

**SPEAKER** Ye Zhou

**COMPANY** HÖGANÄS

**TOPIC** **HOW TO DEVELOP MATERIAL TO  
MEET CUSTOMER REQUIREMENTS  
WITH FOCUS ON SUSTAINABILITY**



# How to develop material to meet customer requirements with focus on sustainability

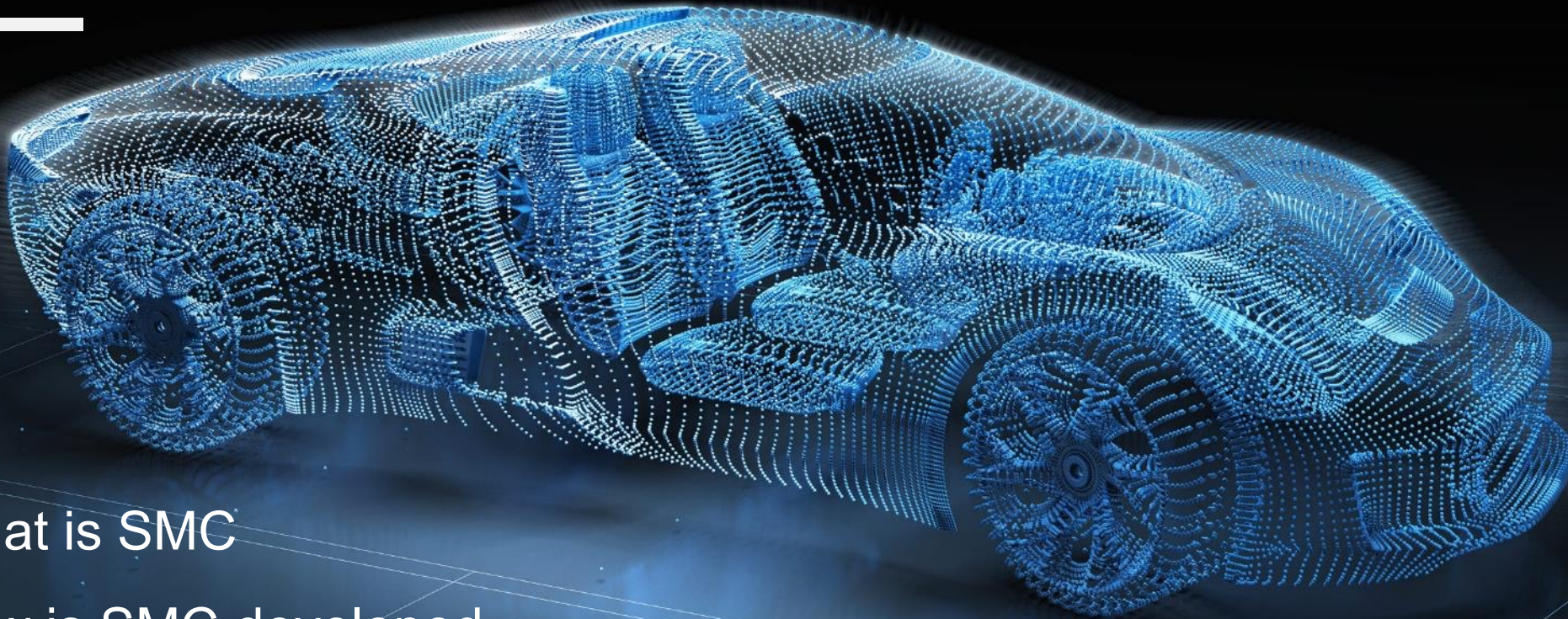
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Zhou Ye, Ph.D



# Outline

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- » What is SMC
- » How is SMC developed
- » Main aspects to be considered for material R&D
- » Conclusions

# SMC Materials – Höganäs Somaloy®

## » Ferromagnetic Iron Particles

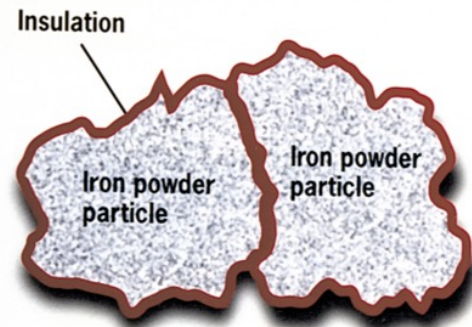
- High purity Iron
- Plastically deformable - Low residual stress
- Surface topology for mechanical strength

