Comptech Rheocasting

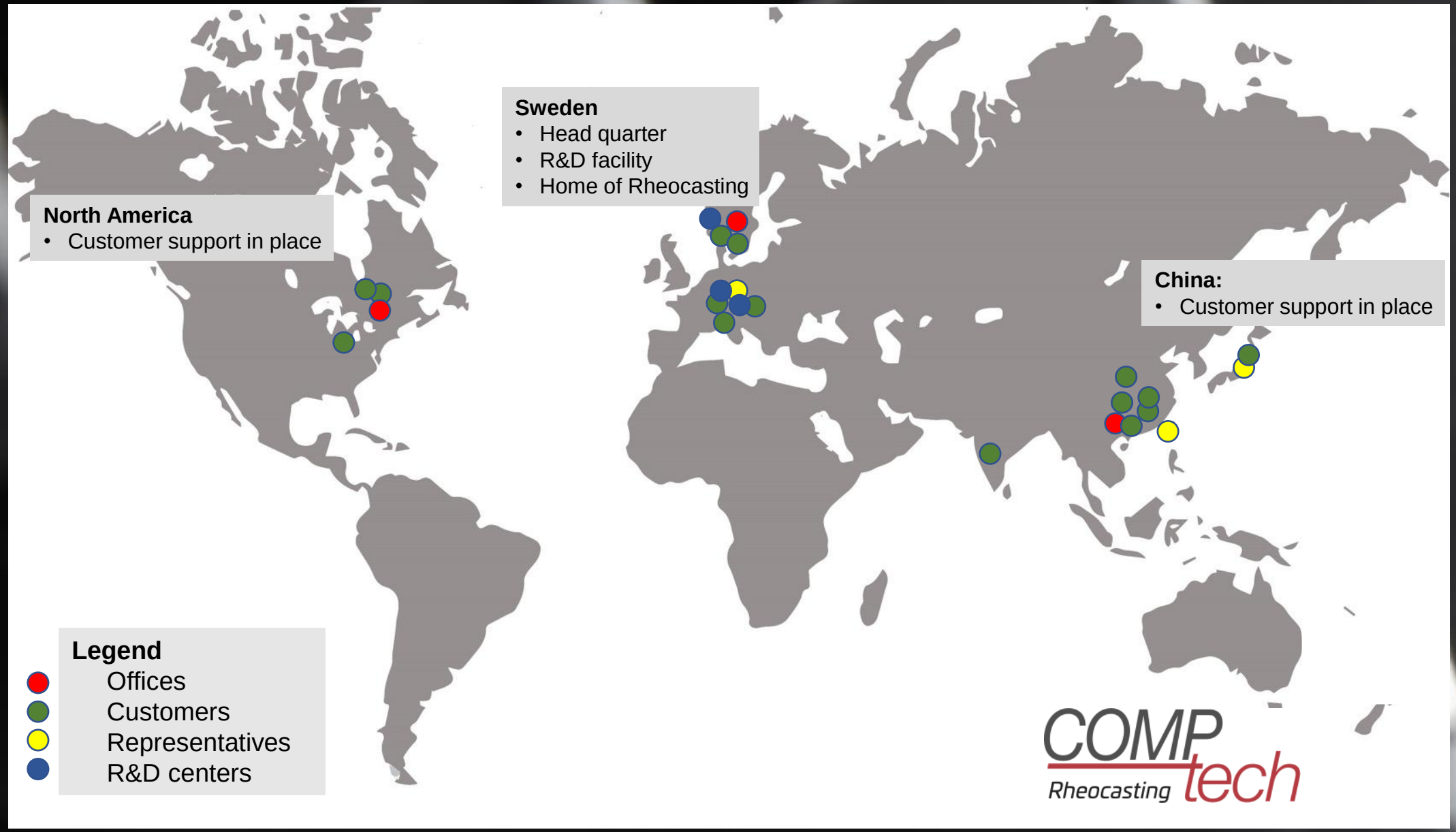
A small addition to the die casting cell…a huge step forward in casting quality, properties and possibilities.

Comptech History

Comptech where born out of former foundry Stilexo Industri AB. Stilexo have been a foundry that have been running HPDC since 1978.

