



Right to the Heart of Task

The New Generation of EMS' PPA

Francesco Martina
Technical Project Manager
EMS-CHEMIE Italia





15-16
MAY
2019

MUSEO ALFA ROMEO, ARESE MI

Agenda

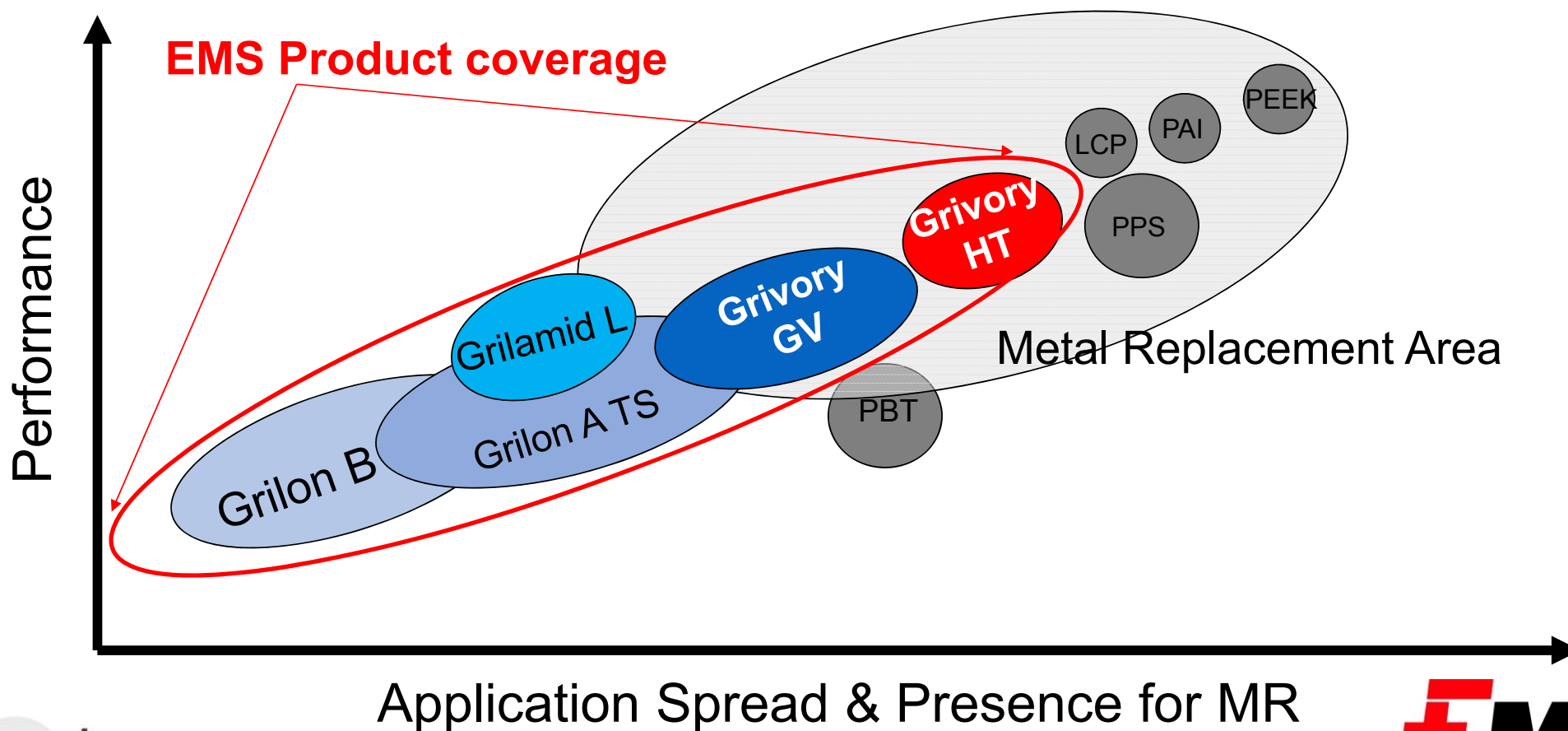
- High Performance Polymers for Metal Rep.
- Successful Application out of Grivory HT



- The New Generation of **EMS' PPA**
- Case Study of Lightning and Cost Saving
- Summary



HPP's Positioning in Respect of Metal Replacement



The Widest Polyamides Portfolio



GRIVORY[®]
EMS

Polyphthalamide
partially
aromatic
(PPA)

Grivory GV
Grivory HT1
Grivory HT2
Grivory HT6

Grilamid[®]
EMS

PA 12
PA 612
Amorphous PA

Grilamid L
Grilamid 2D
Grilamid TR

GRILON[®]
EMS

PA 6
PA 66
PA 6+66 alloy

Grilon B
Grilon A
Grilon TS
Grilon C

GreenLine

Bio- PA
PA 1010
PA 610
PPA
Amorphous PA

Grilamid 1S
Grilamid 2S
Grilamid BTR
Grivory HT3

LFT

Long
Fibre
Technology

Grilamid
Grilon
Grivory

New K+ ENERGY Sewage Electric Pump



- **INNOVATIVE**
- **HIGH PERFORMANCE**
- **ANTI CLOGGING**
- **MULTIPURPOSE**



caprari

New K+ ENERGY Sewage Electric Pump

HYDRAULIC FEATURES

- No Clogging System by CAPRARI *non stop* K+
- Commercial Separated Double Mechanical Seal
- Solutions to improve Pump maintenance
- Flanged suction support as standard

K+ ENERGY



caprari

New K+ ENERGY Sewage Electric Pump

NEW MOTORS

- High Energy Efficiency **IE3**
- Conductive Probe for ATEX version
- Double Shielded Cables
- H CLASS Insulation
- “DRY WET” Cooling System Patented

K+ ENERGY



DRYWET SYSTEM

Caprari International Patent

caprari

DRYWET SYSTEM Cooling system Patented

THE ONLY MULTIPURPOSE PUMP ON THE MARKET

- The same electric pump in wet pit and in dry chamber.
- It's not important the level of the water.
- The Dry Wet cooling system can be activated, if necessary, simply adding commercial oil.



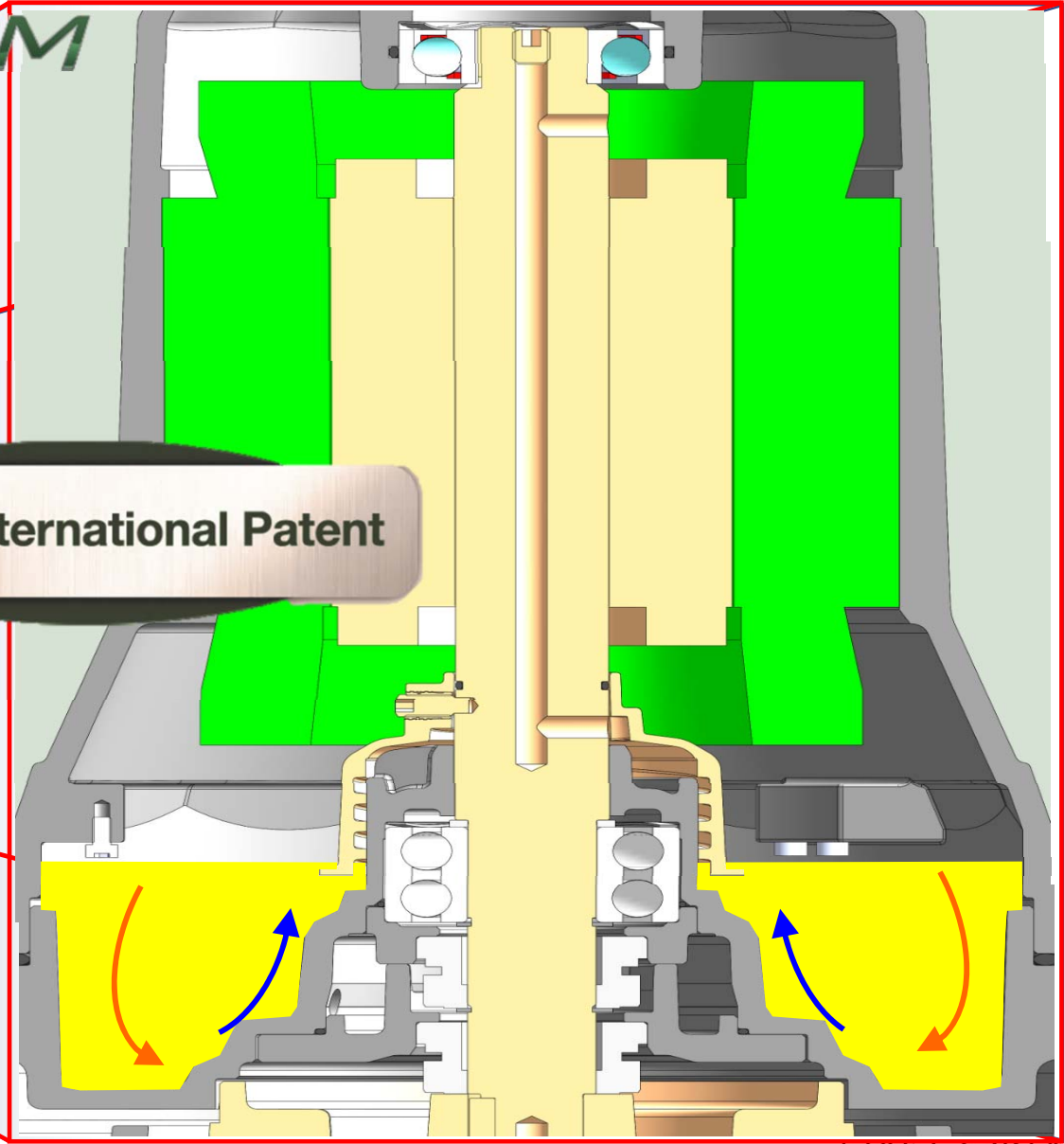
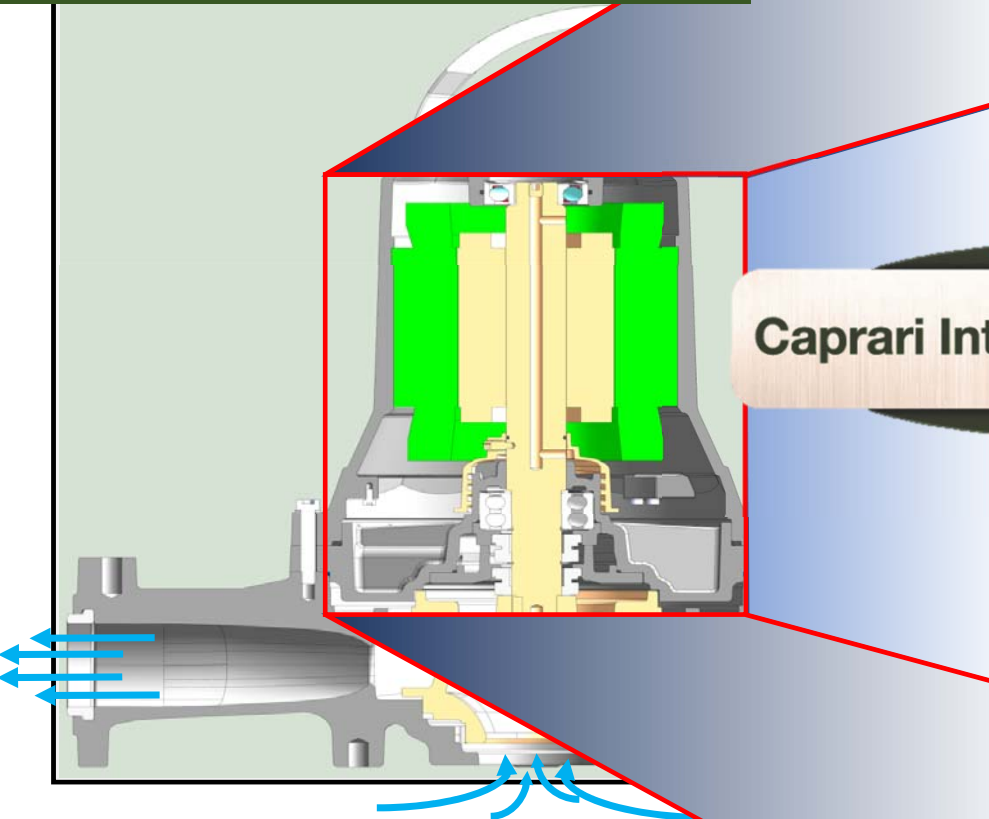
Caprari International Patent



