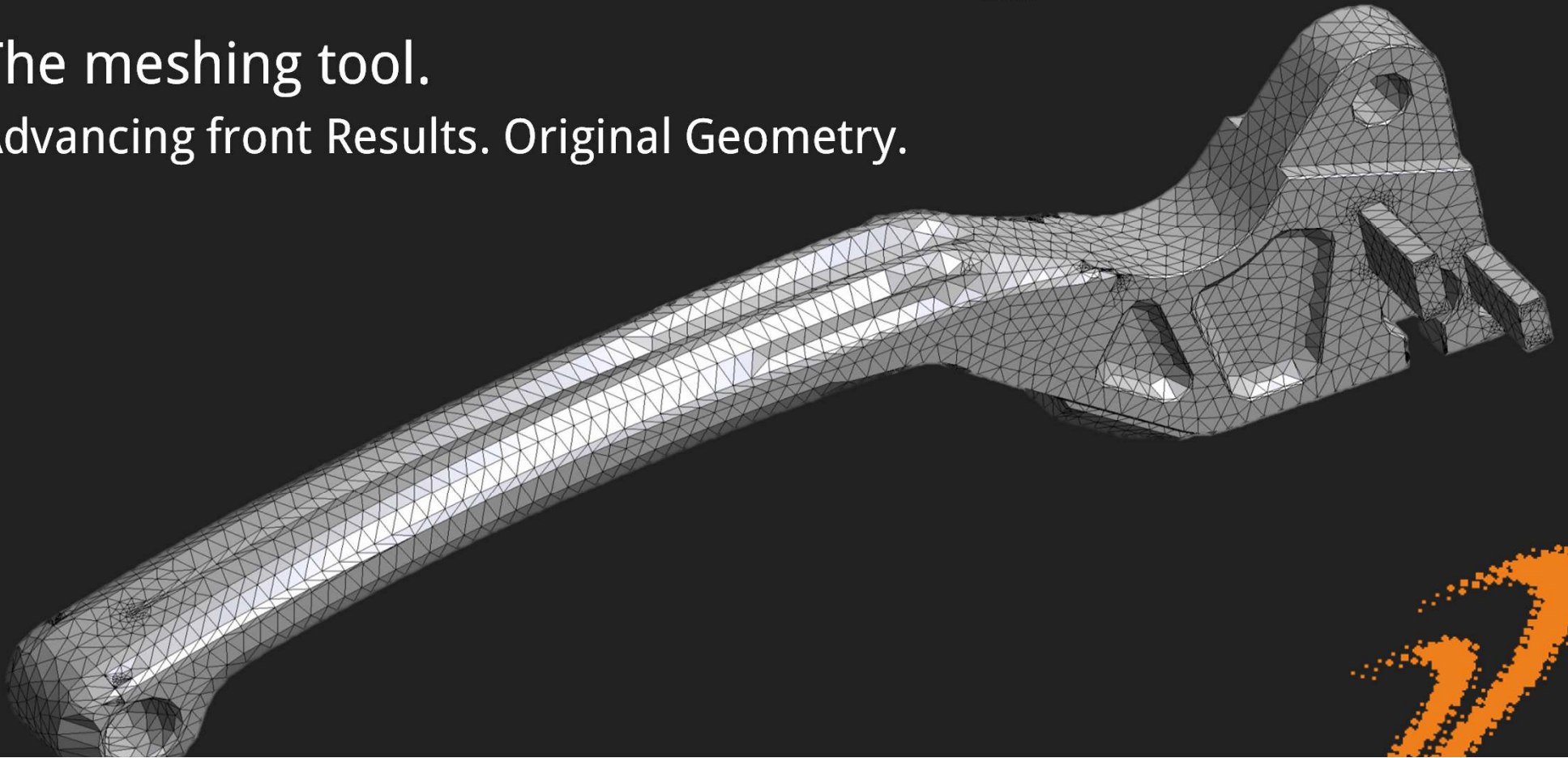
The meshing tool.

Comparing C2C meshing tool vs. typical meshers.



C2C Technology

The meshing tool.
Advancing front Results. Original Geometry.