1971 – Stilexo was founded
1974 – Started Production
1978 – Started with HPDC
1985 – Started subsidiary in Wales UK
1985 – First order to Ericsson to produce infrastructure components for Mobile communications systems (NMT)
1995 – Started with CNC machining
2000 – Started fully owned foundry in China
2002 – New Owners Alteams
2008 – Comptech Started, Management Buy Out.
2008 – Started to cast in Rheocasting
2011 – Foundry started in China
2016 – The factory in Skillingaryd are purchased
2019 – New business model is launched, Technology Migration Solution, sales of slurrymakers.
2020 – First order of a slurrymaker to another foundry
2021 – Fully changeover from a foundry into a technology provider and equipment producer for the foundry industry
2023 – New strategy fully implemented
2023 – Buhler invests as a minority owner

Where we are


Sweden
• Head quarter
• R&D facility
• Home of Rheocasting
North America
• Customer support in place
China:
• Customer support in place
Legend
Offices
Customers
Representatives
R&D centers
COMP tech
Rheocasting

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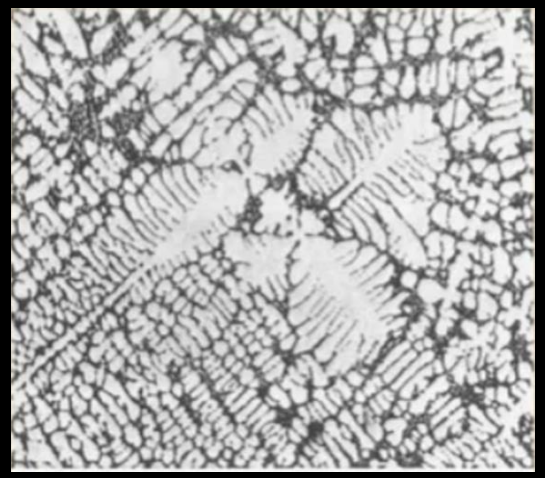
Rheocasting

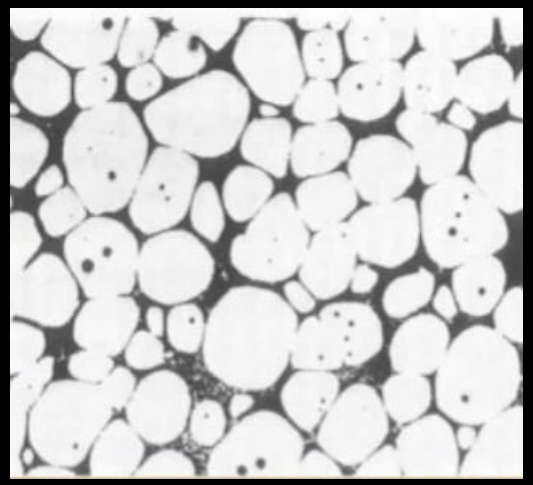
What is Rheocasting?

Melt preparation step before conventional HPDC process which changes a dendritic microstructure to a globular.

Dendritic

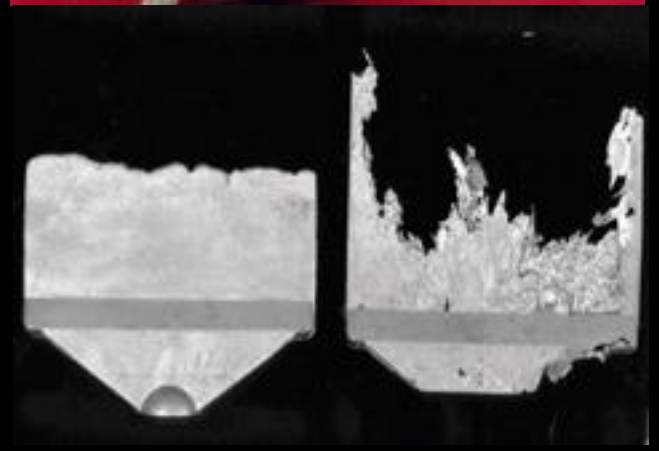


Globular

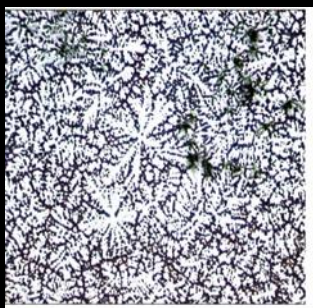


Why Rheocasting?

- Provides laminar flow no with no turbulence and therefore almost gas porosity.
- Lower metal temperature gives less shrinkage related porosity.
- Excellent castability with longer flow length and feeding capacity.
- Lower metal temperature gives extended die life due to less soldering and heat checking.
- Heat treatable and weldable.
- Offers new opportunities for part quality/properties/applications.
- Both very large castings and extremely thin sections can easily be cast.
- Significantly reduced DCM size possible.
- Ability to cast many difficult/impossible alloys (anything but eutectic) gives opportunities for excellent and tailored properties for improved functionality.
- High freezing rate allows higher Fe content than PM/Sand casting and therefore higher recycling content.