DRYWET SYSTEM

THE HEART of the COOLING SYSTEM

Caprari International Patent

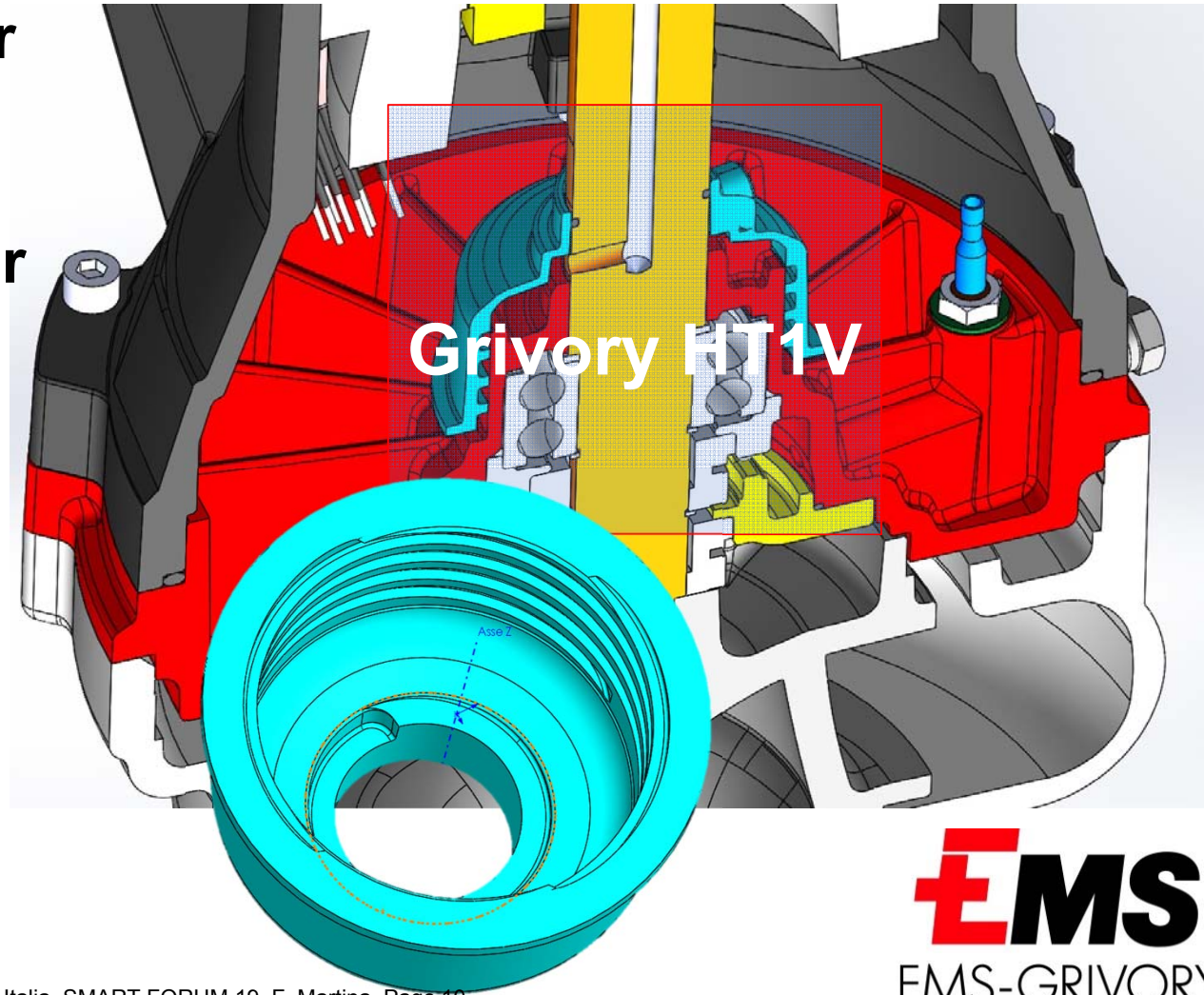


caprari

S
EMIS ORVORY

Right to the Heart of Task: **Grivory HT1V 55X**

- Suction bell acts like a rotor viscose pump
- Oil used to cool down motor temperature
- Operating temperaure, in dry service, up to 90°C
- Available in different sizes



caprari

Right to the Heart of Task: **Grivory HT1V 55X**

Main Application Requirements:

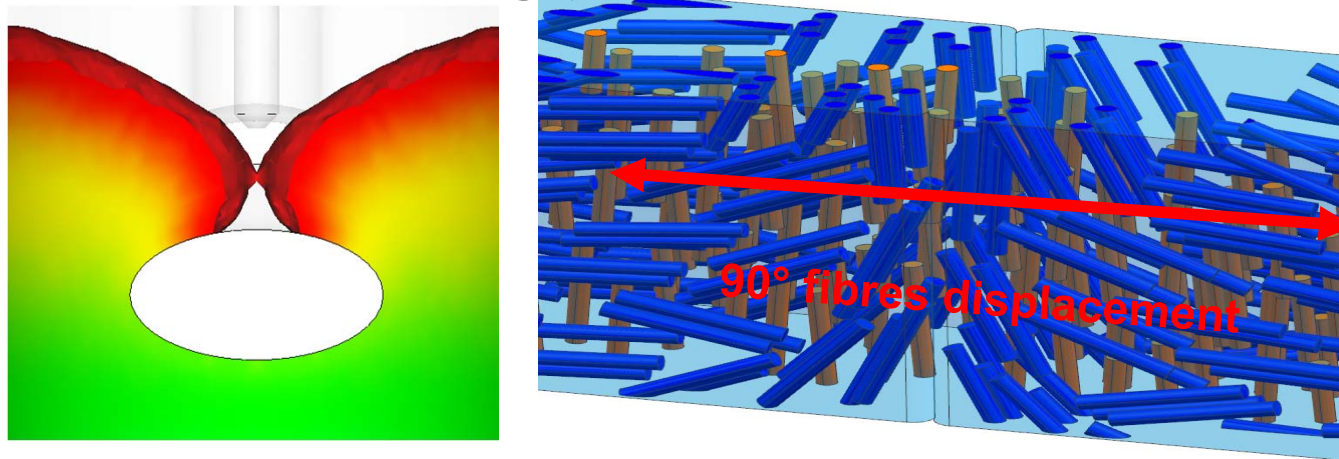
- **Dimensional Precision**
 - ✓ de-moulding accuracy
 - ✓ none swelling
 - ✓ thermal expansion like metal die cast
- **Unchanged stiffness along service temperature**
- **Mechanical strength with over mulded inserts**
- **Chemical compability, contact with Hot Oils Resistant**