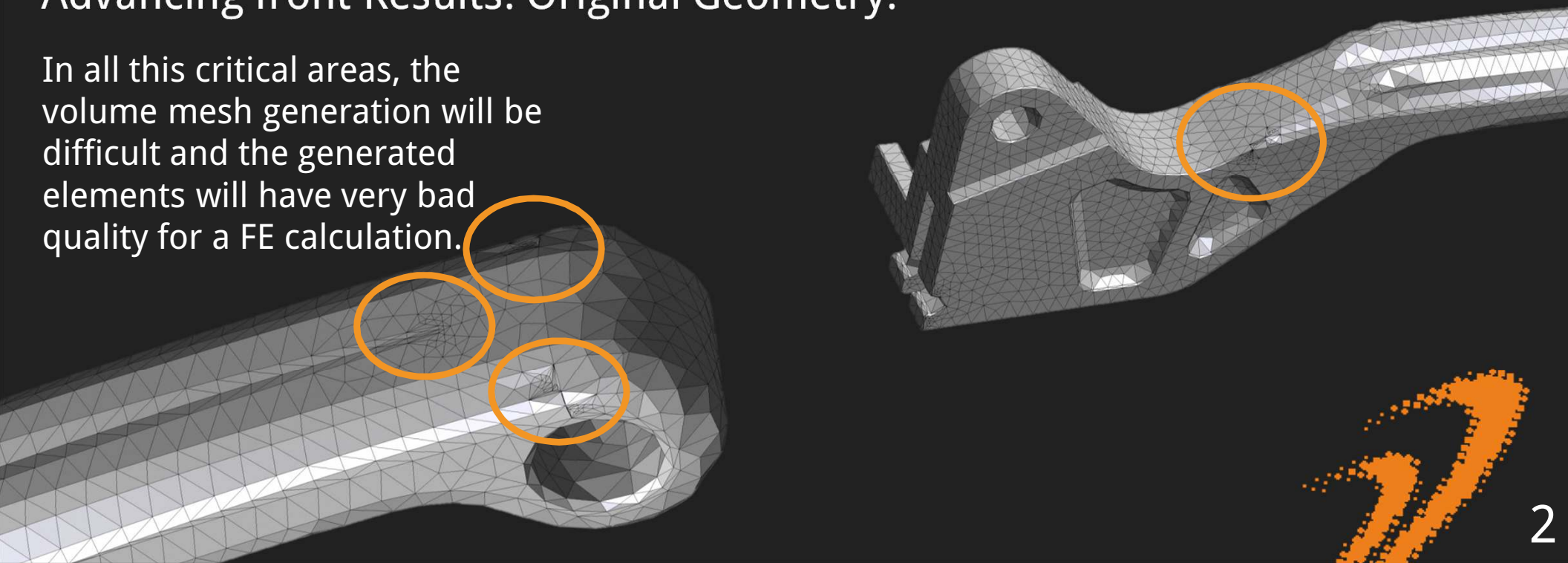


C2C Technology

The meshing tool.

Advancing front Results. Original Geometry.

In all this critical areas, the volume mesh generation will be difficult and the generated elements will have very bad quality for a FE calculation.

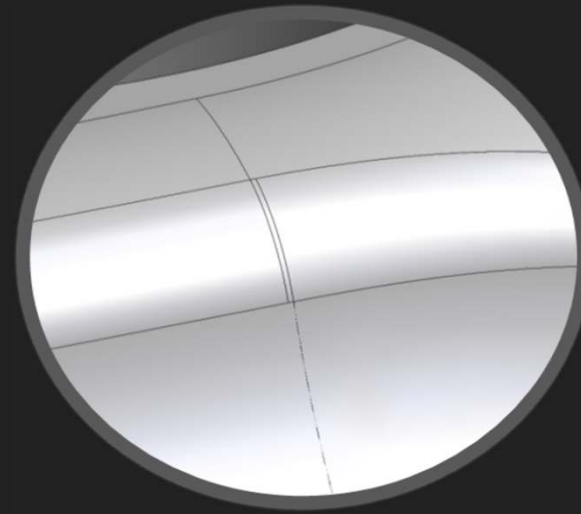
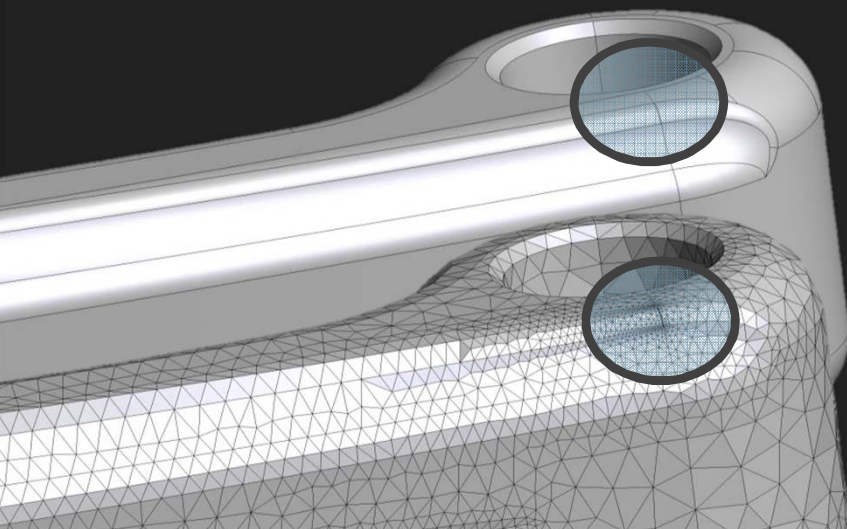


C2C Technology

The meshing tool.

Advancing front Results. Original Geometry.

Advancing front creates the mesh based on the geometry entities.

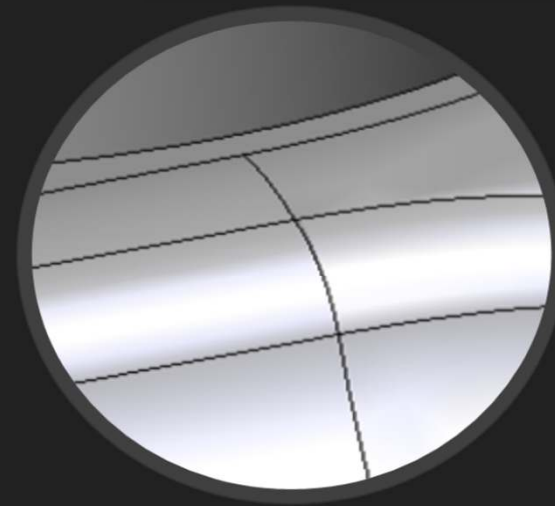
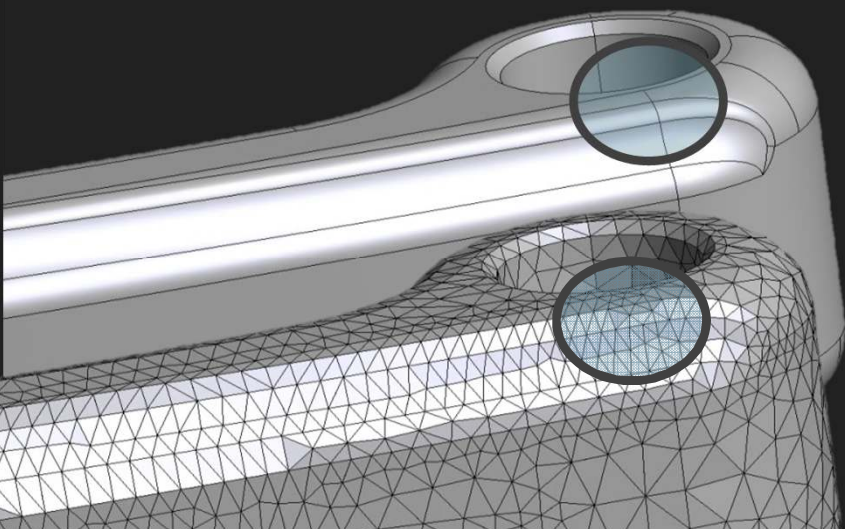


C2C Technology

The meshing tool.