## » Resistive coating

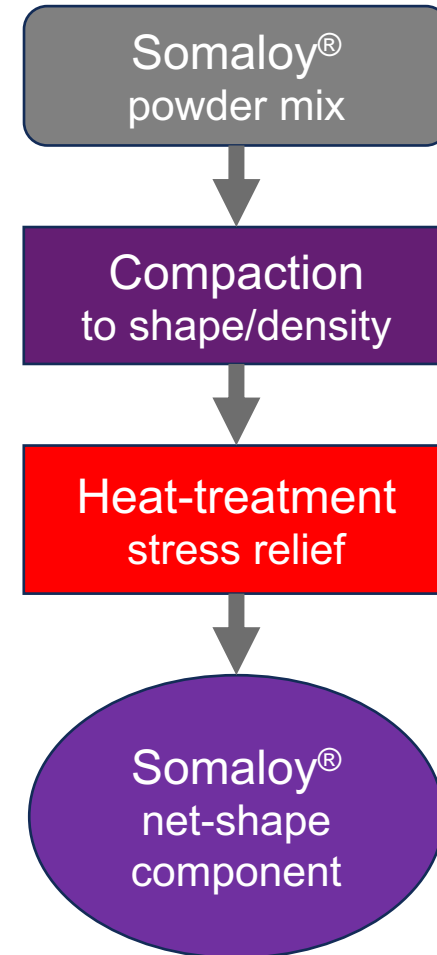
- Thin layers - In-organic
- Thermally stable for HT 500-650C
- Robust in operation

## » Lubricant

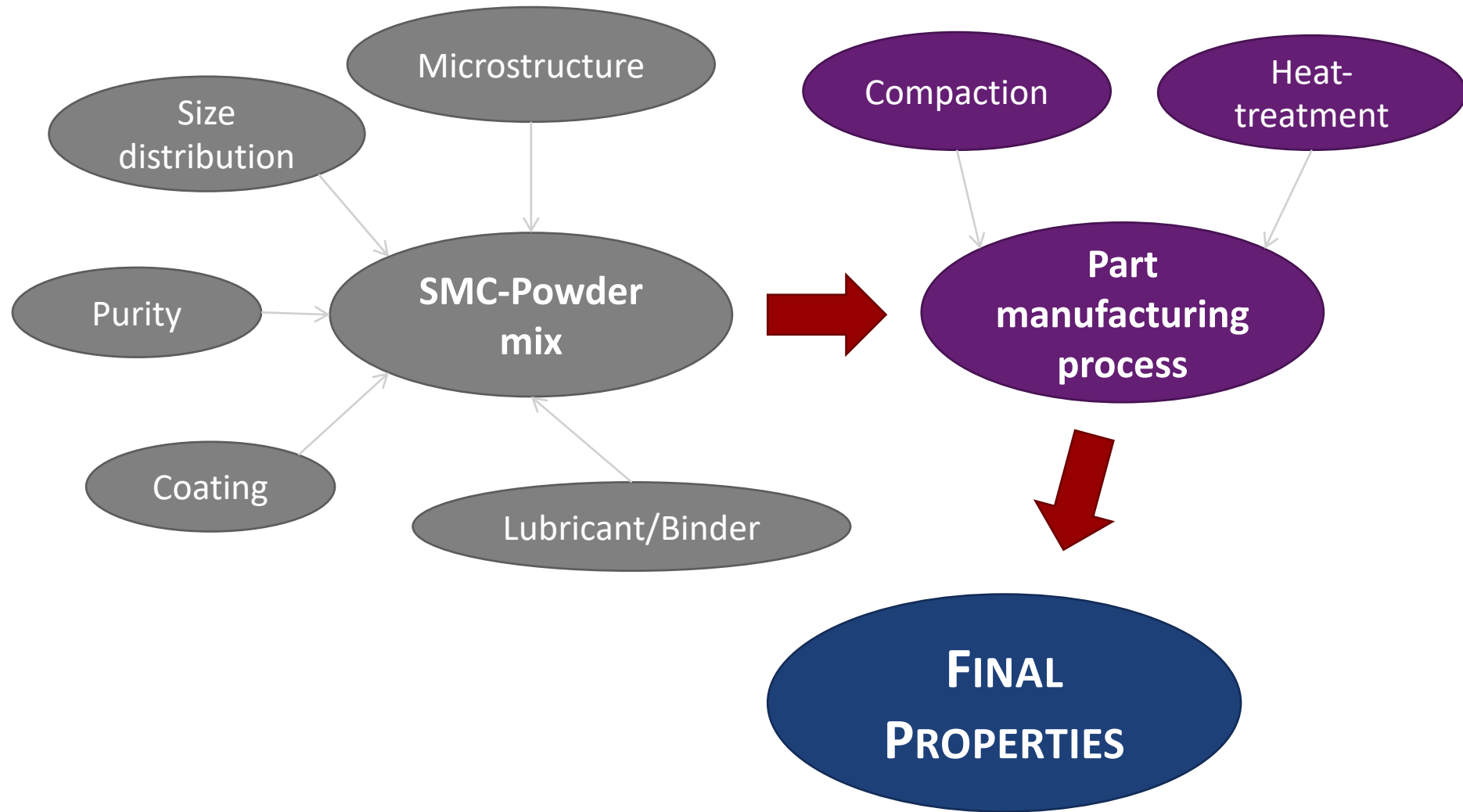
- Available internally inbetween particles
- Available externally on tool surface
- Small additional volume - Well distributed
- Efficient de-lubrication at heat-treatment



