

INGOT

Ingot Casting

What Are You Looking For ?

Shrinkage 1 Shrinkage Prediction Trace Isolated Liquid Center Crack Prediction	Exothermic 2 Evaluation of Exothermic Powder Exothermic Powder	Alloys 2 Alloy Composition
Segregation 3 Segregation Prediction Natural Convection Segregation Reducing Evaluation	Add Pouring 4 Additional Pouring Process Evaluation of Additional Pouring	Inclusion 5 Oxide & Slag Inclusion Gas Amount
Management 6 Gating Design for Ingot Tonnage Mold Design for Ingot Tonnage	Speed 7 Fast Ingot Solver Auto Mesh Auto Report Real Post on PowerPoint	Miscellaneous 8 Result Combination Material Database

How Ingot Casting Simulation ?

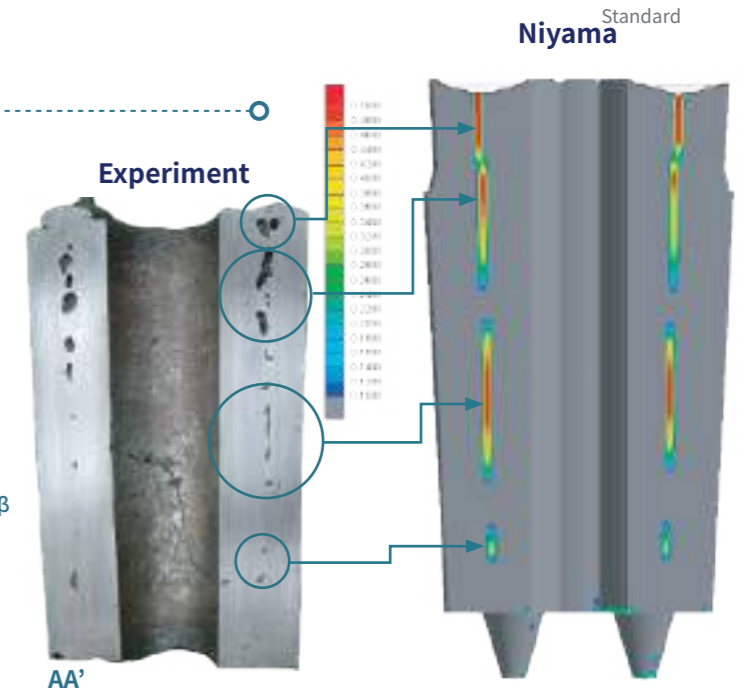
- Shrinkage Analysis :** ★★★★★
 check composition, fraction of solid for data, shrinkage position / size, exothermic powder condition, check various types of segregation
- Filling & Gas Analysis :** ★★★★★
 check oxide / slag inclusions, gas amount, additional pouring condition, manage gating / mold design for ingot tonnage
- Stress Analysis :** ★★★
 check residual stress, check & compare crack possibility / positions, cast deformation
- Work Efficiency :** ★★
 use fast ingot solver, auto report, real post on powerpoint, mesh quality check

The Shrinkage

Shrinkage Prediction

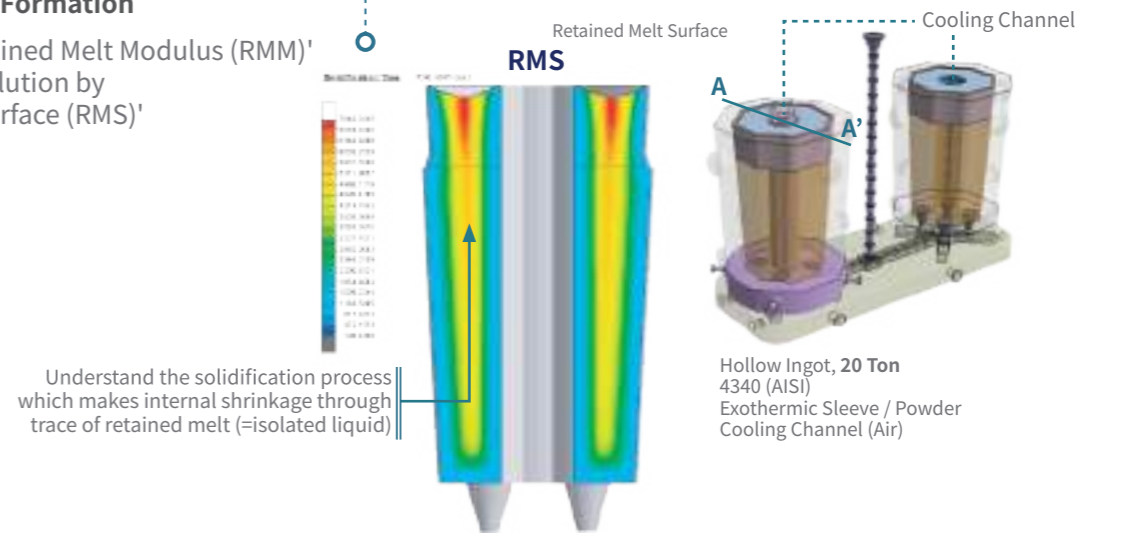
Predict it using a Shrinkage Model
 choose a more accurate shrinkage model (Niyama, M-Niyama, Feeding Eff.)
 optimize shrinkage parameters (G, R, V and a, b, c)