Advancing front Results. Original Geometry.

To avoid this problems the user must repair the geometry modifying the surfaces and lines.
This is a difficult and time consuming operation.



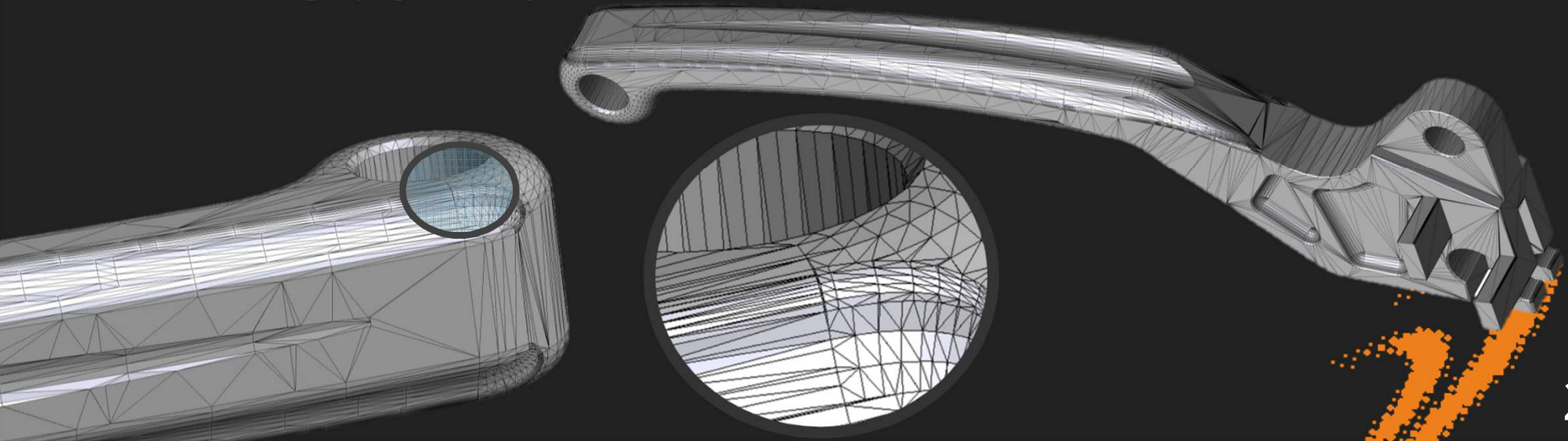
Reparation
time.: 30 Min



C2C Technology

The meshing tool.
Meshing from STL files.

This new meshing technology creates the mesh based on the contour geometry defined by the STereo Lithography of the part (STL)



C2C Technology

The meshing tool.
Meshing from STL files.

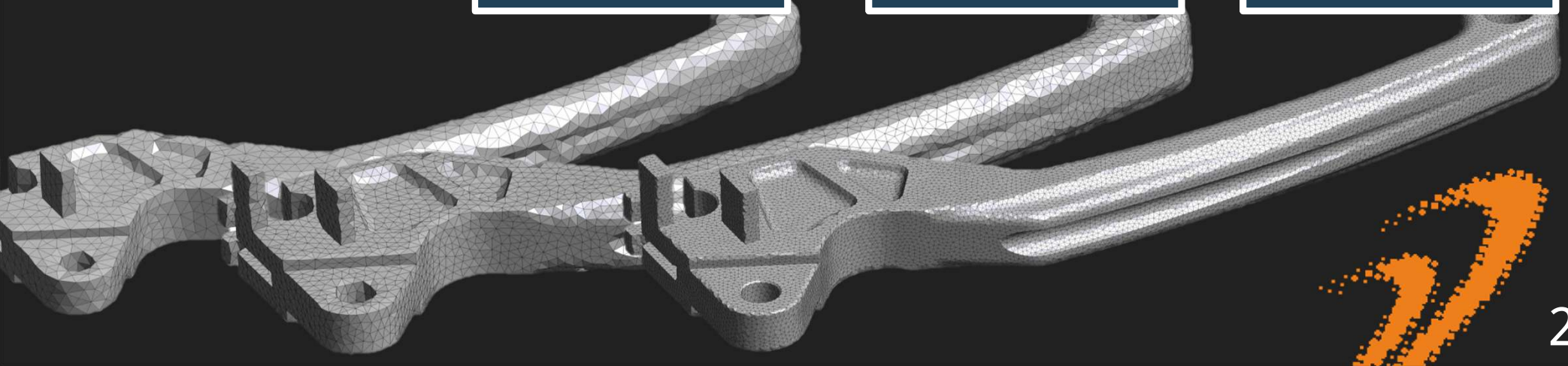
Mesh Generated by using our new technology.