## Processing

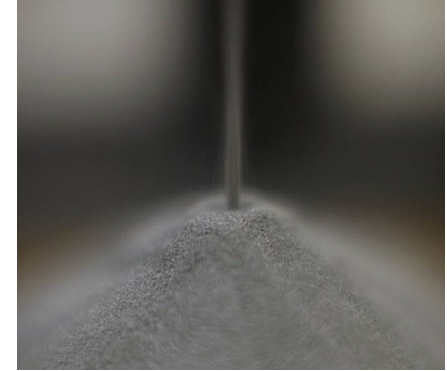


# SMC material design

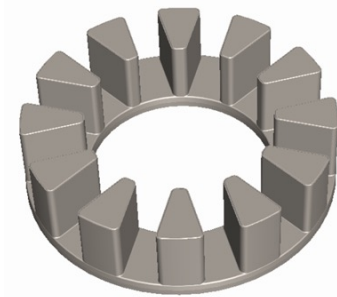


# Raw materials to applications

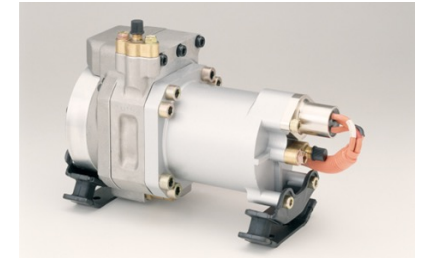
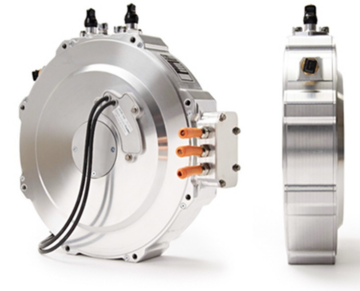
» Raw materials » Melting and atomization » Annealing and milling » Coating and mixing



» Compaction » Heat treatment



» Applications Design and manufacturing ( Tier 1)