caprari

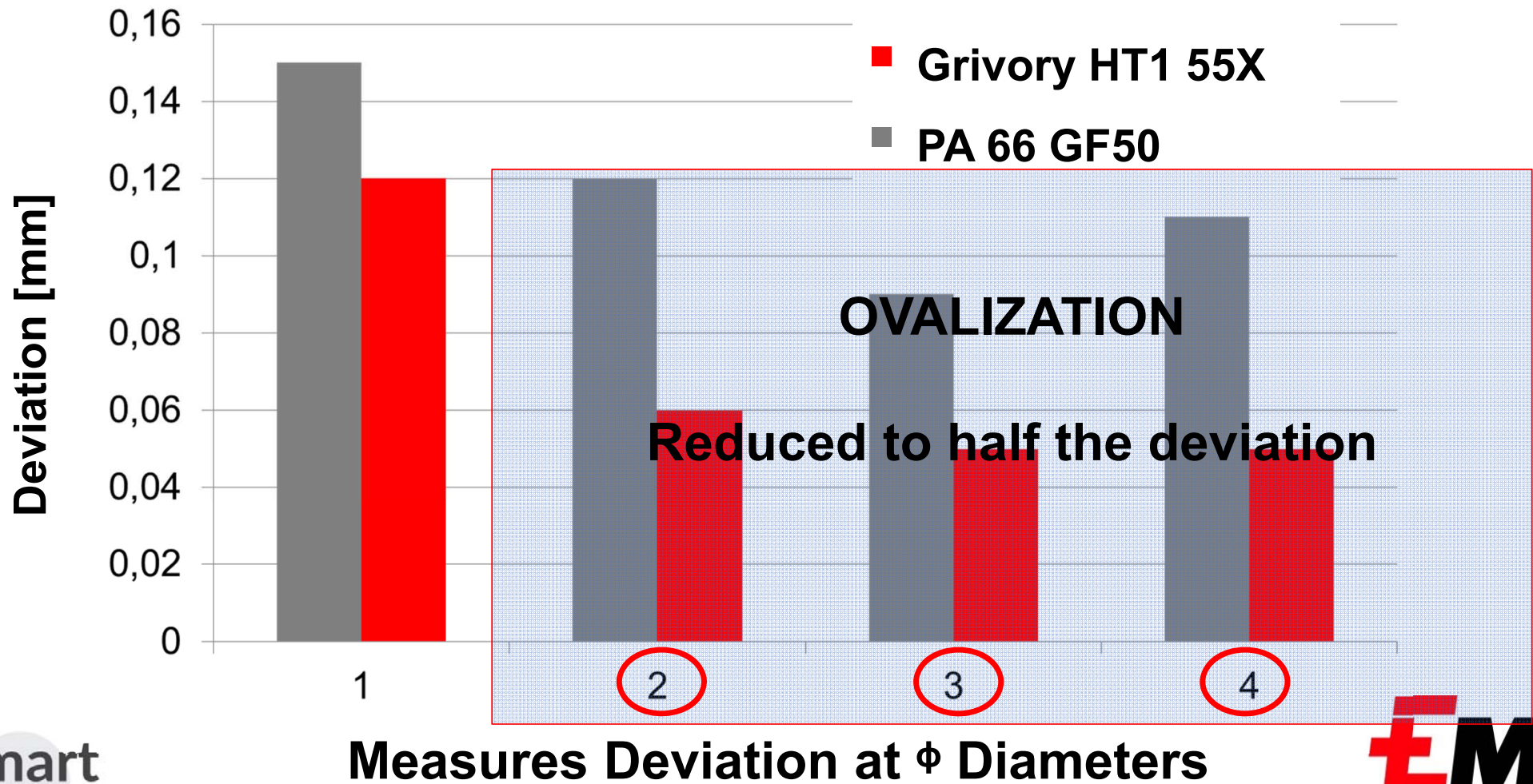
First Criteria of Selection: Dimensional Stability

- EMS Tube Specimen
- Middle side gating
- Preferred weldline creation
- Differentiate shrinkage (long vs. transv.)
- What is about de-moulding dimensional precision?