- 1 **Niyama** : $(G^a / R^b)^c$ a=1.0, b=0.5, c=1.0
- 2 **Modified Niyama** : $(G^a / R^b)^c$ a=1.0, b=0.5±α, c=1.0±β
- 3 **Feeding Efficiency** : $(G^a / V^b)^c$ a=1.0, b=1.0±α, c=1.0±β



Trace Isolated Liquid

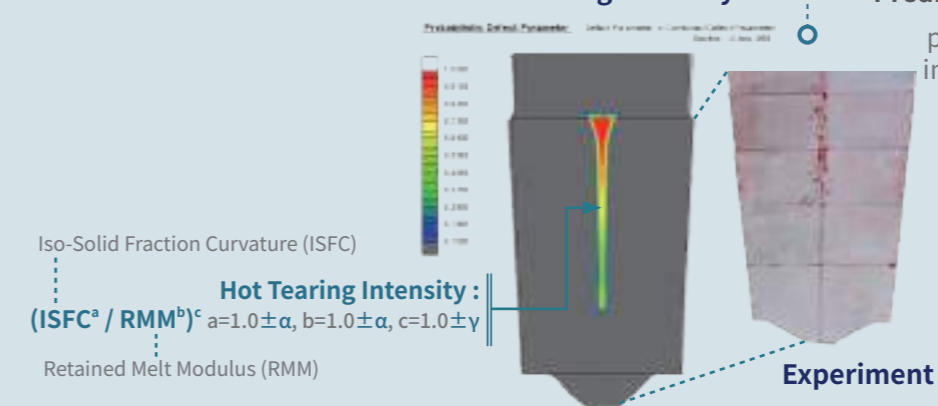
Trace Shrinkage Formation
 monitor the 'Retained Melt Modulus (RMM)'
 check better resolution by 'Retained Melt Surface (RMS)'



Understand the solidification process which makes internal shrinkage through trace of retained melt (=isolated liquid)

Hot Tearing Intensity

Center Crack Prediction



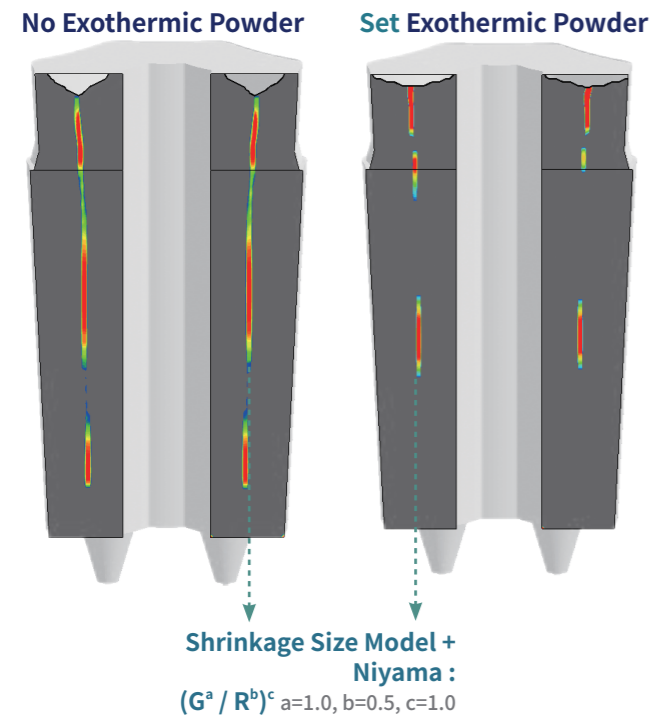
Predict It using Hot Tearing Intensity
 predict center line crack in various ingots using 'Hot Tearing Intensity'
 optimize hot tearing parameters (ISFC, RMM and a, b, c)