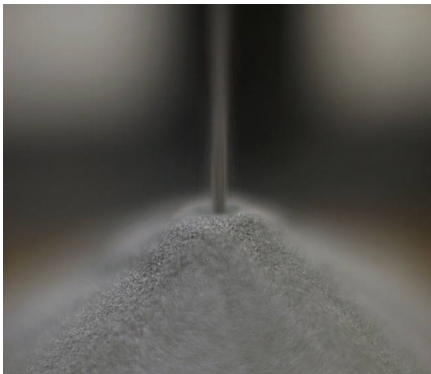
» OEM/End user





# SMC Powder to EV

- » Low Loss
- » High induction level
- » High Permeability

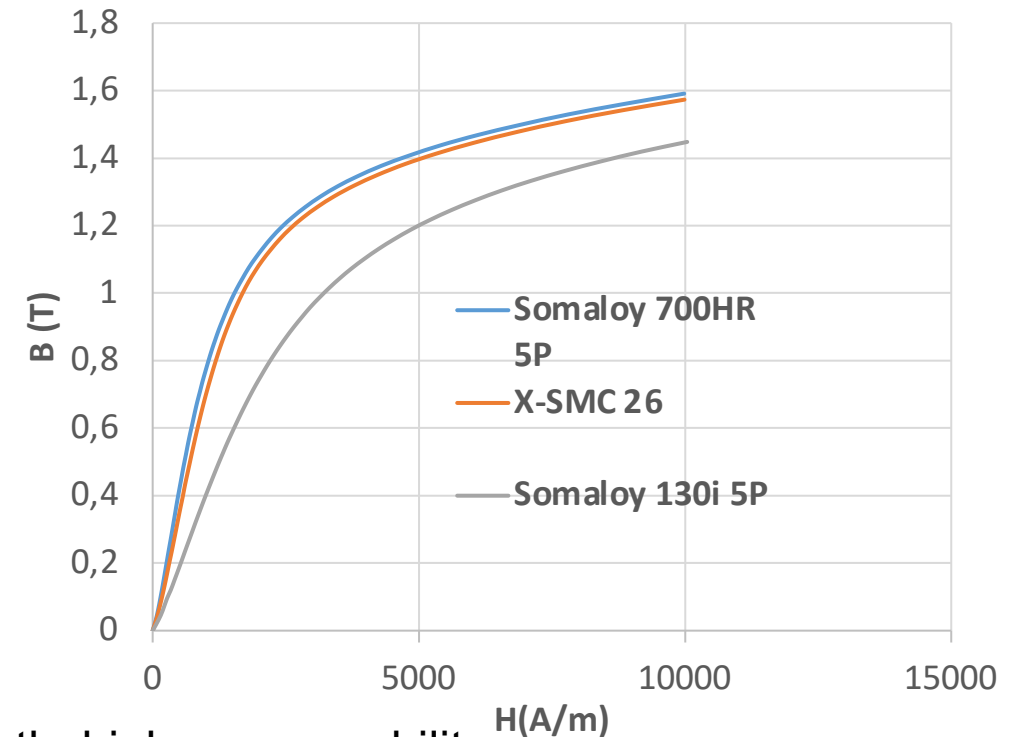


- » Powerful vehicles
- » High efficiency/long drive distance



# Somaloy 7P vs. 5P

Material	GS [MPa]	TRS [MPa]	Ring H5mm Density [g/cm <sup>3</sup> ]	Ring Resistivity [ $\mu\text{Ohm}\cdot\text{m}$ ]	B @ 10kA/m [T]	$\mu_{\text{max}}$	Core Loss @1T, 100Hz	Core Loss @1T, 400Hz	Core Loss @1T, 1kHz
New developed Somaloy (X-SMC 26)	13	60	7.49	6000	1.58	560	6.3	27.1	77.1
Somaloy 130i 5P	8	35	7.44	20000	1.47	350	8.0	33.8	93.0
Somaloy 700HR 5P	15	60	7.50	700	1.57	600	6.6	29.8	92.0



- » New 100 mesh X-SMC 26 shows good resistivity, good strength, higher permeability and lower loss in comparison to Somaloy 130i 5P and Somaloy 700 HR 5P
- » Compaction and heat treatment of new material are similar to Somaloy 5P products
- » The product will be produced by more sustainable processes



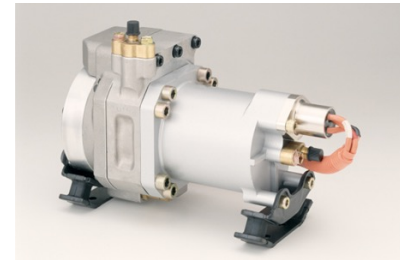
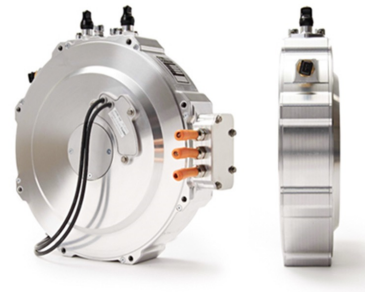
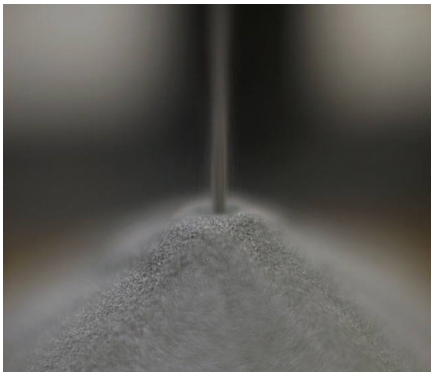
# Short summary of applications effect