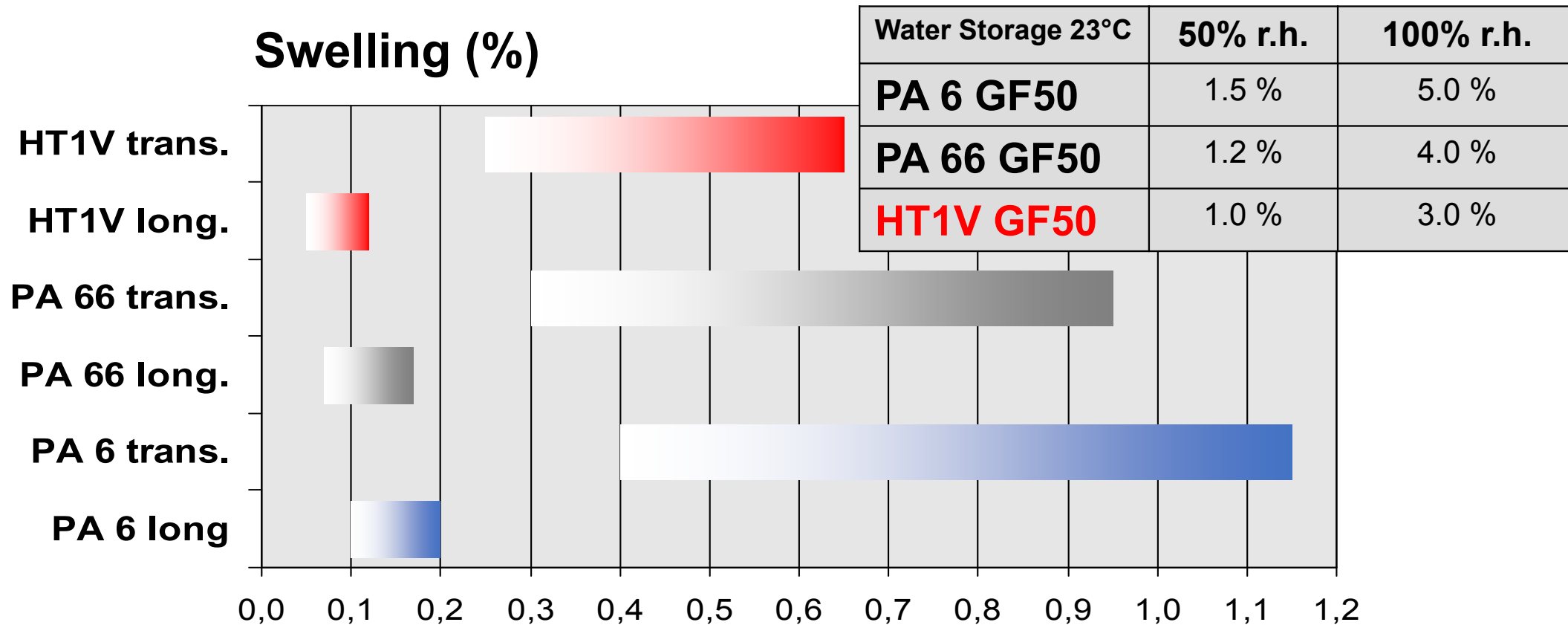


EMS
EMS-GRIVORY

Grivory HT1V 55X: Superior Roundness



First Criteria of Selection: Dimensional Stability



plates with wall thickness = 3 mm

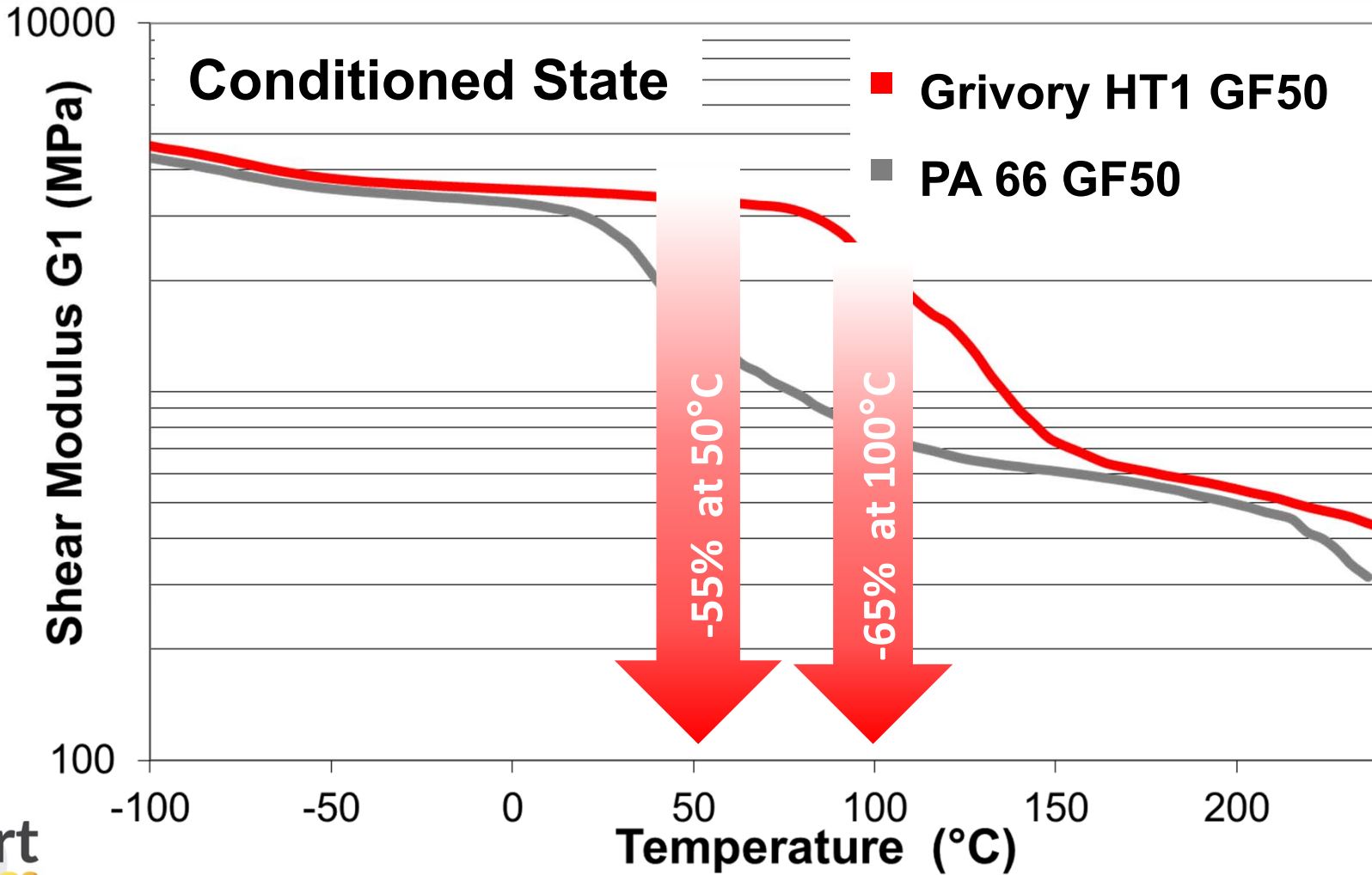
low value @ 23°C at 50% r.h. _ high value @ 23°C at 100% r.h.

First Criteria of Selection: Dimensional Stability

	-40°C [10 ⁻⁴ /K]	23°C [10 ⁻⁴ /K]	80°C [10 ⁻⁴ /K]	150°C [10 ⁻⁴ /K]
HT1V GF50 long	0.15	0.15	0.15	0.14
HT1V GF50 trans	0.45	0.45	0.50	0.58
HT1V GF50 avg	0.30	0.30	0.33	0.36
Aluminium	0.23	0.23	0.23	0.23

similar thermal expansion coefficient

Second Criteria of Selection: **Widest Stiffness**

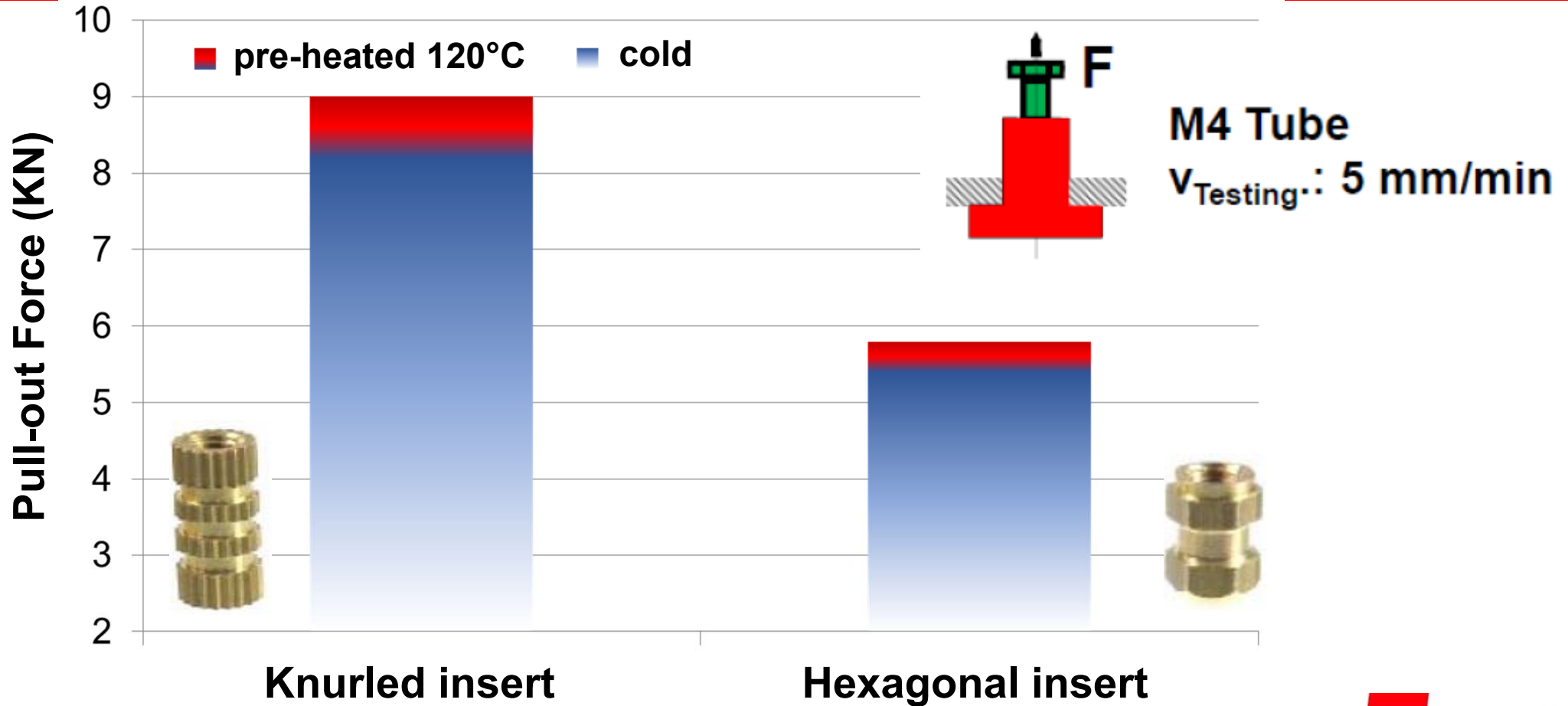


Grivory HT1V: Stiff but also Tough, the Fair Balance

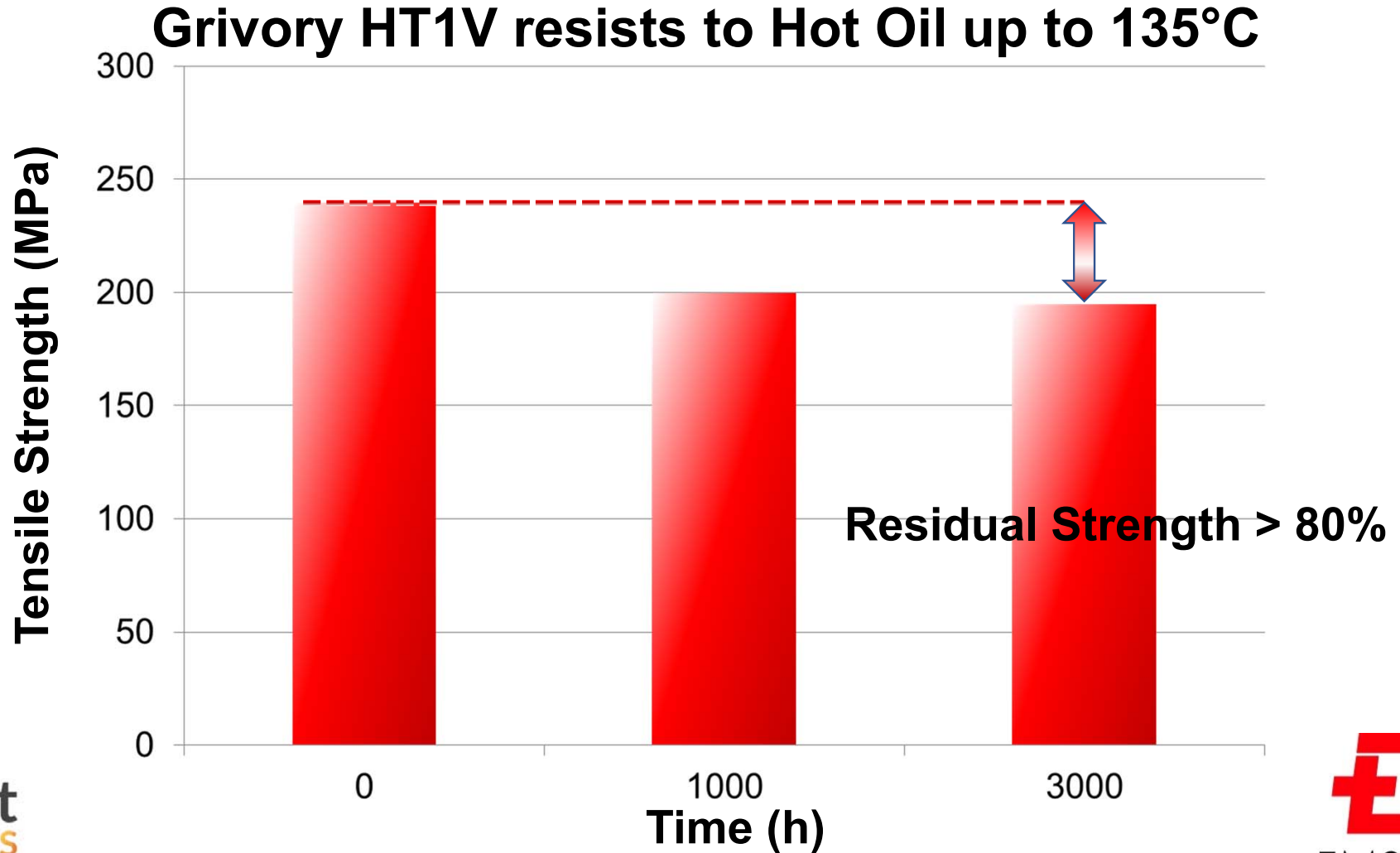


What is about pull out force with over moulded inserts?