Reparation
time.: 0 Min

Element Size = 3

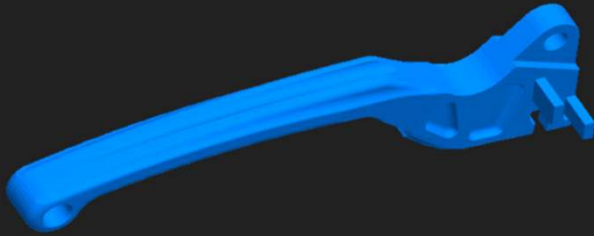
Element Size = 2

Element Size = 1

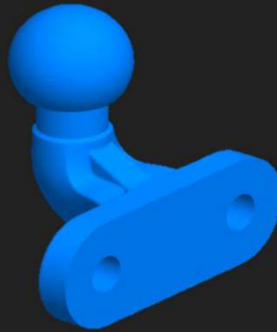


C2C Technology

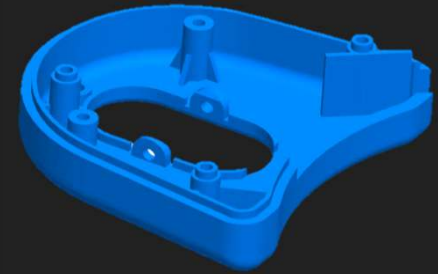
The meshing tool.
Meshing from STL files.



Open Demo



Open Demo

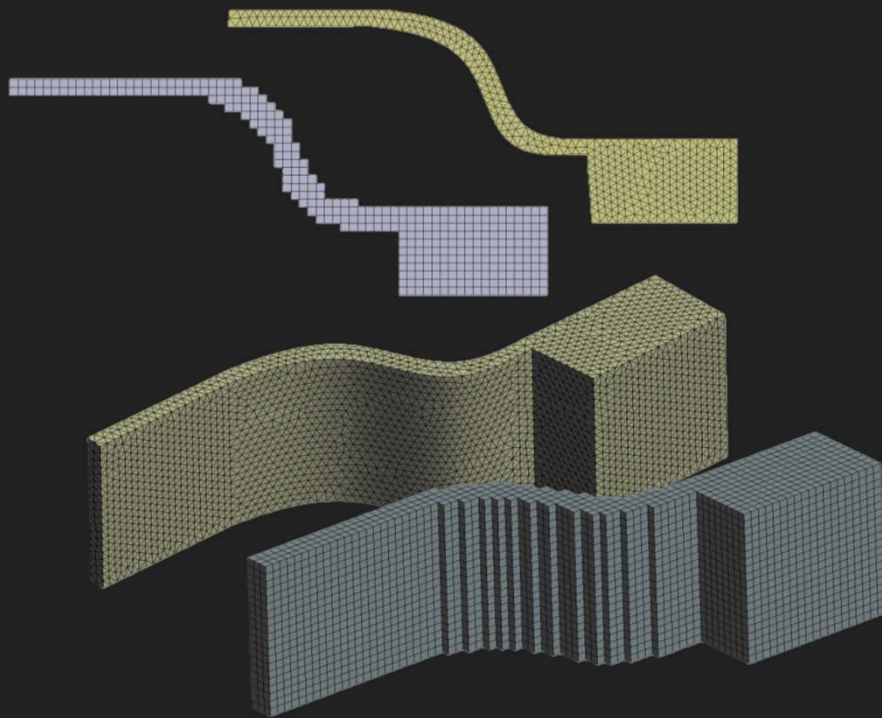


Open Demo



C2C Technology

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contact simulation (Thermo-
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FE mesh gives better
accuracy by using the same
element size

FD Mesh

generation is

FE Mesh generation
is fast and easy

No need to repair
Geometry

Five simple steps

CLICK2CAST

GEOMETRY

MESH

PARAMETERS

CALCULATE

RESULTS

REPORT

New project



Open project



Model



Length units

mm

NEXT



Import geometry or open an existing project.



XY XZ

YZ Iso



Five simple steps



1. Geometry



Open file (as *.STL)

or

Open existing project (as GID project/folder)

Define geometry length units.

2. Mesh

3. Parameters

4. Calculate

5. Results



Five simple steps



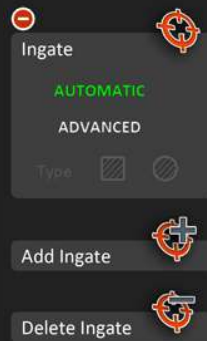
1. Geometry

2. Mesh

3. Parameters

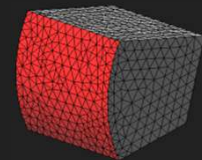
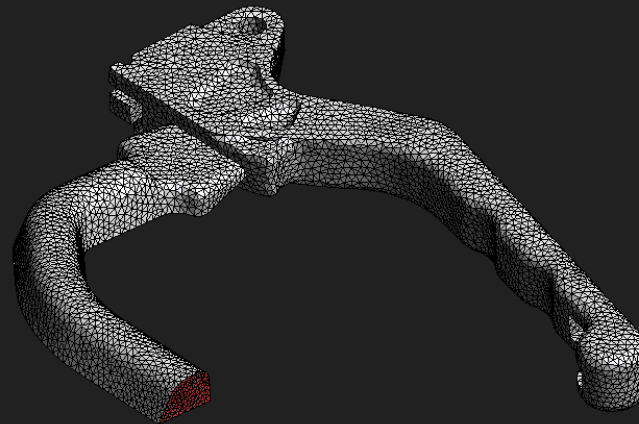
4. Calculate

5. Results



InGate definition.

Automatic option works with a pre-designed geometry ingate, either the runner or part.