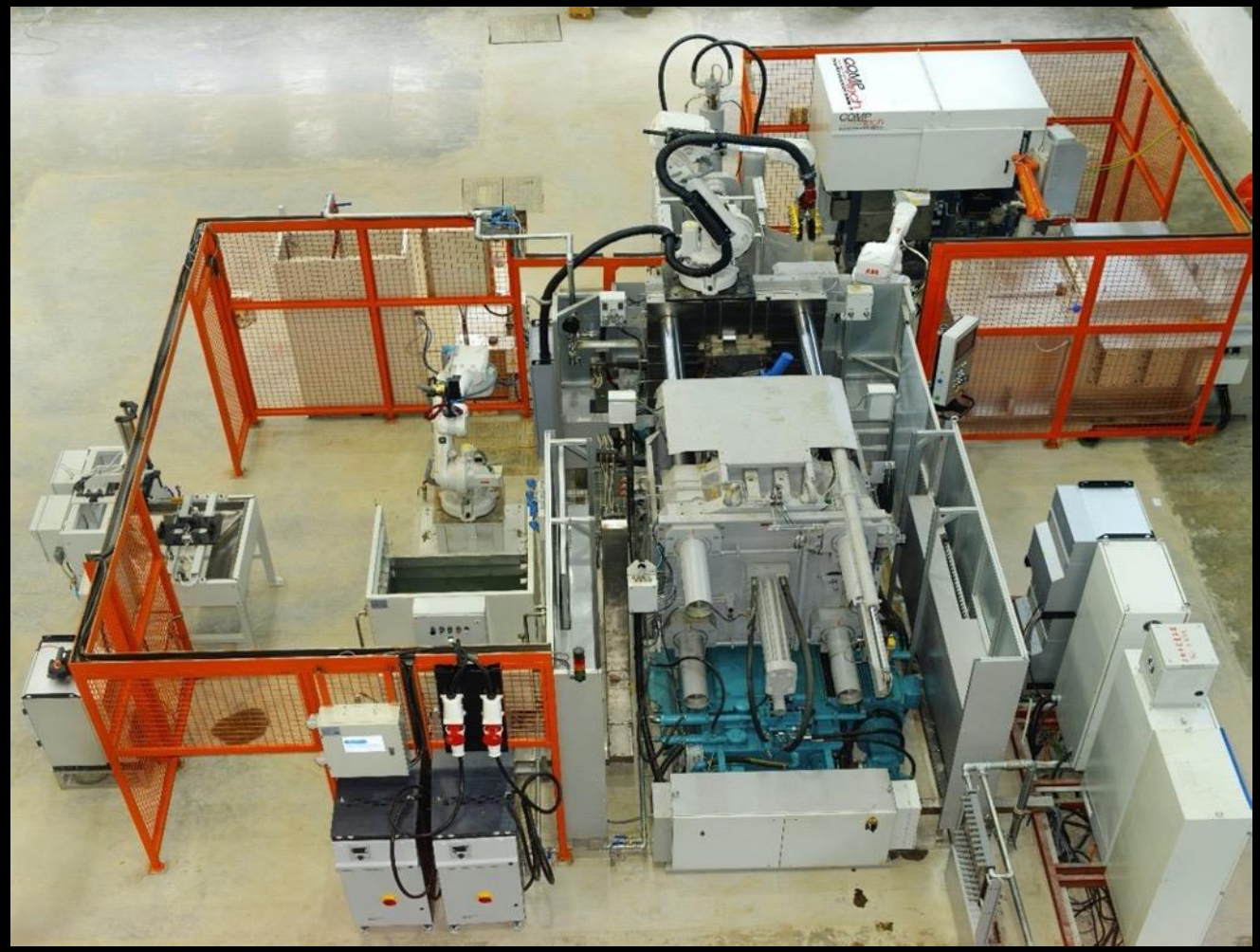
Slurry: Non-dendritic shear strength of about **0.2 kPa** at fs=40%