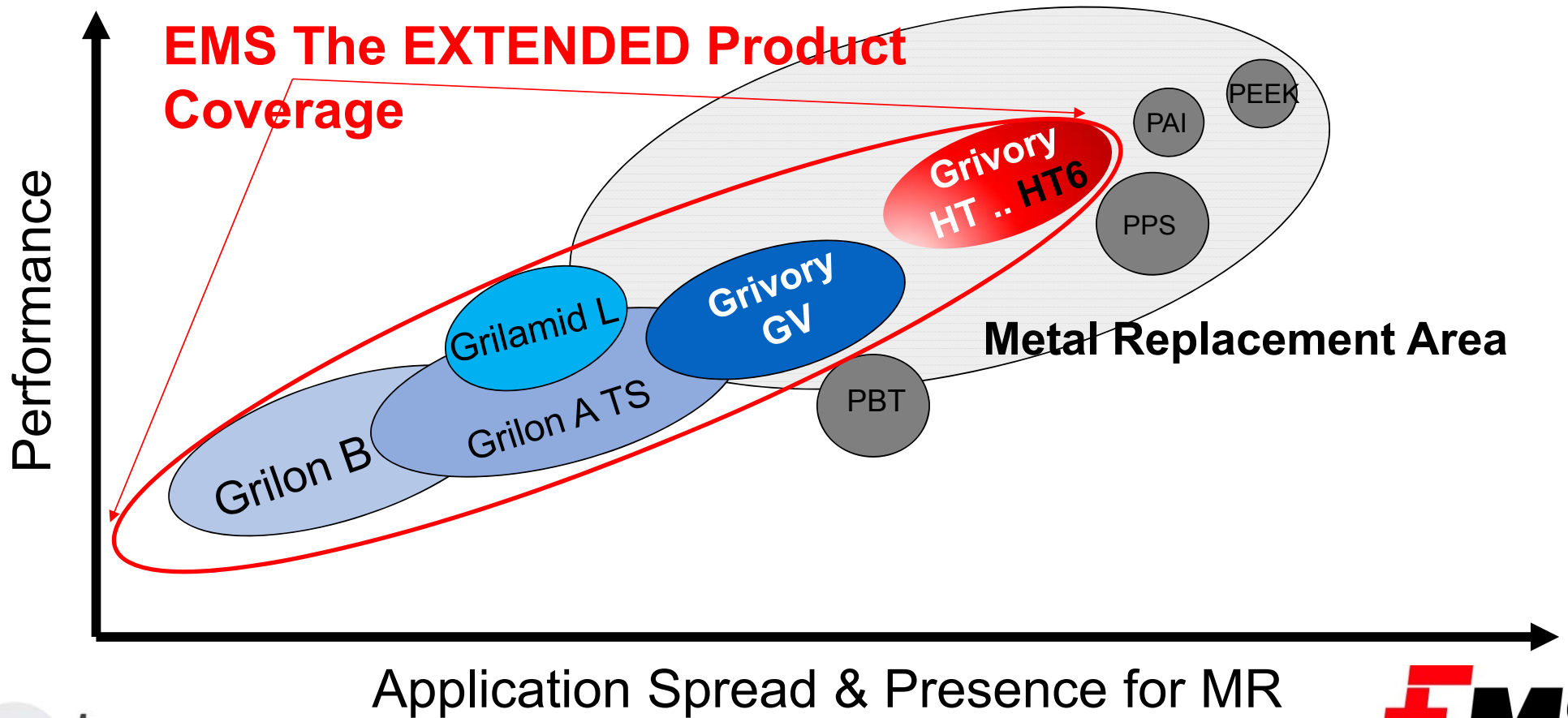
Grivory HT1V: Stiff but Tough, the Fair Balance



Third Criteria of Selection: Oil Resistance



HPP's Positioning in Respect of Metal Replacement



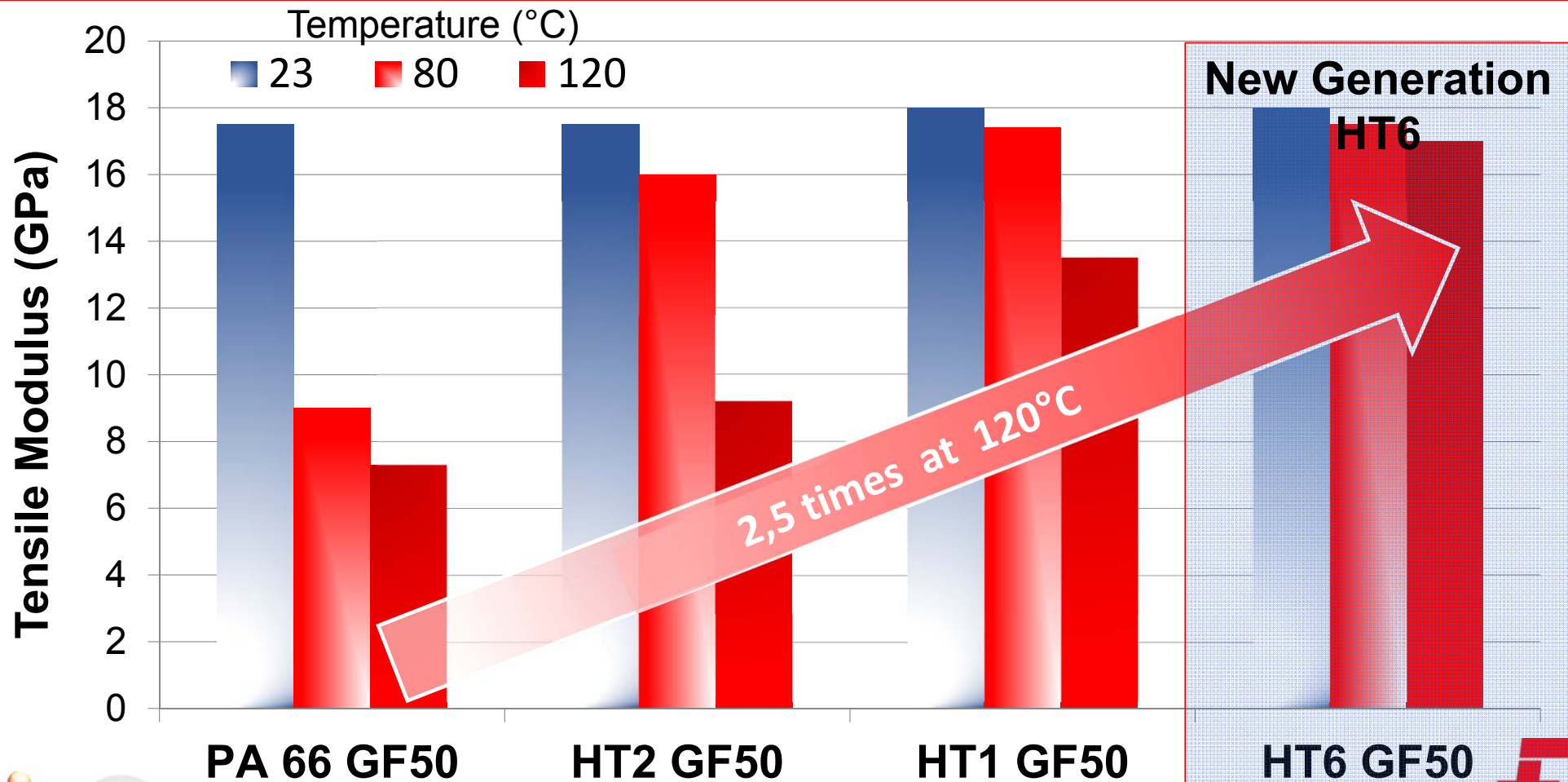
Extended Product Assortment: **The New Grivory HT6**