Five simple steps



1. Geometry

2. Mesh

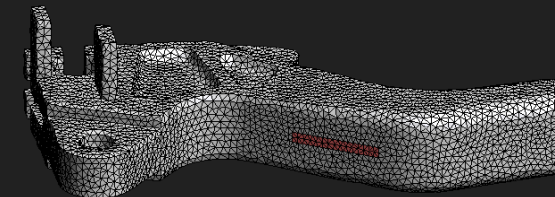
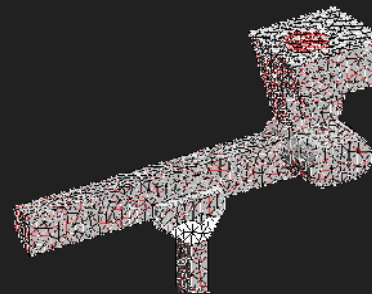
3. Parameters

4. Calculate

5. Results



- Selecting the *advanced* ingate definition the user can choose a virtual ingate introducing the height and width dimension or the radius.



- Positioning the ingate in a curved surface the ingate will be projected over the surface..
- The ingate can not overstep the limits of geometry and can not overlap to a sharp edge.



Five simple steps



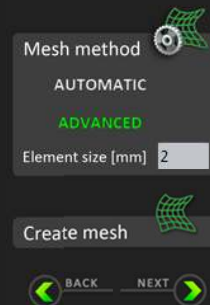
1. Geometry

2. Mesh

3. Parameters

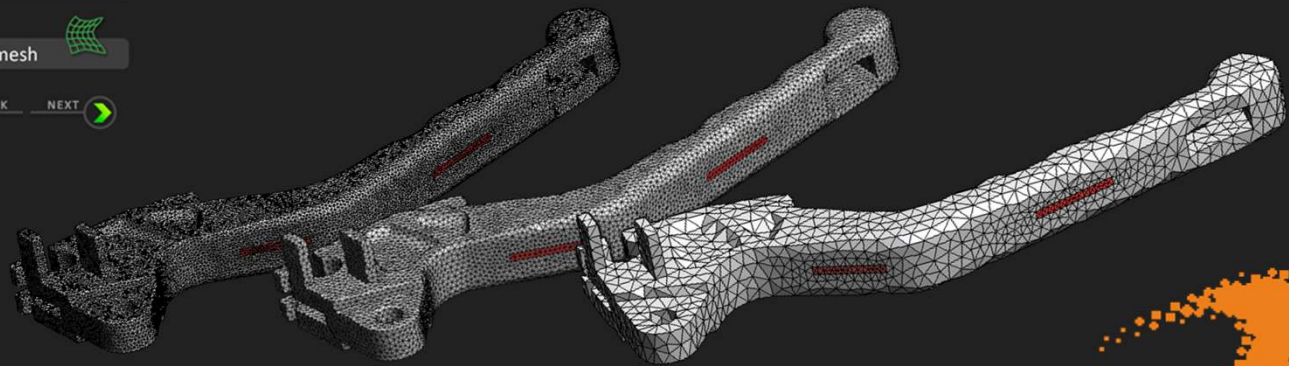
4. Calculate

5. Results



Mesh Generation.

Depending the element size value selected, the mesh will be more accurate.



If the element size is higher than the thickness of the part, the geometry will be distorted, even to not be able to generate the mesh. In this case, reduce the element size and mesh again.

Five simple steps

GEOMETRY MESH **PARAMETERS** CALCULATE RESULTS REPORT


1. Geometry

2. Mesh

3. Parameters

4. Calculate


5. Results

Part Material 

Group Aluminium


Type AlSi7Mg

Temperature [°C] 700

Mold Material 

Steel-X40CrMoV5-m


Temperature [°C] 150

Process params 

Gravity direction X

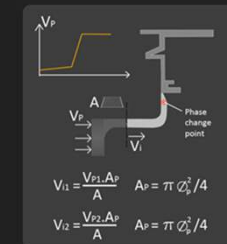
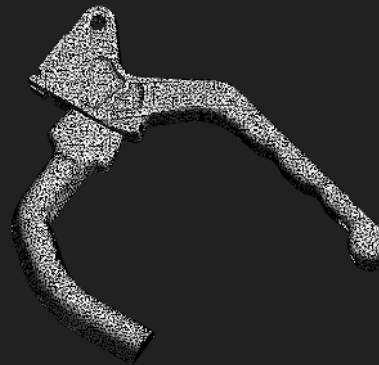
1st Velocity [m/s] 20

2nd Velocity [m/s] 40

Velocity phase change point 

2 Phases velocity ☒

Once the mesh was done, set the process parameters. Select the part material, alloy and temperature for the part and mold.



In case of HP-DC process, set first and second phase velocity and select a node to change phase.



Five simple steps

GEOMETRY MESH **PARAMETERS** CALCULATE RESULTS REPORT


1. Geometry

2. Mesh

3. Parameters

4. Calculate


5. Results

Part Material 

Group Aluminium


Type AlSi7Mg

Temperature [°C] 700

Mold Material 

Steel-X40CrMoV5-m

Temperature [°C] 150


Process params 

Gravity direction X

Rot. Time [sec] 10.0

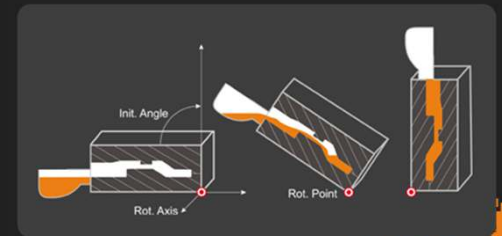
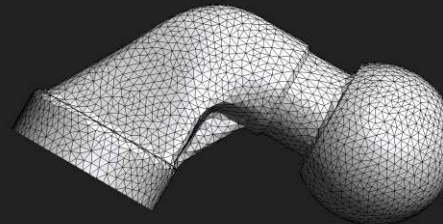
Initial Angle [°] -40.0

Global Axis X Y Z

Rotation Point 

Tilt Pouring ☒

Once the mesh was done, set the process parameters. Select the part material, alloy and temperature for the part and mold.



In case of TiltPouring process, set Initial Angle, Rotation time and rotation axis.