HPDC: Dendritic shear strength of about **200 kPa** at fs=40%

COMP Rheocasting tech

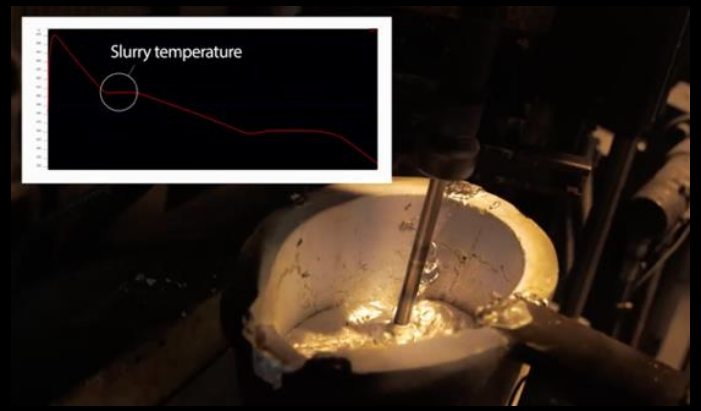
Our Product - Slurrymaker

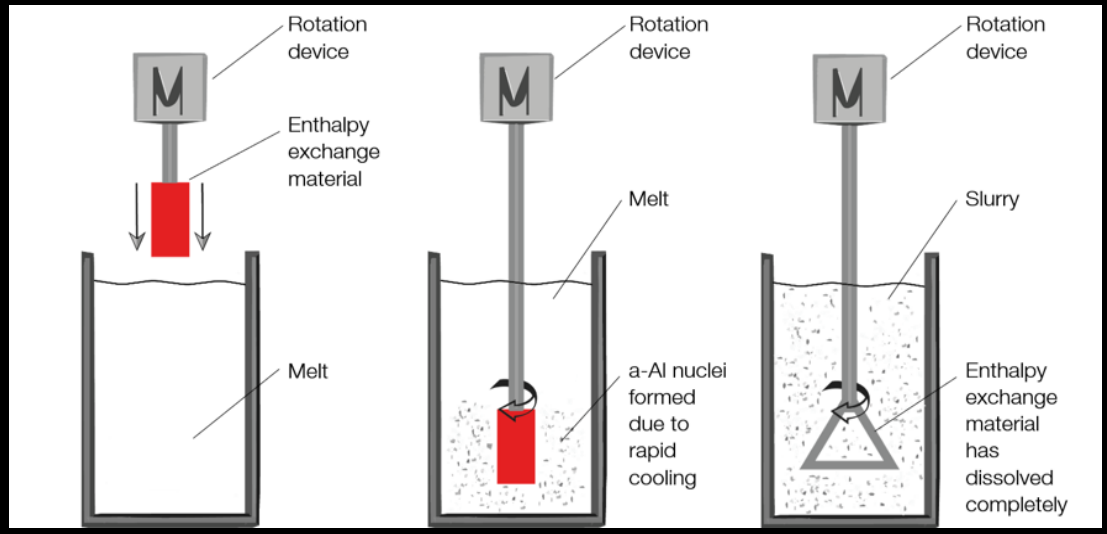


Why Comptech process?

- Simple process using a carousel to create an EEM (Enthalpy Equilibration Material) that is carefully stirred in the liquid metal of the dosing ladle, creating the semi-solid slurry.
- Very high slurry quality with absolutely a minimum of oxide inclusions.
- Solid fraction can be tailored (15-45%).
- Cost-efficient process (minimum addition to conventional HPDC process, significant increase in machine capability of HPDC cell) with small footprint for additional equipment.