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- » AFM motor 100 kW : X-SMC 26 vs. 5P, 0,2-0,6% efficiency improvement or 10-20% lower iron loss
- » AFM, 34 kW X-SMC 26 vs. Somaloy 700HR 5P 0,3% efficiency improvement or 15% lower iron loss
- » RFM motor (30-60 Nm and 1000-12000 RPM): X-SMC 26 vs. Somaloy 130i 5P 0,4-0,8% efficiency improvement or 15-17% lower Iron loss

# SMC Powder to Tier 1

- » 3D magnetic flux
- » Low Loss
- » High Permeability and Saturation
- » Good thermal durability
- » Good mechanical and other physical properties
- » Downsizing
- » Other material saving
- » Easy assembling
- » Simple thermal management

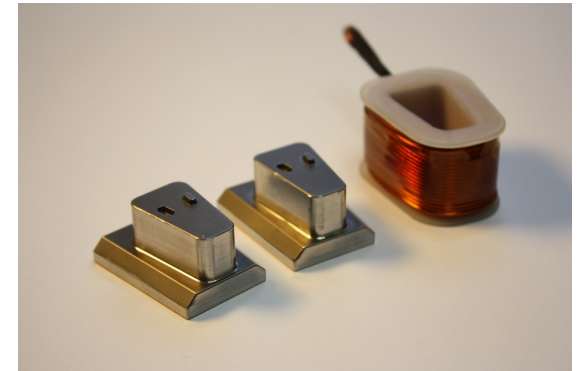
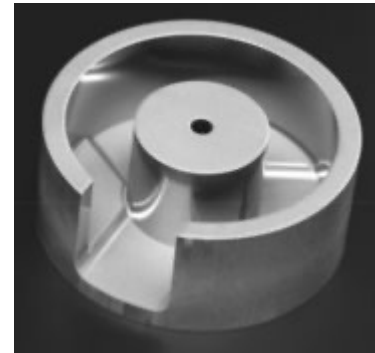
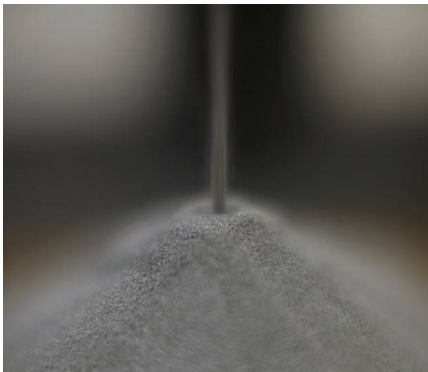