Five simple steps



1. Geometry

2. Mesh

3. Parameters

4. Calculate

5. Results

Part Material

Group: Aluminium

Type: AlSi7Mg

Temperature [°C]: 700

Mold Material

Steel-X40CrMoV5-m

Temperature [°C]: 150

Process params

Gravity direction: X

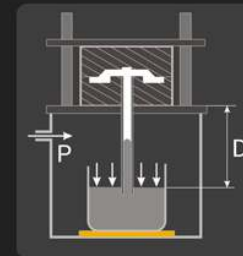
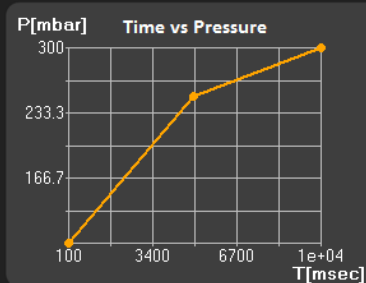
Distance [mm]: 150.0

Pressure Curve

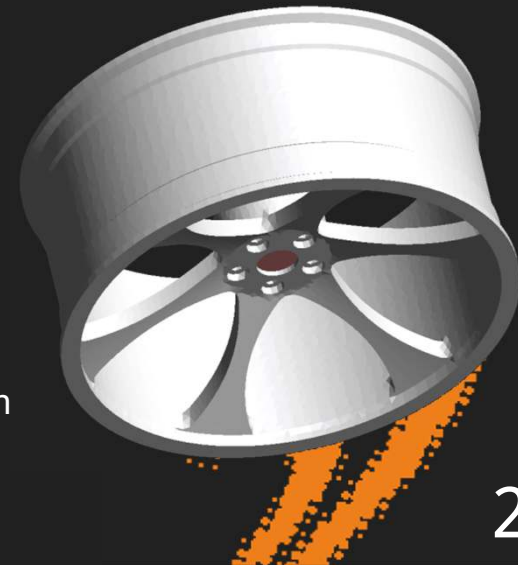
T [msec]	P [mbar]
100.0	100.0
5000.0	250.0
10000.0	300.0

Low Pressure

Once the mesh was done, set the process parameters. Select the part material, alloy and temperature for the part and mold.



increase or decrease the pressure curve and other parameters that concern the process.



Five simple steps



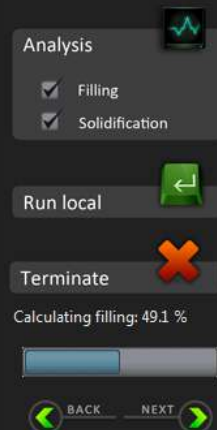
1. Geometry

2. Mesh

3. Parameters

4. Calculate

5. Results



The filling and solidification calculation can be done both together.

Once the calculation reaches 1% it's possible to go to next step and check the results.

If only solidification calculation has been done the starting temperature will be equal in all the part.

If the filling calculation was performed previously, the temperature distribution at the end of the filling will be used as starting point for solidification analysis.



Five simple steps



1. Geometry

2. Mesh

3. Parameters

4. Calculate

5. Results

Front flow



Temperature



Velocities



Cold shuts



Air entrap.



Mold erosion



Filling time

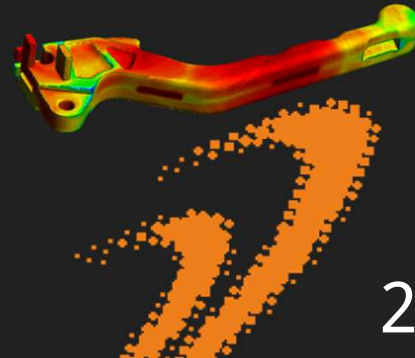


Solid Fraction



Front flow shows the filling material evolution. This visualization gives a preliminary idea of the filling time, and the way the part is filled..

Temperature evolution results shows the evolution of temperatures during filling. This animations helps to better understand the heat lost during the filling.



Five simple steps



1. Geometry

2. Mesh

3. Parameters

4. Calculate

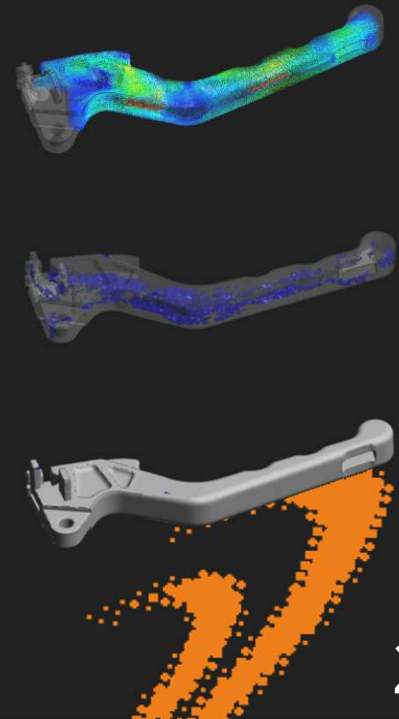
5. Results



Shows the vectors representation of the velocities.

Shows the front encounter of material during the filling evolution. Blue color shows the areas where exists the front encounter of material.

Shows the last areas to fill the part and his air entrapment during the evolution of filling.



Five simple steps



1. Geometry

2. Mesh

3. Parameters

4. Calculate

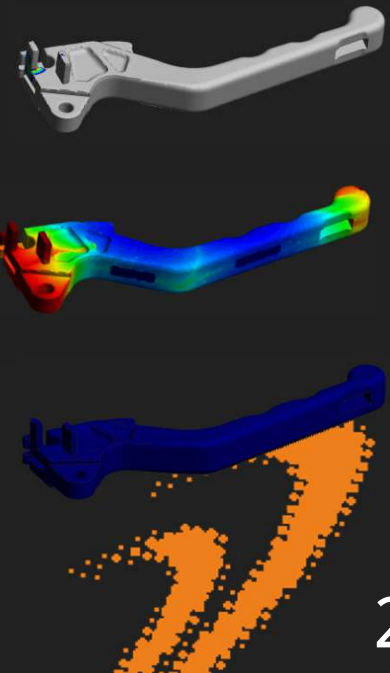
5. Results



Mold erosion shows the areas with velocities exceeding 35 m/s, and with high probability of mold erosion problems during the evolution of filling.