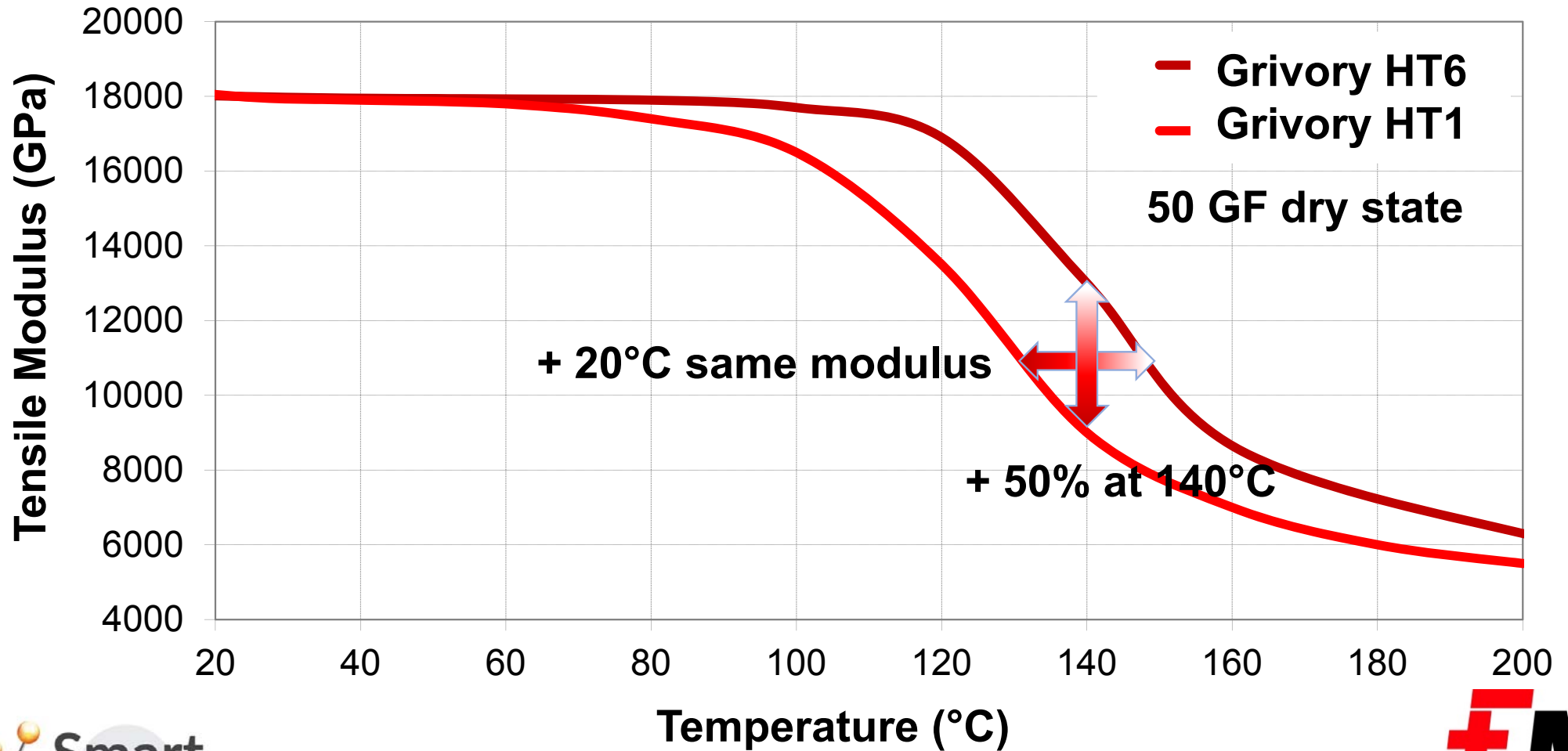
- Grivory HT XE 10129 → HT**6**V-4H
- Grivory HT XE 11600 → HT**6**V-4X ¹⁾
- Grivory HT XE 11601 → HT**6**V-5X ¹⁾
- Grivory HT XE 11602 → HT**6**V-5H

1) electro compatible heat stabilisation

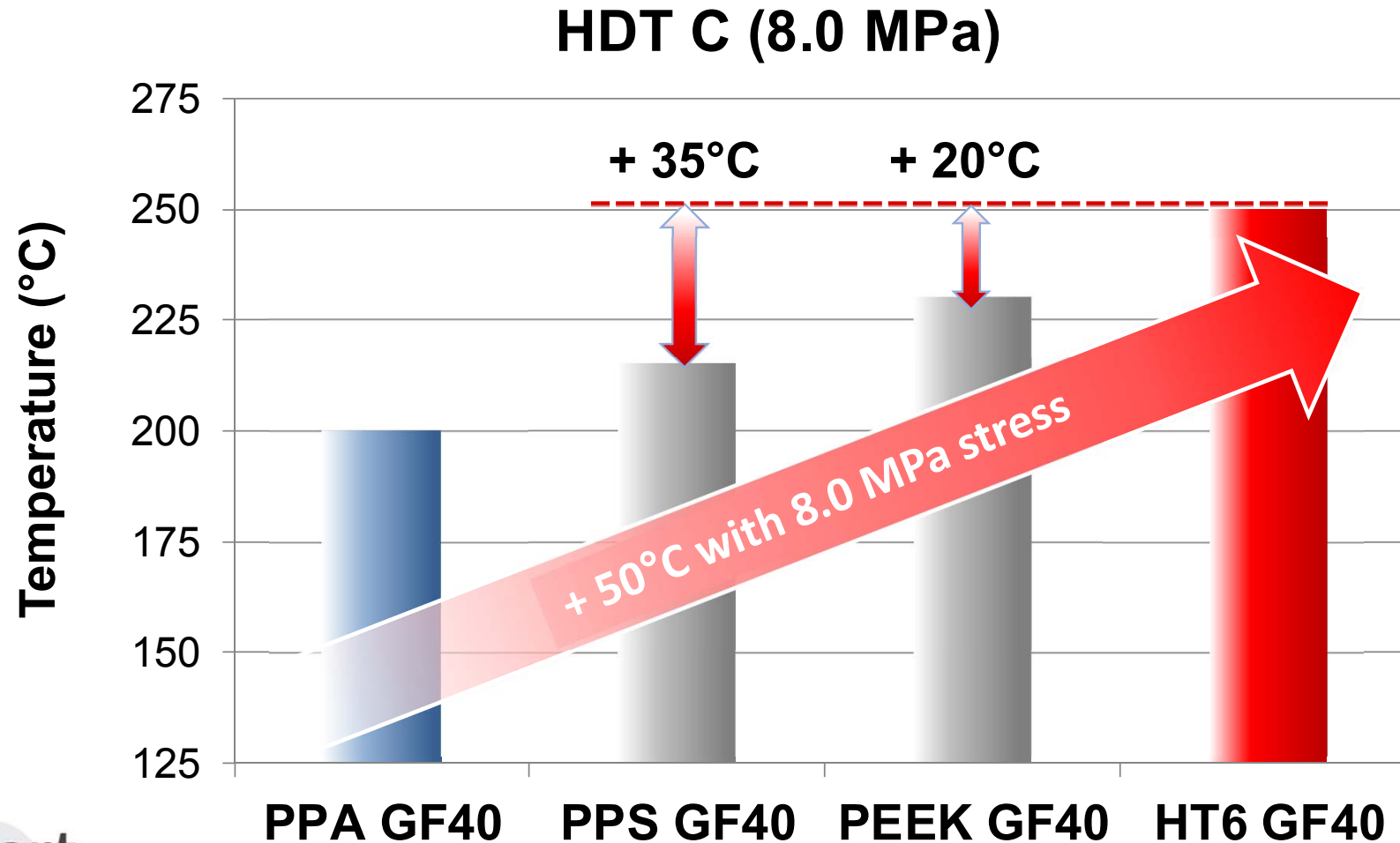
Grivory HT6: Unchanged Stiffness up to 120°C



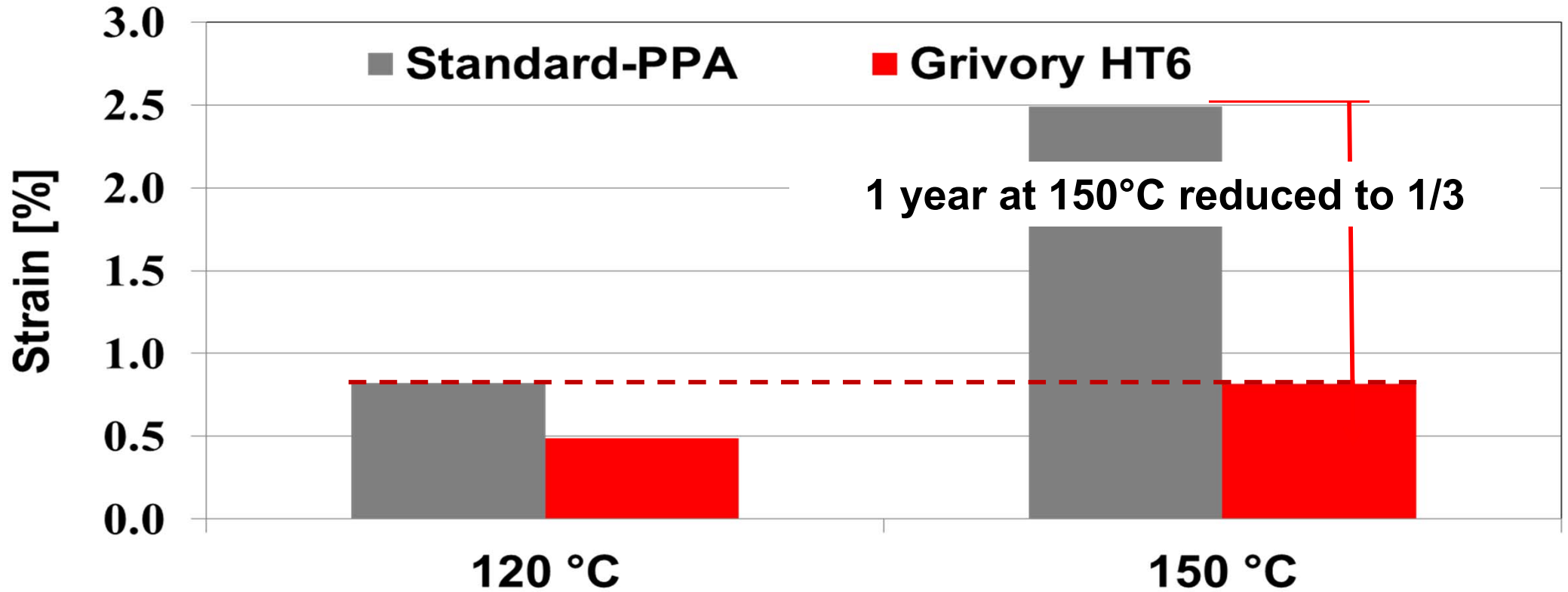
Grivory HT6: Stronger Performance at High Temp