Hot Tearing Intensity : $(ISFC^a / RMM^b)^c$ a=1.0±α, b=1.0±α, c=1.0±γ

The Exothermic

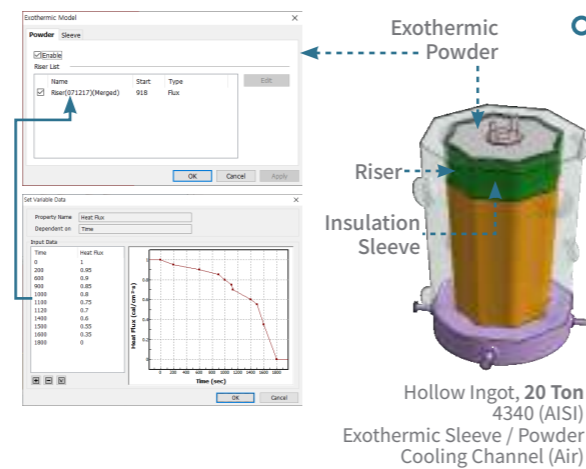
Evaluation of Exothermic Powder | Evaluate Exothermic Powder by Shrinkage Model

AnyCasting can optimize exothermic layer's thickness, type, conditions
quantitative comparison of 'Exothermic Powder Models'



Exothermic Powder | Enhance Riser Feeding by using Exothermic Powder

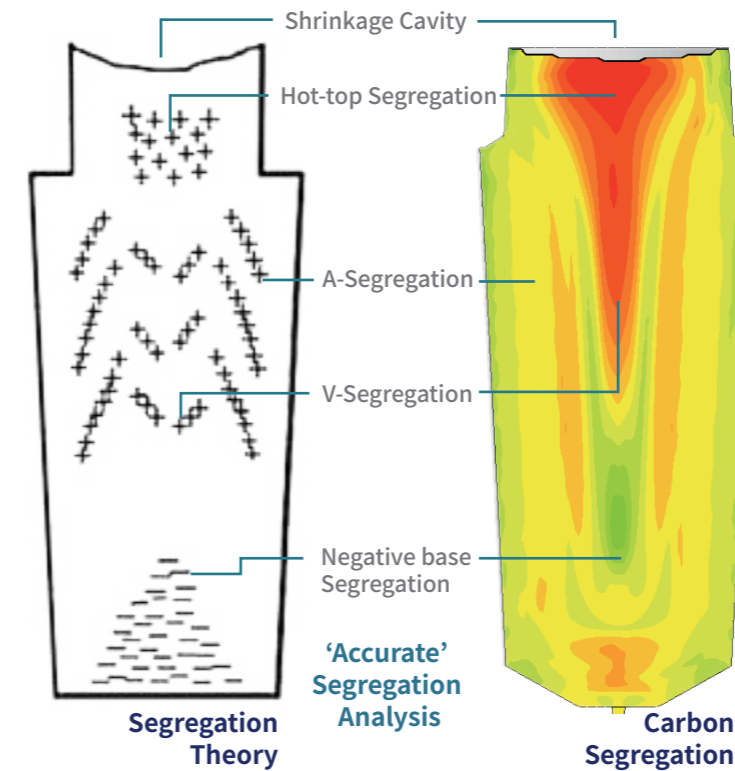
install 3D CAD model is not needed for 'Exothermic Powder' on top of riser
set exothermic conditions: ignition time, heat flux by time, etc.