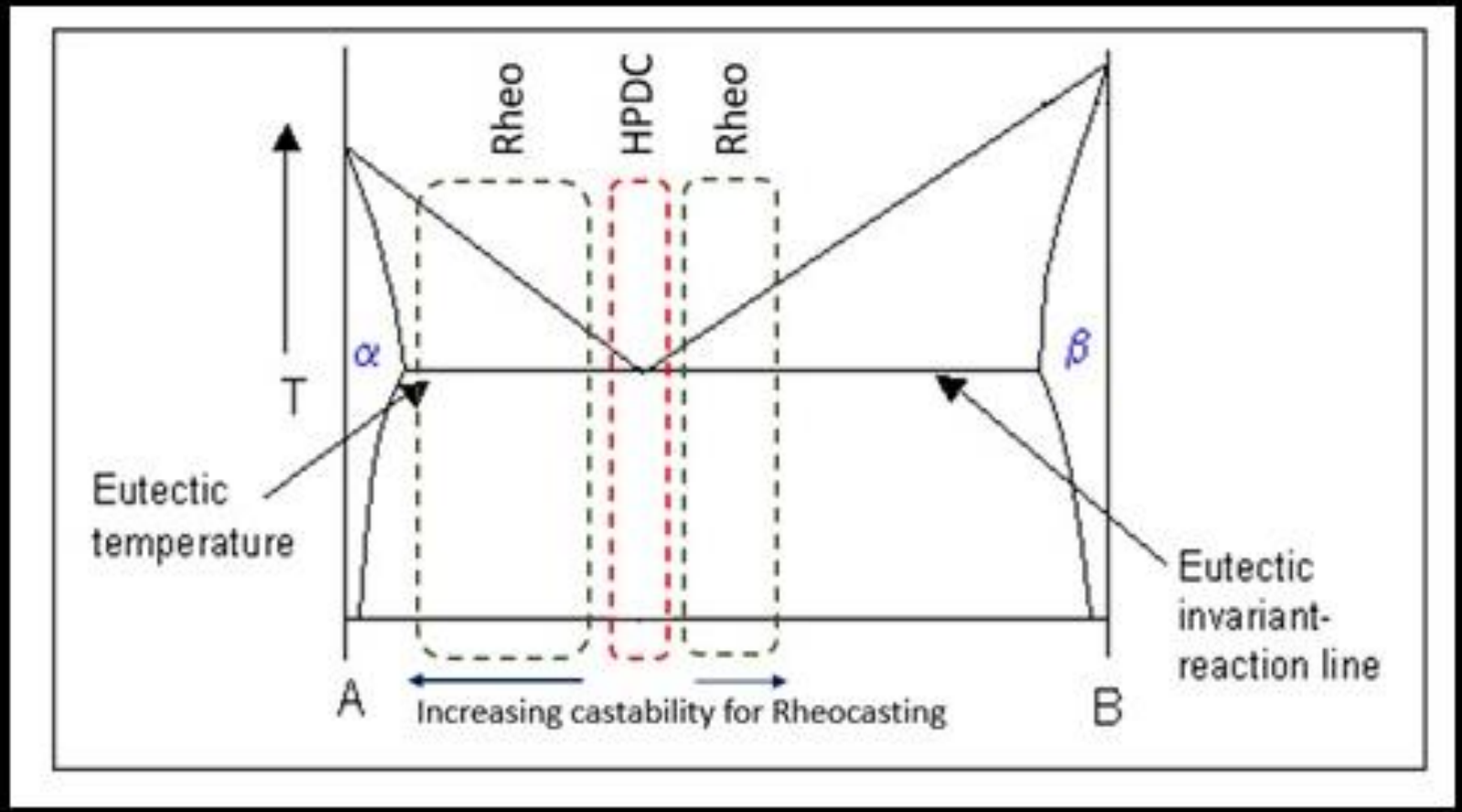
- Production movie





COMP Rheocasting tech

Alloys for Rheocasting

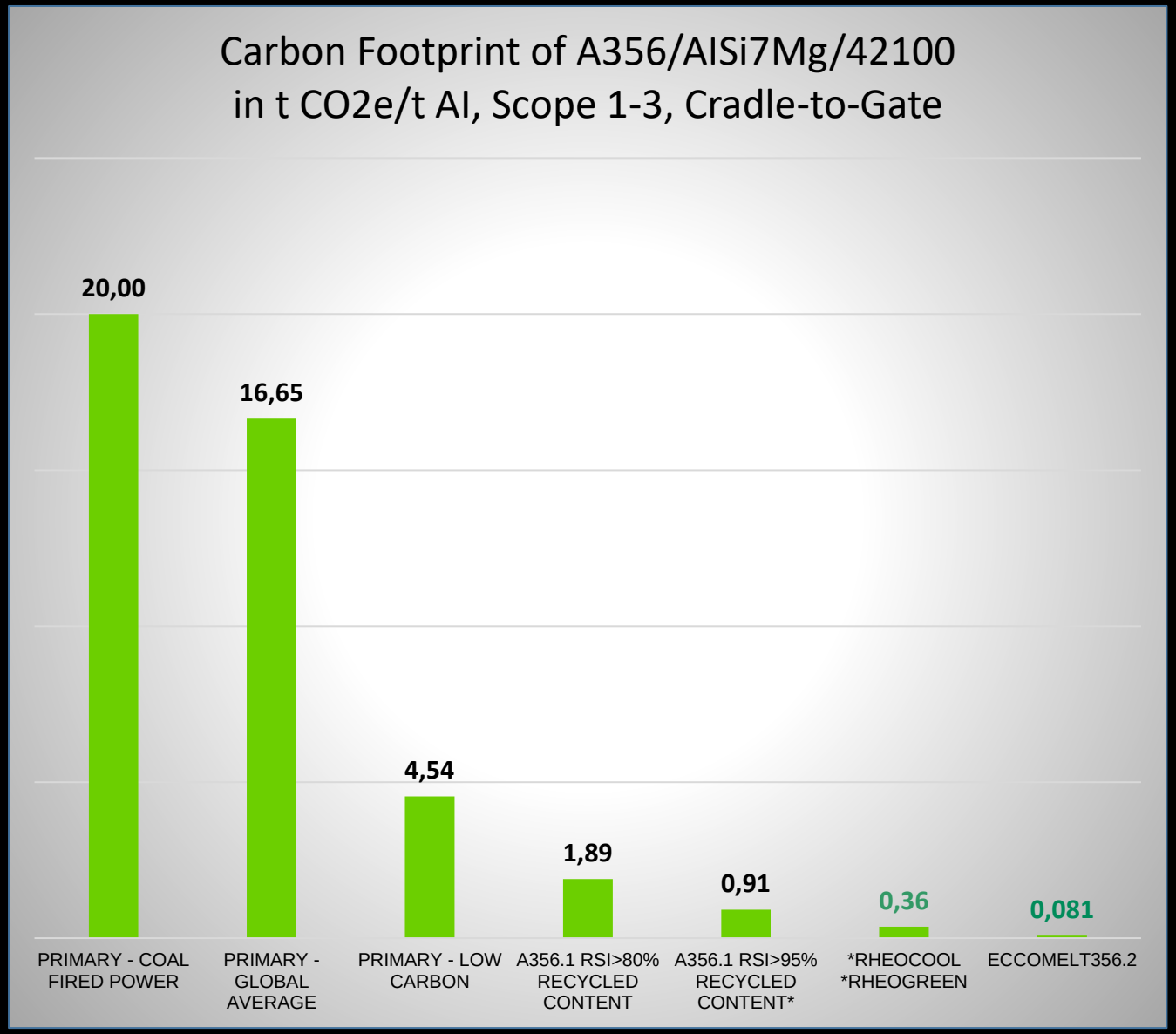


Sustainable castings requires Rheocasting

- In today's business, CO_2 footprint is an essential part towards the global net-zero target.
- Silicon is a major CO_2 contributor (approx. 40%) in production of secondary alloys.
- Rheocasting allows to use a new set of alloys that contain less Si.
- Due to the thixotropic behavior of a slurry, Rheocasting do not require high Si inside the alloy to have a good castability.
- With Rheocasting you can reduce the CO_2 footprint by increasing recycling content and use less alloying elements. It also enables weight reductions through improved properties.

CO_2 in different alloys

- There are also primary alloys used in the market.
- The diagram shows CO_2 footprint of some alloys used.



https://www.aluminum.org/sites/default/files/2022-01/2022_Semi-Fab_LCA_Report.pdf

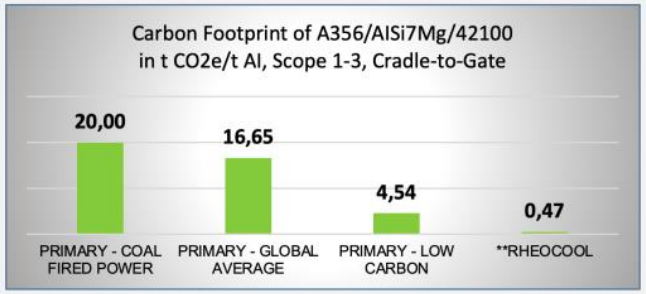
* Stena Aluminium

Example: CO_2 savings in Heatsinks

Why Rheocasting for Heatsinks

- Heatsink castings for thermal management usually uses primary based alloys in order to reach requested characteristics.
- But with Rheocasting it is possible to use other alloys that are secondary that show better properties than primary HPDC alloys.
- With Rheocasting there are also excellent flow behavior to fill thin cooling fin structures.
- Lower temperatures are positive on die life.

CO_2-effect by using Rheocasting and Rheocool



*Life Cycle Assessment Report of the Aluminum Association

**Stena Aluminium

In the table below a comparison has been made between the different alloys. Some key players in industry says that 1 kg of CO2 = 0,1 EUR which gives below savings. The calculation is based on a heatsink of 30 kg with an annual volume of 100 000 pcs.

Type of alloy	CO_2 kg/kg Al	CO_2 impact	Saving compared with Stena (kg)	Saving in EUR
Primary, Coal based power	20 CO_2 kg/kg Al	60 000 000	58 590 000	5 859 000
Global Average	16,6 CO_2 kg/kg Al	49 800 000	48 390 000	4 839 000
Hydropower	4,5 CO_2 kg/kg Al	13 500 000	12 090 000	1 209 000
Stena RheoCool	0,47 CO_2 kg/kg Al	1 410 000		

Conclusion: If the value of CO_2 is true there are huge savings to be made by changing HPDC into Rheo for these heatsink castings.