Grivory HT6: Exceptional Heat Deflection Resistance



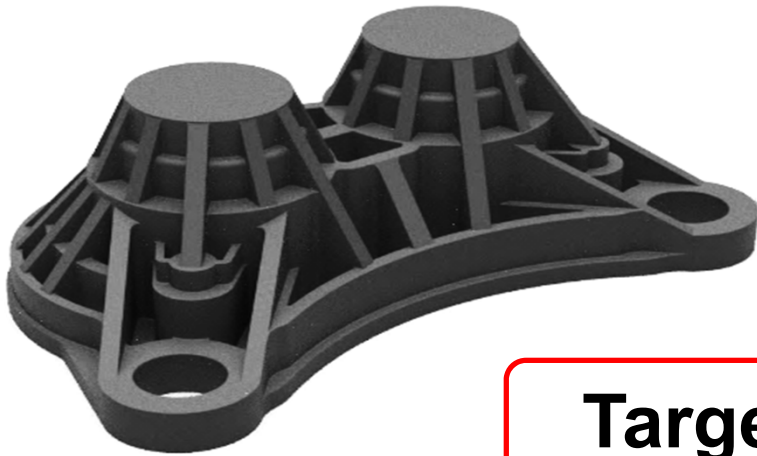
Grivory HT6: The Best Creep Resistance



10'000 h (>1 year) at 40 MPa load

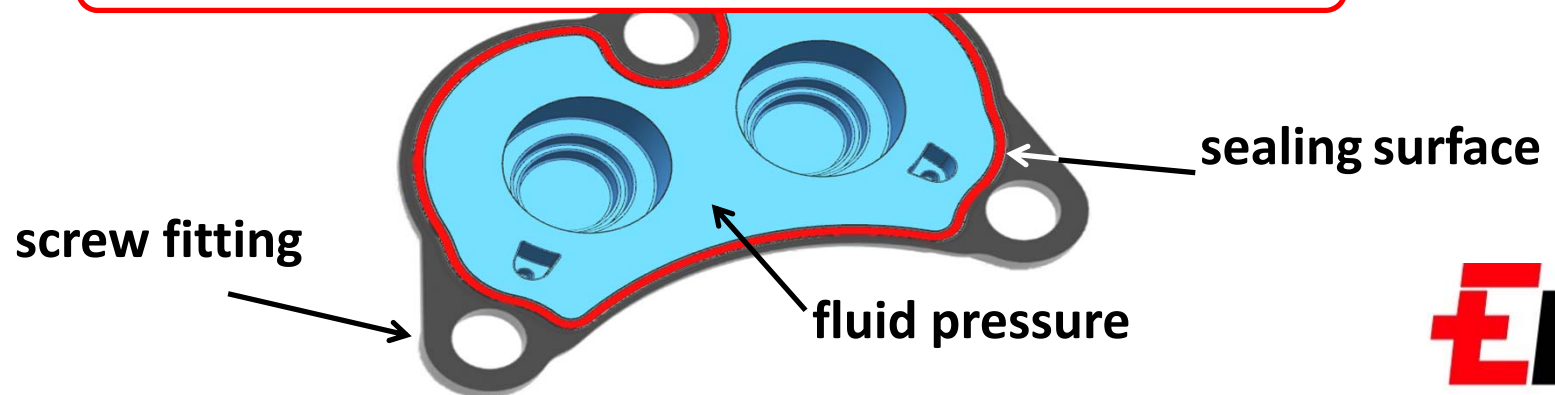
Cost and Weight Reduction Case Study

Cover for pressurized gearbox component



- Load case: internal pressure
- Fixation: 3 screws
- Critical: deflection of sealing surface (leakage)
- Out of reinforced PPA


Target: cost & weight reduction




Critical Deformation of Sealing Surface

Cover out of standard PPA GF50_ Original Geometry V0

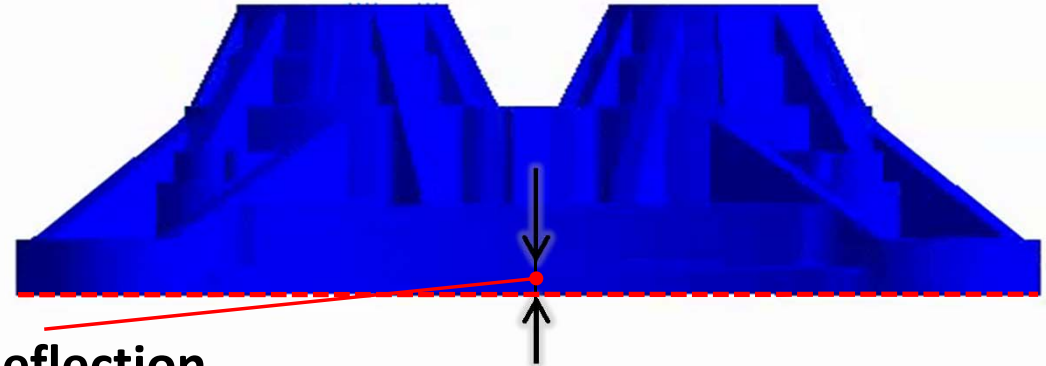
140°C



20 bar

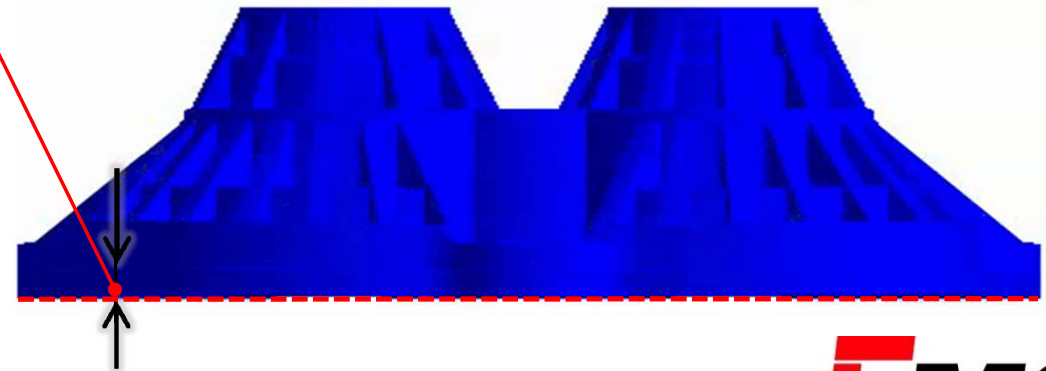


Front view



critical deflection

Back view



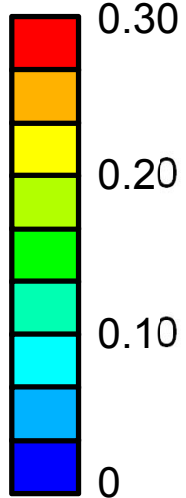
Max. 0.30 mm total deformation allowed

EMS
EMS-GRIVORY

Critical Deformation of Sealing Surface

Cover out of standard PPA GF50 _ Original Geometry V0

Total Deformation (mm)