The Segregation

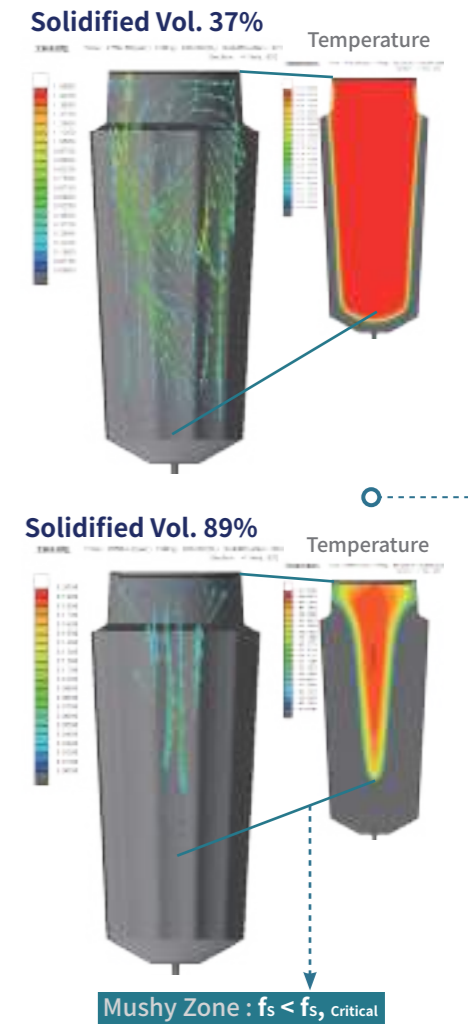
Segregation Prediction | Predict Segregation of Major Components

calculate diffusion of components & natural convection in mushy zone
predict 'Segregation' of major components (C, P, S, Mn) all at once



Natural Convection | Consider Natural Convection during Solidification

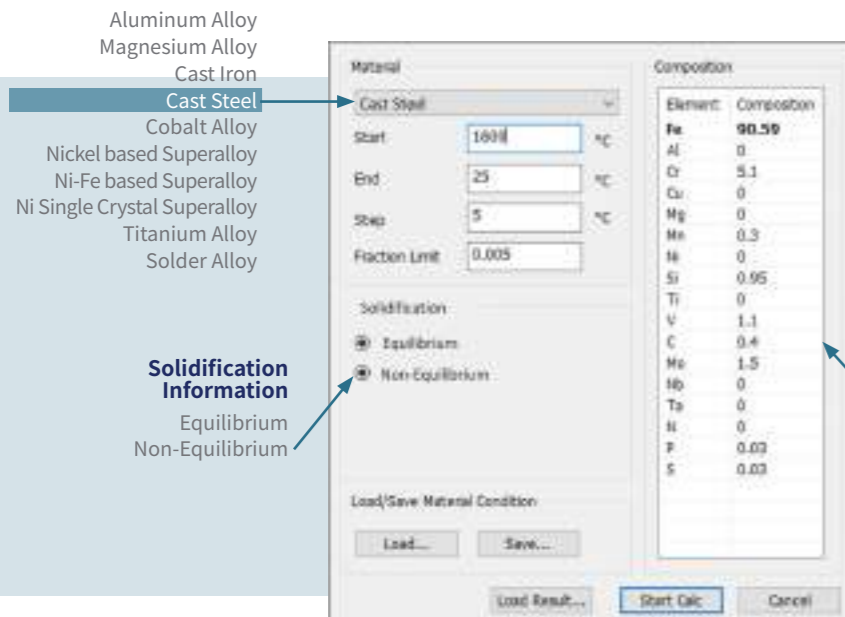
calculate natural convection in mushy zone during & after 100% filling
it changes composition in mushy zone and accelerate segregation



The Alloys

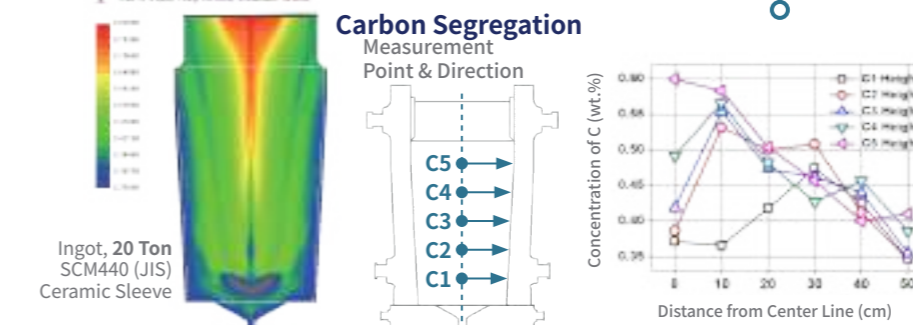
Alloy Composition | Make Your Own Alloy with Your Composition

property optimization using composition & phase transformation info.
predict shrinkage, phase & mechanical properties according to composition



Segregation Reducing Evaluation | AnyCasting can evaluate Segregation reducing Methods

calculate diffusion of components & natural convection in mushy zone
predict 'Segregation' of all major components (C, P, S, Mn) all at once