# SMC Powder to component makers

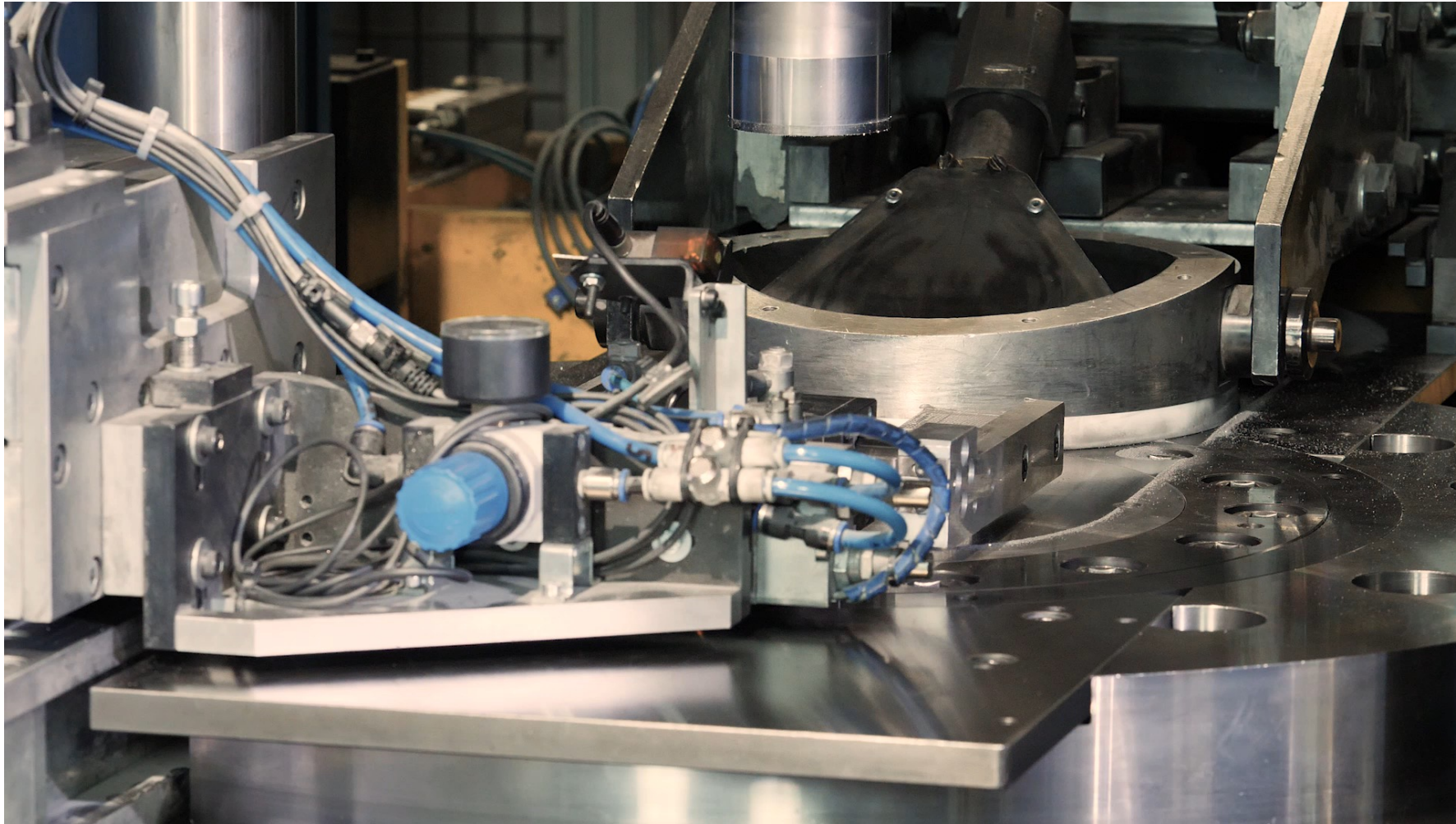
- » Powder properties
- » Green strength
- » Processibility