Shows the filling time of the different areas of the part.

Predict if there are some areas solidified during the filling.



Five simple steps



1. Geometry

2. Mesh

3. Parameters

4. Calculate

5. Results

Temperature



Shows the temperature evolution during the solidification.

Solid Fraction



Shows the evolution of the solidification. The material that solidifies will disappear from the animation and liquid material will be represented in red color.

Solidif. times



Shrinkage P.



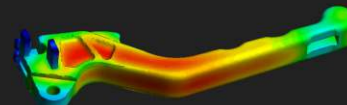
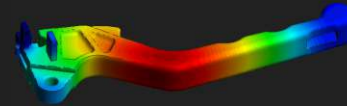
Solid. Modulus



Riser Designer



Shows the time that takes any area of the part to solidify.



Five simple steps

GEOMETRY MESH PARAMETERS CALCULATE RESULTS REPORT

1. Geometry

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Temperature

Solid Fraction

Solidif. times

Shrinkage P.

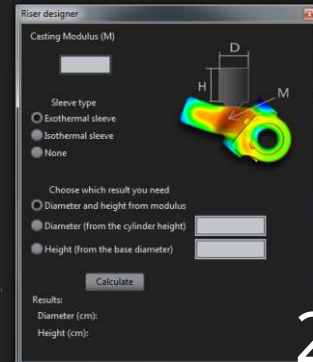
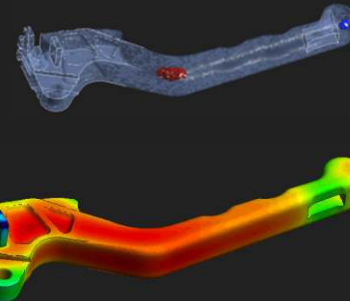
Solid. Modulus

Riser Designer

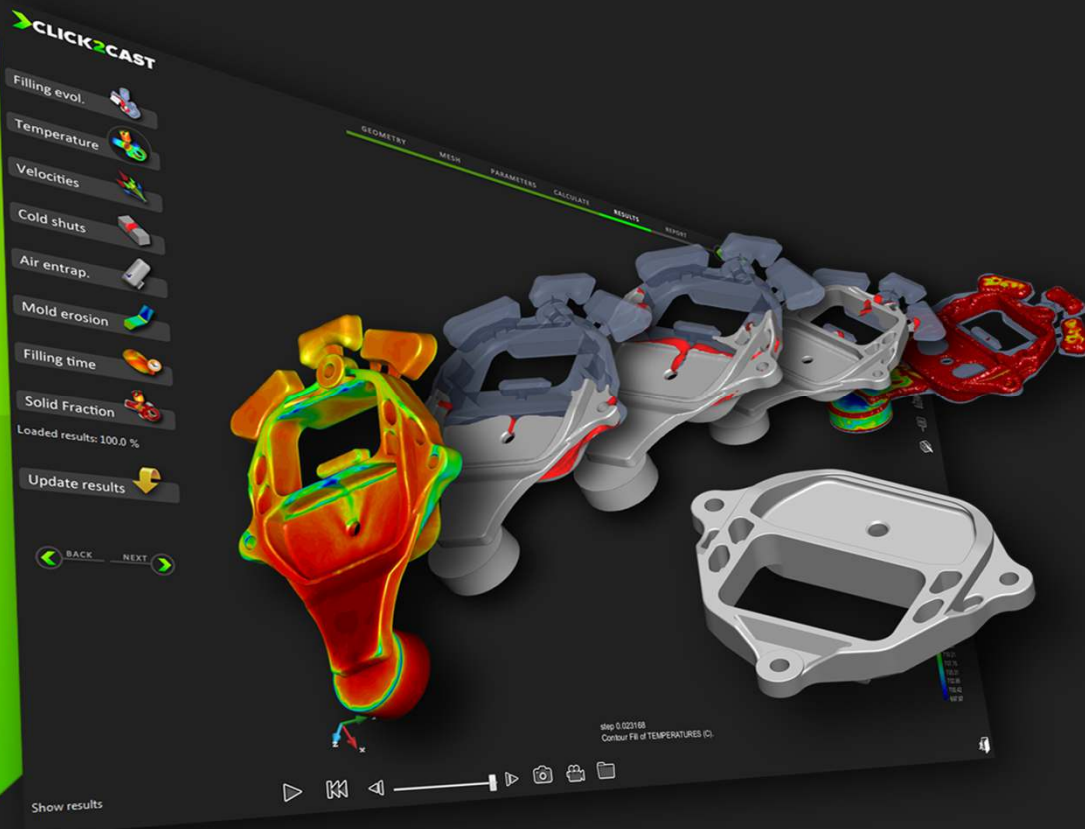
Shows the shrinkage porosity percentage in volume over the total volume of the part.

Solidification Modulus (Volume-to-area ratio. To use in the riser designer wizard.

Helps to calculate an optimal riser. Introducing the casting modulus (meters) we can calculate the required riser for the part.