Alloys for Rheocasting

Trade name	Chemical designation		Standard	Application	State	Rp02 (Mpa)	Rm (Mpa)	A %	W/m*k (100 C)
Rheocool	AlSi2.5FeMg	Secondary	N.A	Thermal management	F O	90 85-130	200 150-190	9 4,5-6,5	165-175 180-198
Rheogreen	AlSi5-8CuFe	Secondary	N.A	All purpose, sustainability, pressure tight, leak free	F T5	140 150	250 250	2-5 2-4	
Eccomelt	AlSi7Mg	Secondary	A356	High strength	F T5 T6	95-115 160-180 160-240	200-230 240-260 240-310	10-18 8-12 5-15	
Aural-5/C611	AlSi7MnMg	Primary	A374	BIW components	F	100-120	225-260	8-16	
A319	AlSi6Cu4	Primary	A319	High strength	T6	360-400	420-460	4-9	
RT Revolution Al	AlSi7MnMg	Primary	A357	High strength	F T6	90 240-280	185 320-340	8 5-8	
Castaduct	AlMg4Fe2	Primary	N.A	BIW components	F	120	250	15	
A380 ***ADC10, 46500**	AlSi8	Secondary	A380	All purpose, sustainability, pressure tight, leak free	F T5	140-170 150-175	260-325 270-330	2,5-5 2-3,5	
A380Mg0,3	AlSi8Mg0,3	Secondary	A380Mg0,3	All purpose, sustainability, pressure tight, leak free	F T5	160-170 230-250	260-280 290-310	1,5-3 1,5-3	
A356	AlSi7Mg0,3	Primary	A356	All purpose, sustainability, pressure tight, leak free	F	90	160	3	
***42000**	AlSi7Mg	Secondary	42000		F T5 T6	110 205 280	210 270 310	4-6 3-4 3-5	
***Equivalent**									

Customer benefits

How to be technical successful

- Tech feasibility studies
- Education, process and parts development
- Development support, from idea to PPAP
- Prototype casting facility

How to be Commercially successful

- Integrated marketing
- Marketing with material from Comptech
- Directed RFQ flow from Comptech
- Weekly OEM presentation

COMP tech
Rheocasting

SIGMASOFT®
Virtual Molding

SolidWorks

Engineering support

- Feasibility analysis
- Material selection
- Component design
- Tooling concept design

In cooperation with
Dr. Magnus Wessén (SWEFOS)

SWEFOS

COMP tech
Rheocasting

Application areas for Rheo-casting

- Pressure tight and leak free Rheocastings
- MEGA Rheocastings
- High conductivity Rheocastings
- Load carrying Rheocasting
- Cost reduction Rheocasting
- Wear resistant Rheocastings

Pressure tight and leak free rheo-castings

Applications

- Pumps
- Compressors
- Transmission components
- Hydraulic and pneumatic components

Advantages with Rheocasting

- Reduced porosity
- Reduced oxides
- No need for impregnation
- Thin and thick walls possible