The Add Pouring

Additional Pouring Process
Additional Pouring for Two Purposes

add pouring to decrease segregation and shrinkage
optimize pouring temperature, time, composition (C, P, S, Mn)

- 1 Temperature
- 2 Time
- 3 Composition

1st Pouring

Additional Pouring
2nd Pouring

Ingots, 510 Ton
3.4NiCrMoV (DIN)
Exothermic Sleeve / Powder

Additional Pouring Condition

General

TIME: 1200 SEC

MATERIAL

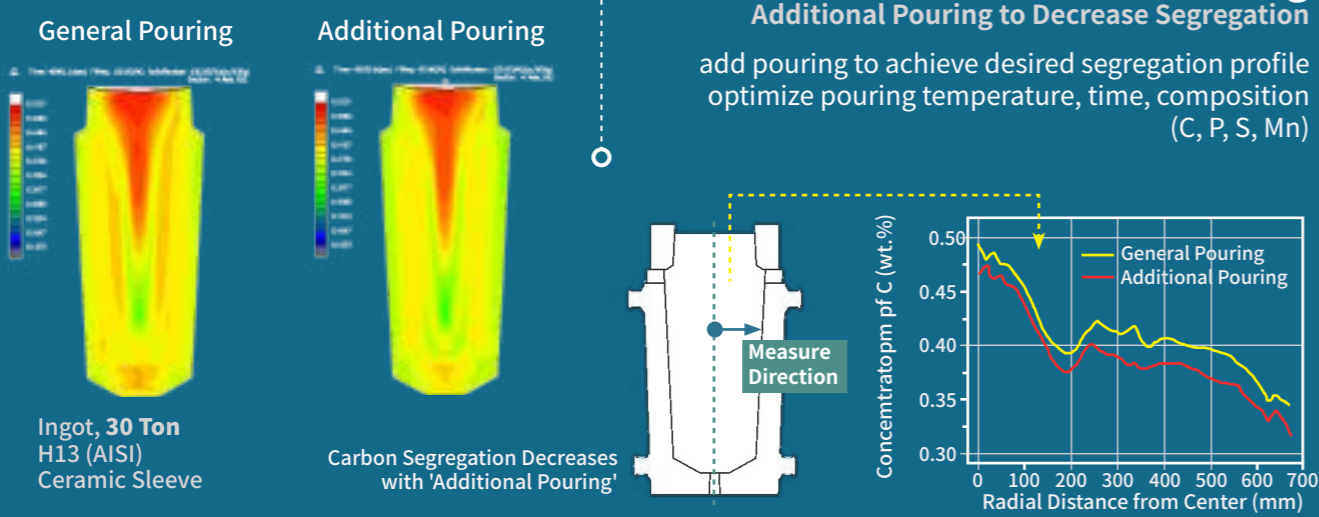
Soluble concentration is changed.

No.	Name	CB	CI
1	C	0.14	0.22
2	Mn	0.25	0.25

Evaluation of Additional Pouring

Additional Pouring to Decrease Segregation

add pouring to achieve desired segregation profile
optimize pouring temperature, time, composition (C, P, S, Mn)



The Inclusion

Oxide & Slag Inclusion

Trace Oxide & Slag Inclusion during Filling

analyze the path of 'Oxide & Slag Inclusions'
modify pouring & lining conditions to reduce defects

Oxide & Slag Distribution during Filling

Ingots, 45 Ton
SCM440 (JIS)
Ceramic Sleeve

G42CrMo4 Steel
Nonmetallic Inclusions arise due to Reactions during the Melting Process

Gas Amount

Tracing of Gas Amount during Filling

AnyCasting can quantitatively compare pouring conditions based on 'Gas Amount'
check the location & reason of gas entrapment

Gas Amount Distribution during Filling

Whole Gating System

Center Cooling

Hollow Ingots, 20 Ton
4340 (AISI)
Exothermic Sleeve / Powder
Cooling Channel (Air)

Min. Gas Amount	=	2.55533 cc
Max. Gas Amount	=	46.0441 cc
Avg. Gas Amount	=	13.5880 cc
Standard Deviation	=	0.93420 cc

(Unit : cc/100g)