KEY Features

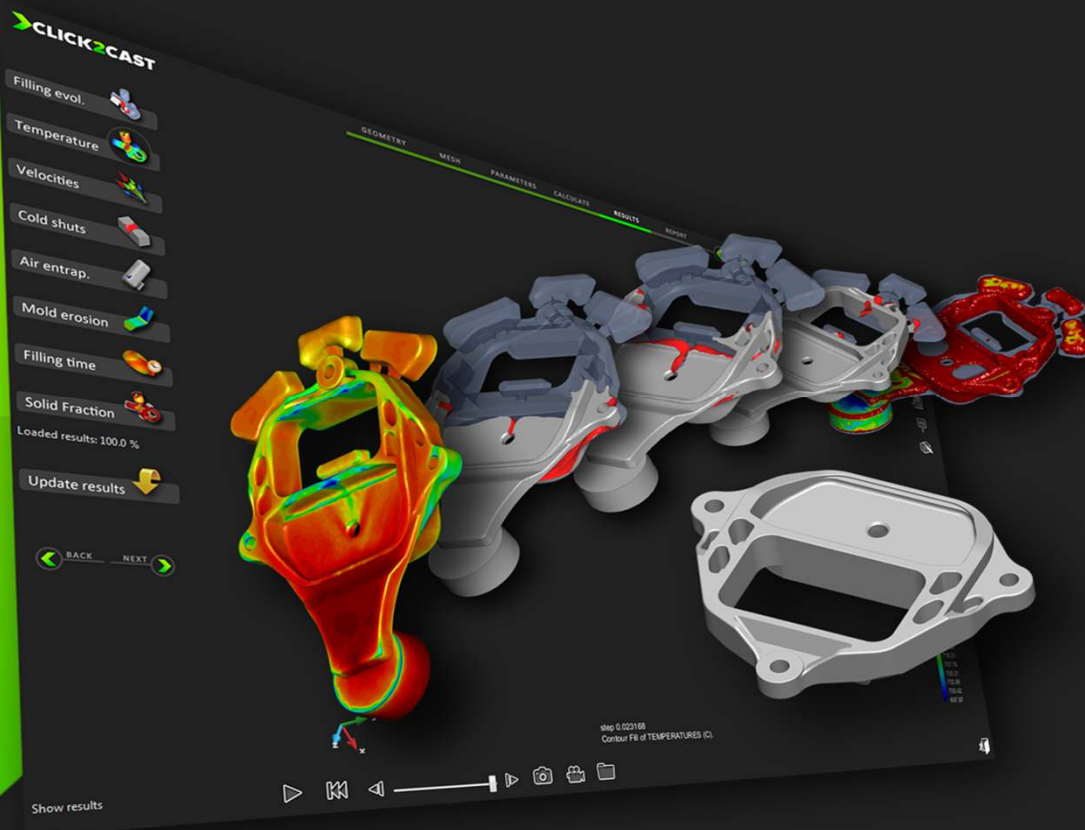


KEY Features

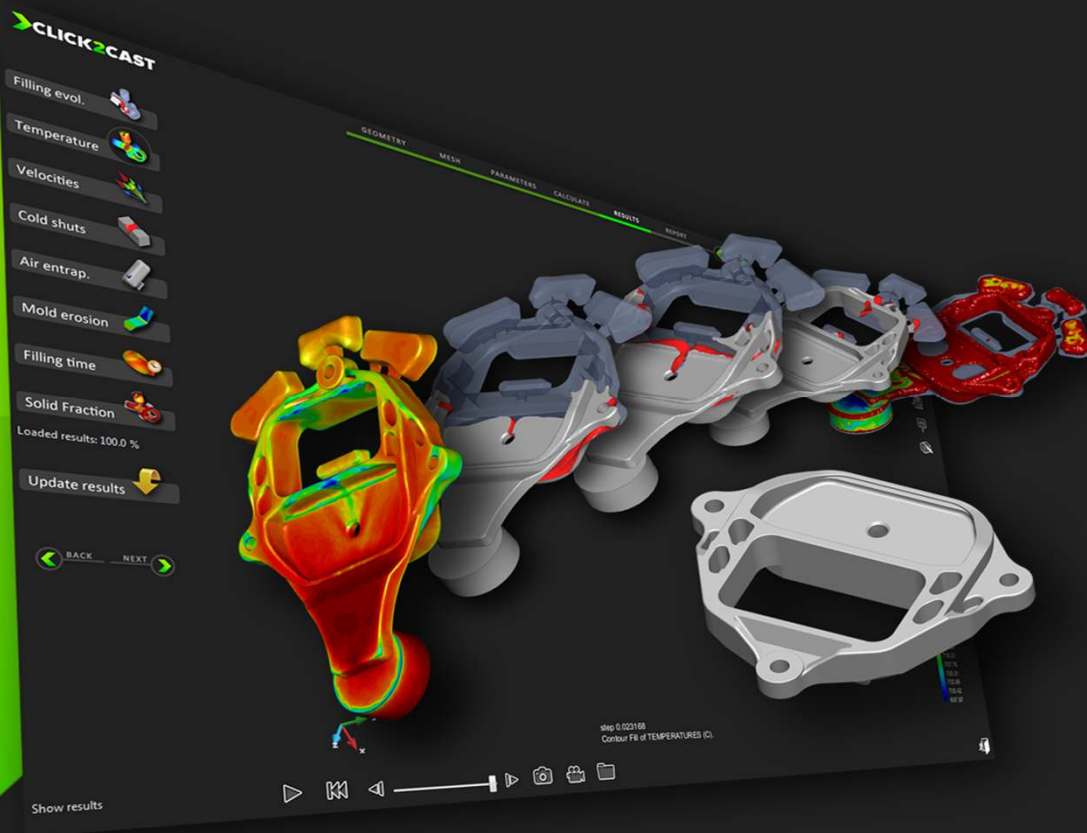
- C2C is a truly friendly interface simulation software for Casting process
- Simplicity and ease of use.
- Accurate results due to the powerful FEM solvers.
- Allow the users to test different mold design possibilities by very few intuitive button clicks



Live Demo



Q&A Session



For more info please visit
www.click2cast.com