- » High productivity
- » Lower scrap ratio



# SMC Materials – Höganäs Somaloy®

From Powder to Components



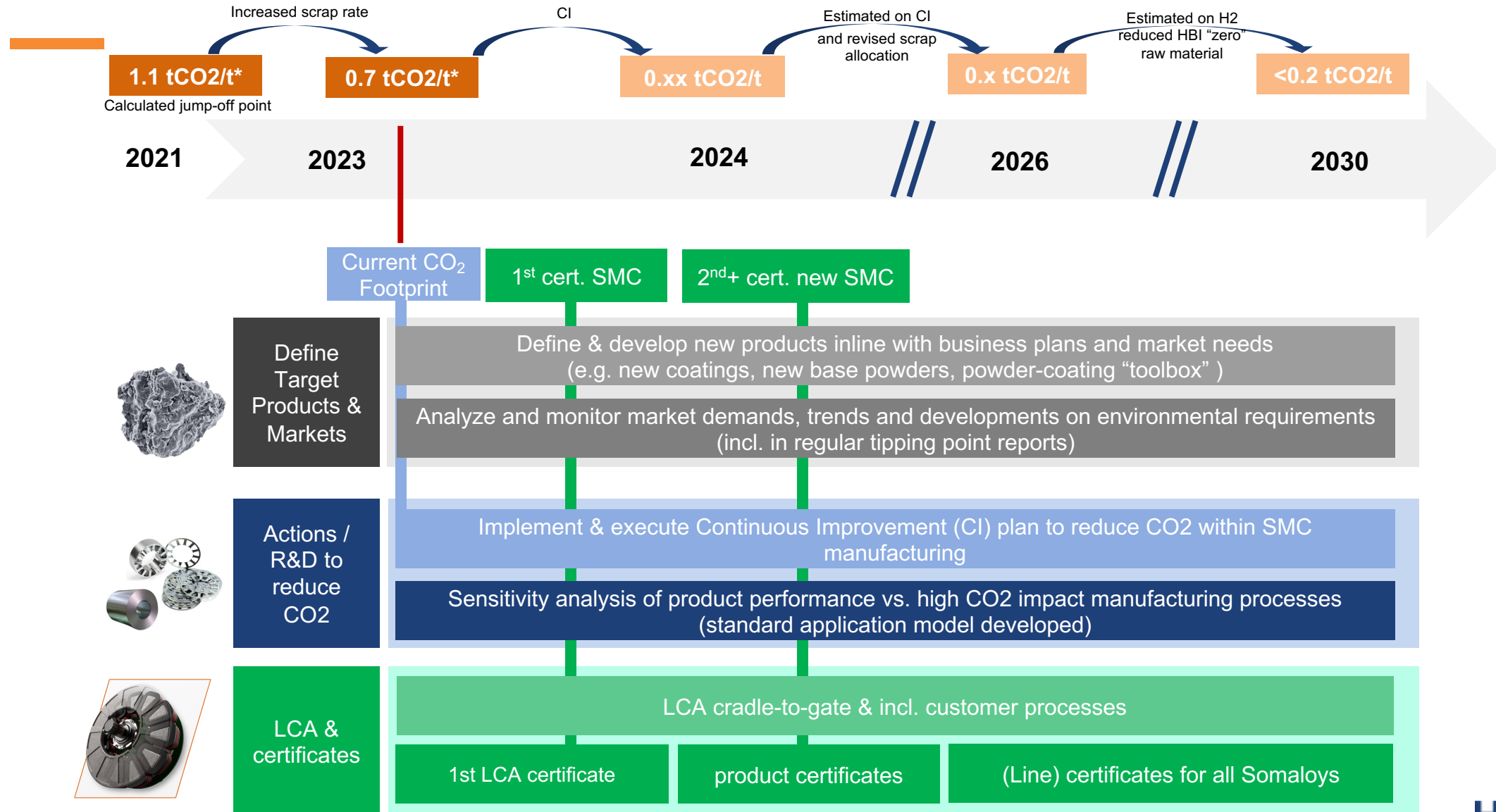


# Höganäs Process

» Raw materials » Melting and atomization » Annealing and milling » Coating and mixing



# Höganäs SMC Sustainability Roadmap





# Some main activities for more sustainable SMC

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- » To increase Scrap rate for melting, 2023 up to 95%
- » To use Bio-gas or Hydrogen/ green electricity for annealing
- » Water based solution for coating ( 7P/new products)
- » Re-use organic solvent (commercial products)
- » Purchasing sustainable additives
- » Minimizing Each gram CO2 is important

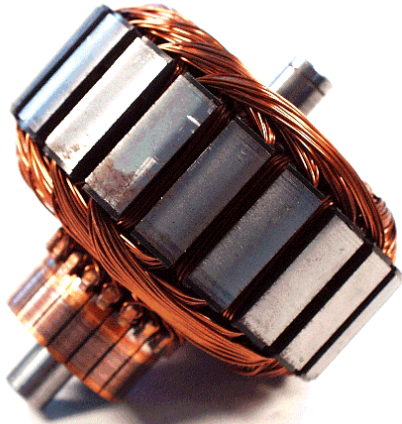
# Other aspects with focus on sustainability

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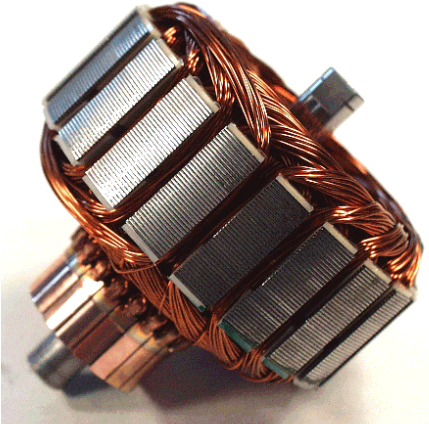
- » Educated staffs with sustainability thinking
- » New facilities with Good energy efficiency
- » Optimizing trials to minimizing wastes

# Recycling (re-melting)

SMC



Lams.





# Re-use SMC material

- » Crashing ( SMC motor or inductor)
- » Seperating
- » Milling
  - » Compaction
  - » Coating
  - » Annealing/coating

# Summary

- » To improve the material properties for better application efficiency
- » To optimize material features for supplying sustainable solution for ties 1
- » To improve powder processibility to Component makers
- » To develop SMC products with lower CO2 footprint or Carbon neutrality
- » To develop material or solution to re-use/recycle SMC material

# Thank you!

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