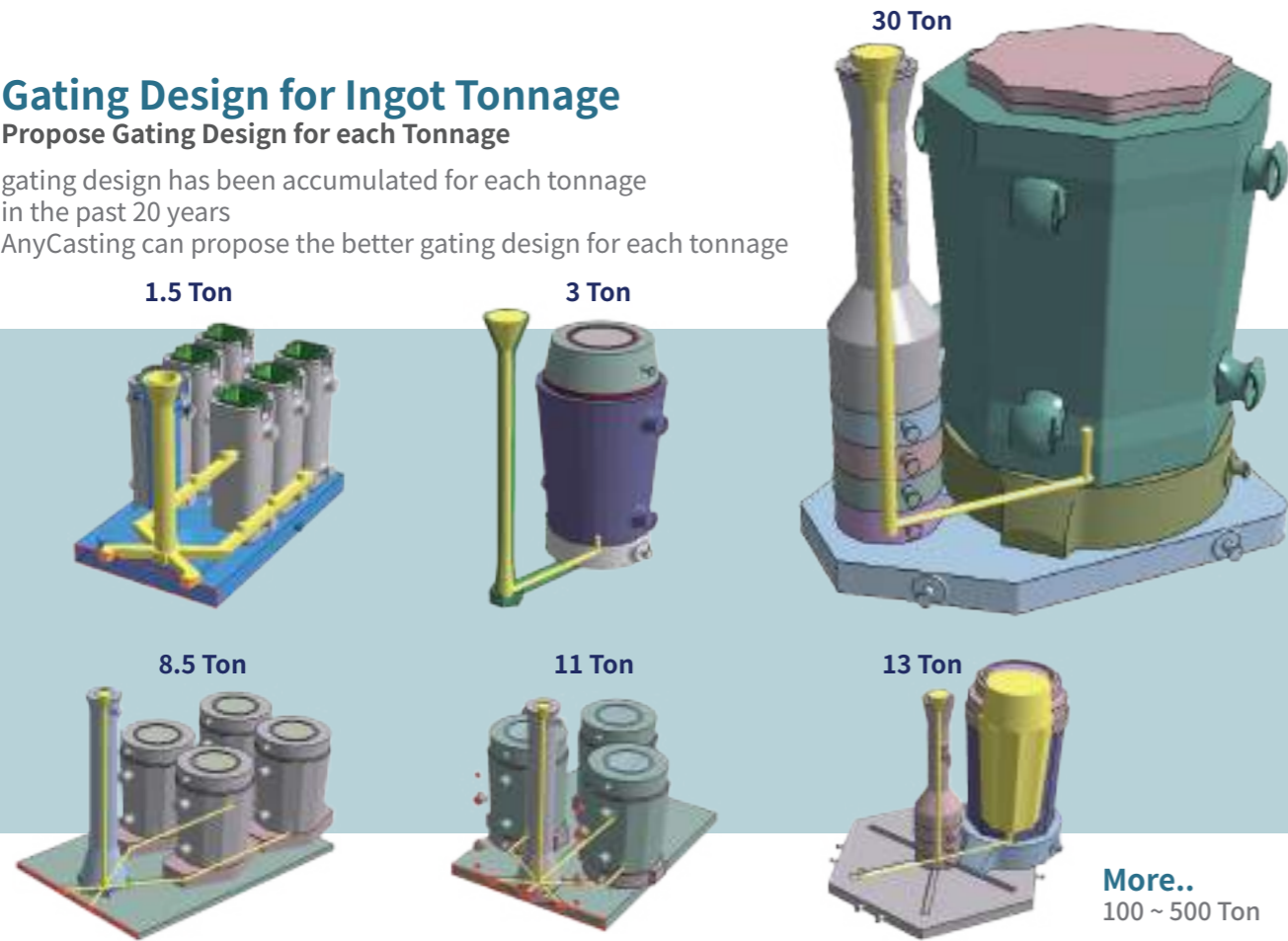
Quantitative Analysis

The Management

Gating Design for Ingot Tonnage

Propose Gating Design for each Tonnage

gating design has been accumulated for each tonnage in the past 20 years
AnyCasting can propose the better gating design for each tonnage



Mold Design for Ingot Tonnage

Propose Mold Design for each Tonnage

mold design has been accumulated for each tonnage in the past 20 years
AnyCasting can propose the better mold design for each tonnage