Material

- RheoGreen

MEGA Rheocastings

Applications

- New body in white concepts
- Large single piece castings with long flow length

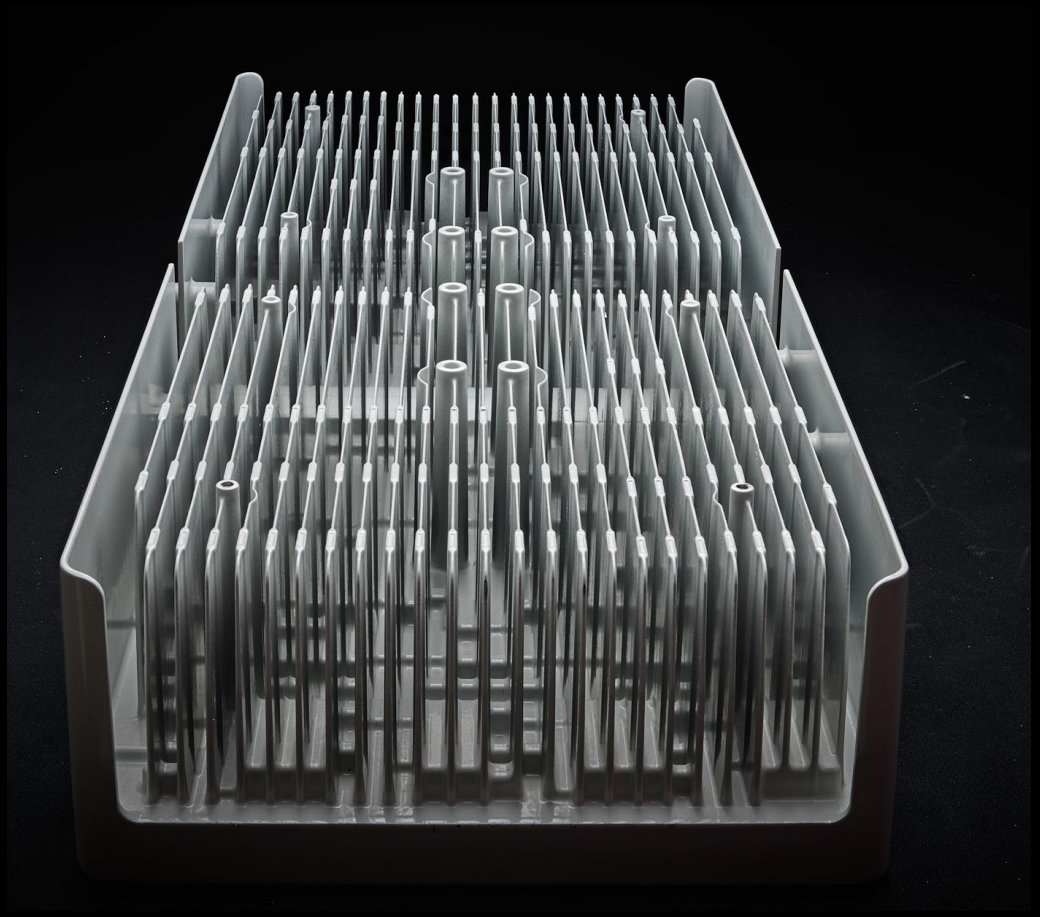
Advantages with Rheocasting

- Excellent flowability in thin sections
- Laminar flow gives minimal amount of defects
- Excellent elongation as cast
- No heat treatment is necessary
- Use of smaller HPDC machines compare to HPDC

Material

- RheoBody

High conductivity Rheocastings



Applications

- Heat sinks
- Housings
- EV Power Electronics

Advantages with Rheocasting

- High thermal conductivity
- Extreme thin-walled castings
- Excellent flowability
- Weldable
- Smaller HPDC machines
- Decreased CO2 footprint

Material

- RheoCool (up to 198 W/mK)

Load carrying, Rheo castings

Applications

- Load carrying structural components
- Fatigue
- Replacing Fe components
- Cast GDC part in HPDC with Rheo
- Cast LPDC in HPDC with Rheo

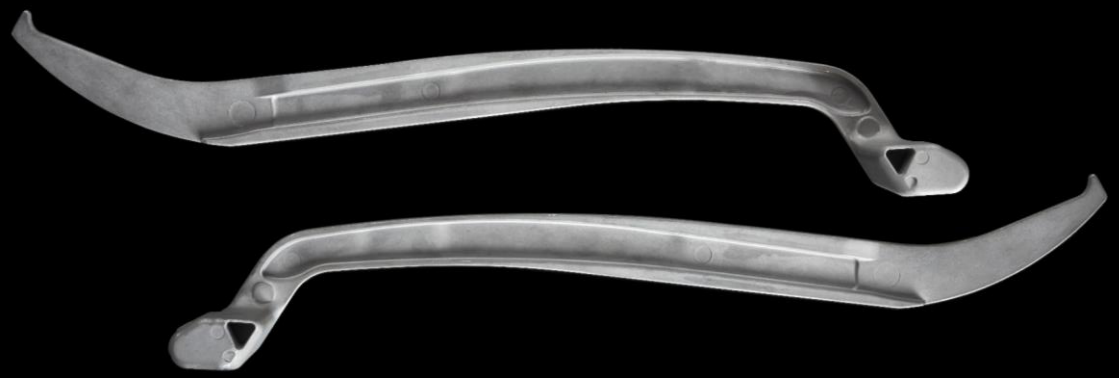
Advantages with Rheocasting

- Minimal amount of defects
- Shorter cycle time
- Heat treatable
- Use of soluble cores

Material

- RheoStrong

Cost reduction Rheo-casting



Applications

- General components replacing standard HPDC components

Advantages with Rheocasting

- Smaller DC machines
- Longer tool life
- Decreased CO2 footprint

Material

- RheoGreen

Hypereutectic Rheocasting

Applications

- Wear resistant
- Strength requirements
- Thermal stability (low coefficient of thermal expansion)

Advantages with Rheocasting compared to HPDC

- Excellent castability
  - improved flowability
  - decreased porosity
- Longer die life
- Increased hardness – no need for anodization
- Increased mechanical properties

Material

- AlSi (15-20%)

Thank you!

- Questions or comments?
- Feel free to contact us!

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