The Speed

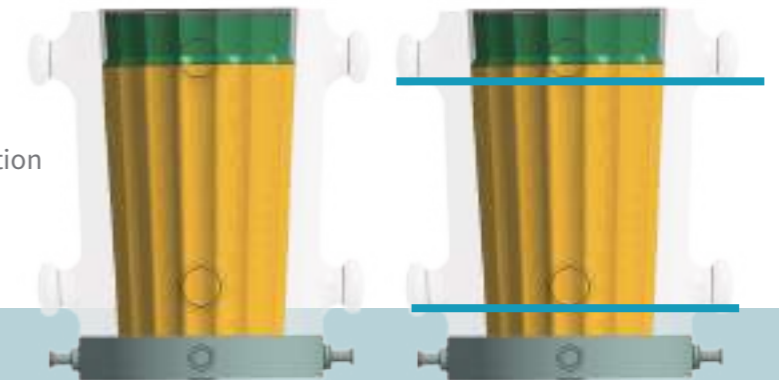
Fast Ingot Solver

Dramatically Decrease Calculation Time

over 100 ton large ingot with over 2 mill. mesh & 30 min. filling time
'Fast Ingot Solver' dramatically saves calculation time up to 10 times more than usual

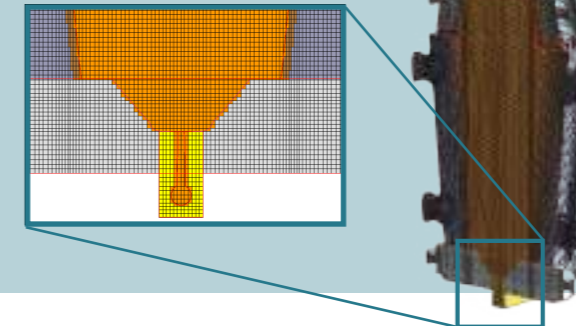


Too much of a Small Gate for such a Large Ingot

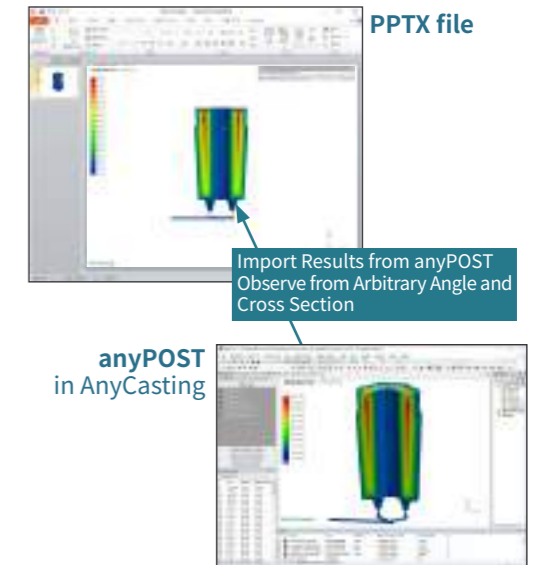
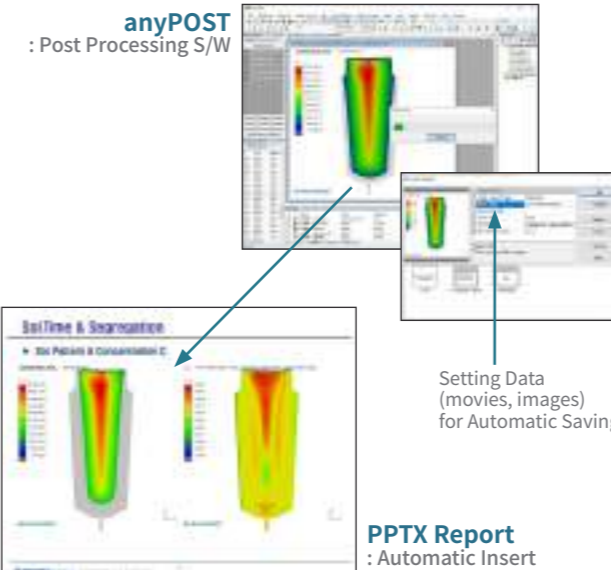


General Solver
30 Days
Filling & Solidification

Fast Ingot Solver
2.5 Days
Filling & Solidification



Auto Mesh
3-Click is Enough for Mesh Generation
find the best meshing condition automatically (dramatically save human time)
check thin-sectioned areas automatically



Auto Report

Make PowerPoint Report more Efficiently & Quickly

AnyCasting can save anyPOST results automatically for PowerPoint in anyPOST
set what results to be saved automatically

Real Post on PowerPoint

You can do Post Processing on PowerPoint File

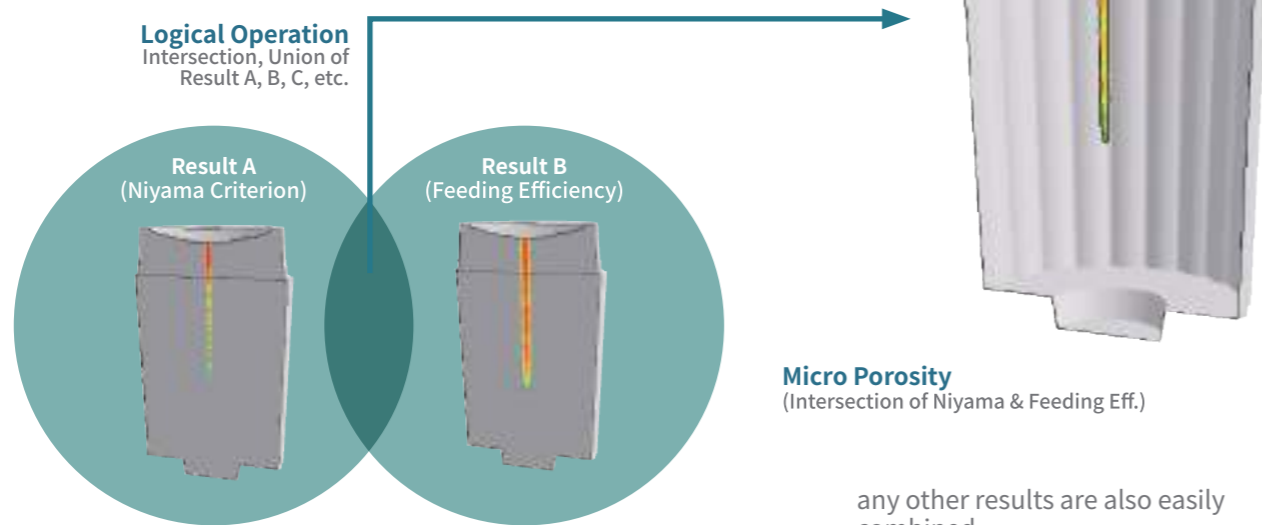
observe results from various angles / cross sections without running anyPOST
enhance efficiency of reporting and sharing simulation results

The Miscellaneous

Result Combination

Make Your Own Combination for better Observation

multi-results can be combined and analyzed using logical operations
AnyCasting can make a new combination to observe the best results



any other results are also easily combined

Material Database

Make Your Own Material DB for Accuracy

General Database : provides 600 alloys, freely modify & make user DB
Alloy Composition : thermodynamically calculation, phase information

General Database



Alloy Composition



User DB
Save / Load
Apply to other
Project

any alloy that has changed composition or properties can be stored in user database

The Useful Sites

World Wide

World Foundry Organization
Argentina
Australia
Austria
Belarus
Bosnia
Brazil
Bulgaria
Canada
Chile
China
Croatia
Czech
Denmark
Egypt
Euroguss, Int'l Fair for Die Casting
European Foundry Association
Finland
France
Georgia
Germany
GIFA, Int'l Foundry Trade Fair
Greece
Hungary
India
Indonesia
Iran
Italy
Japan
Korea, South
Lithuania
Malaysia
Metal & Metallurgy China
Mexico
New Zealand
Norway
Pakistan
Philippines
Poland
Portugal
Romania
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Serbia
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www.ogi.at
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www.abifa.org.br
www.bami.bg
www.mech-ing.com
www.ims.bas.bg
foundryassociation.ca
www.asimet.cl
www.foundry-china.com
www.foundrynations.com
crofoundry.simet.hr
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www.ombkenet.hu
www.indianfoundry.org
www.aplindo.web.id
www.iranfoundry.com
www.assofond.it
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www.diecasting.or.jp
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http://www.castingarea.com/societies/alf.htm
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www.mm-china.com
www.smfac.org.mx
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www.stoperi.no
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www.philmetalcasting.com
www.stowarzyszenie-stop.pl
www.apf.com.pt
www.foundry-attr.ro
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Dark Roast Sumatra Mandheling
Coffee Beans from Indonesia

Brand : Volcanica Coffee
Beans : Arabica
Origin : Sumatra, Indonesia
Type : Single origin
Tasting notes : lower acidity with a sweet, smooth body
Aroma : earthy, mossy, funky and mushroomy
Recommended brew styles : French Press and pressure brewing



Have a sweet break with a cup of coffee ...

AnyCasting

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