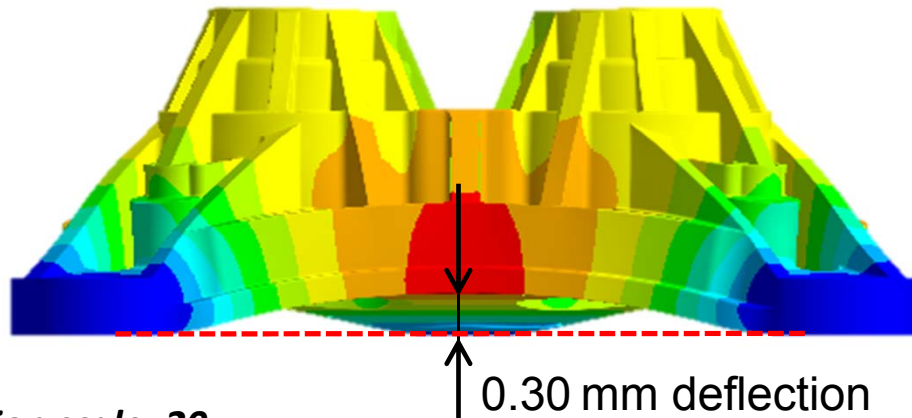
Deformation scale: 20



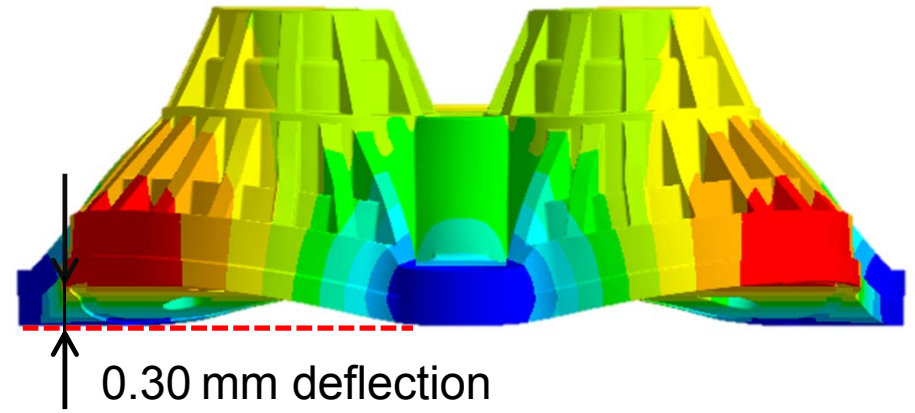
140°C



20 bar



0.30 mm deflection



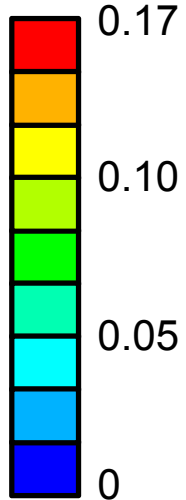
0.30 mm deflection

Total deformation within max. allowed

Critical Deformation of Sealing Surface

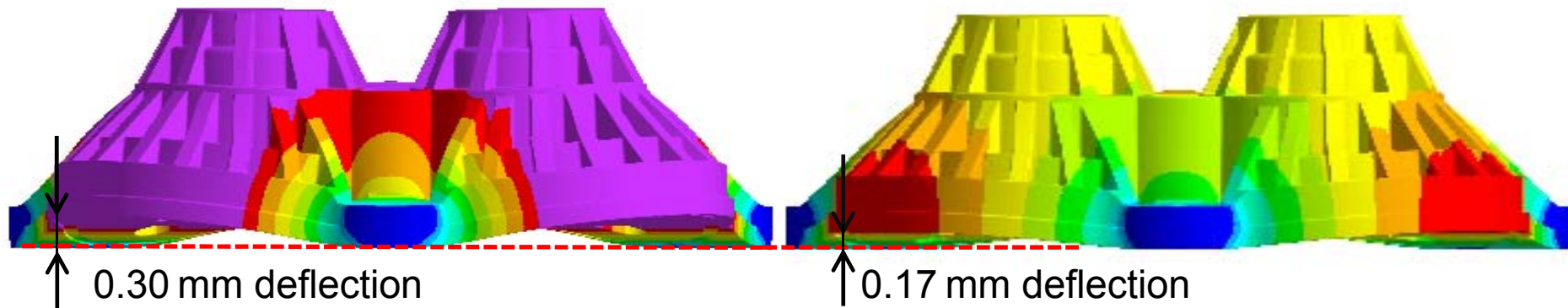
Same Geometry (V0) but different PPA's

Total Deformation (mm)



Standard PPA GF50

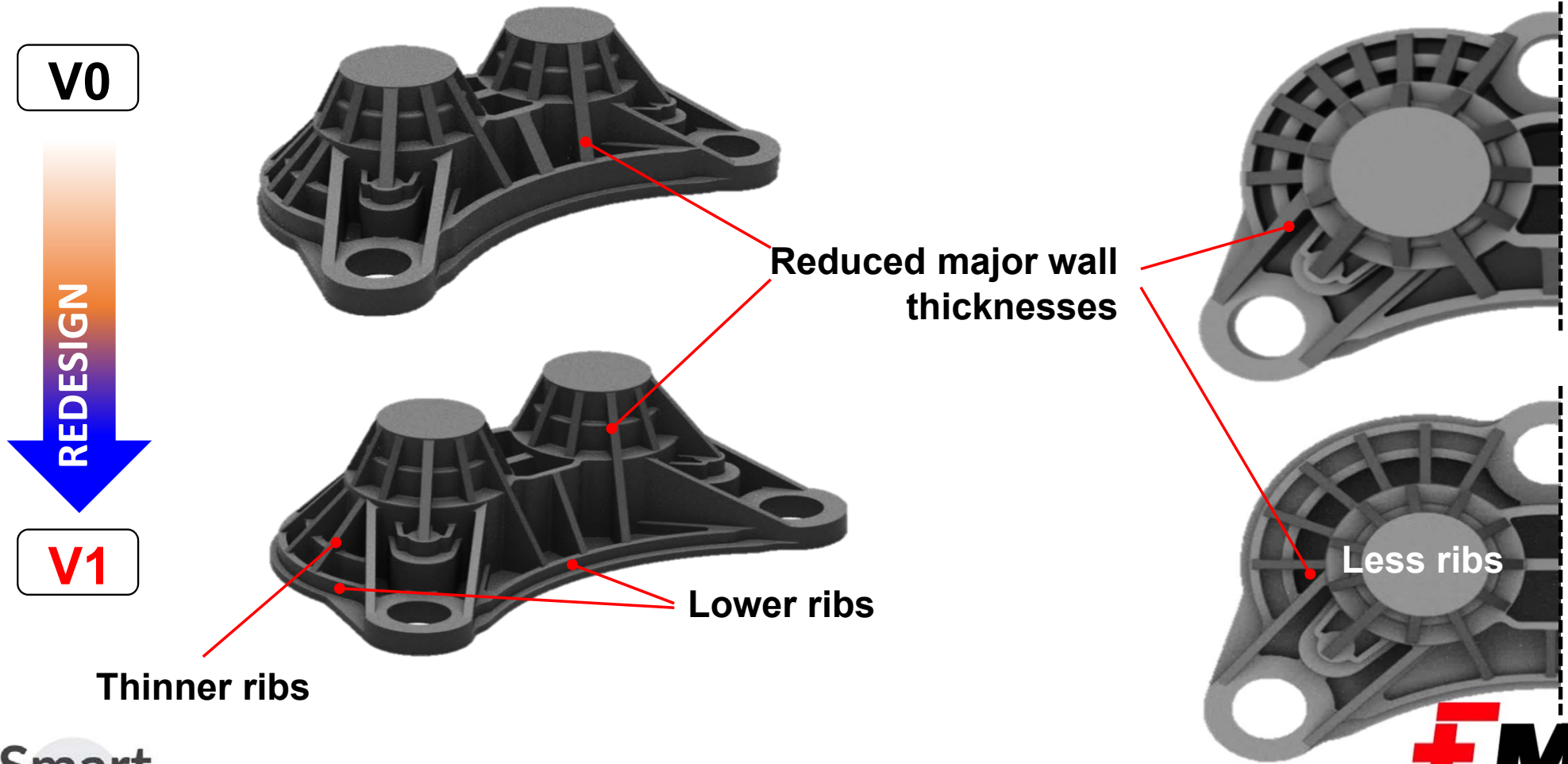
New Grivory HT6 GF50



Deformation scale: 20

Total deformation reduced to half

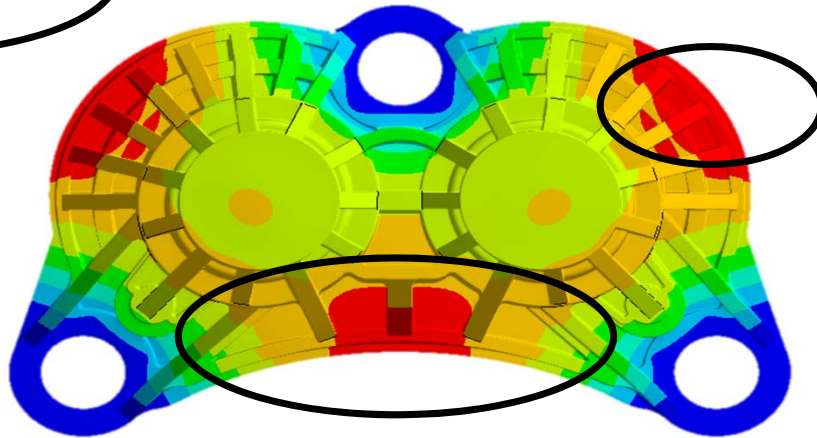
Grivory HT6: Stiffer & Lighter



Grivory HT6: Stiffer & Lighter

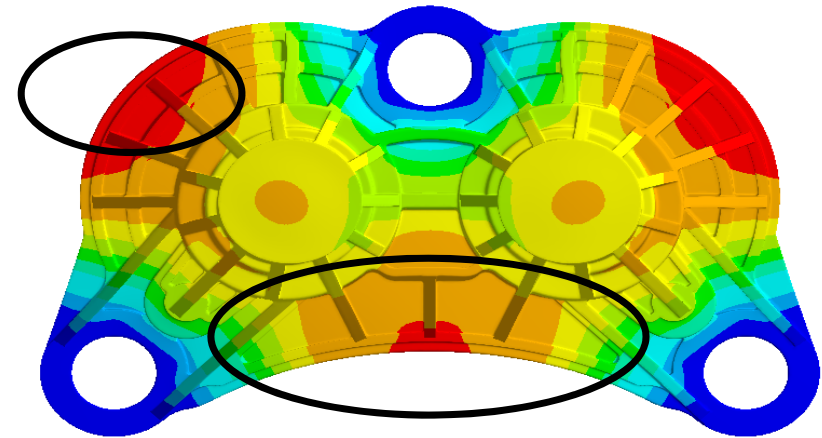
Standard PPA GF50

V0



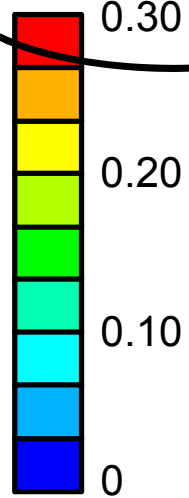
New Grivory HT6 GF50

V1



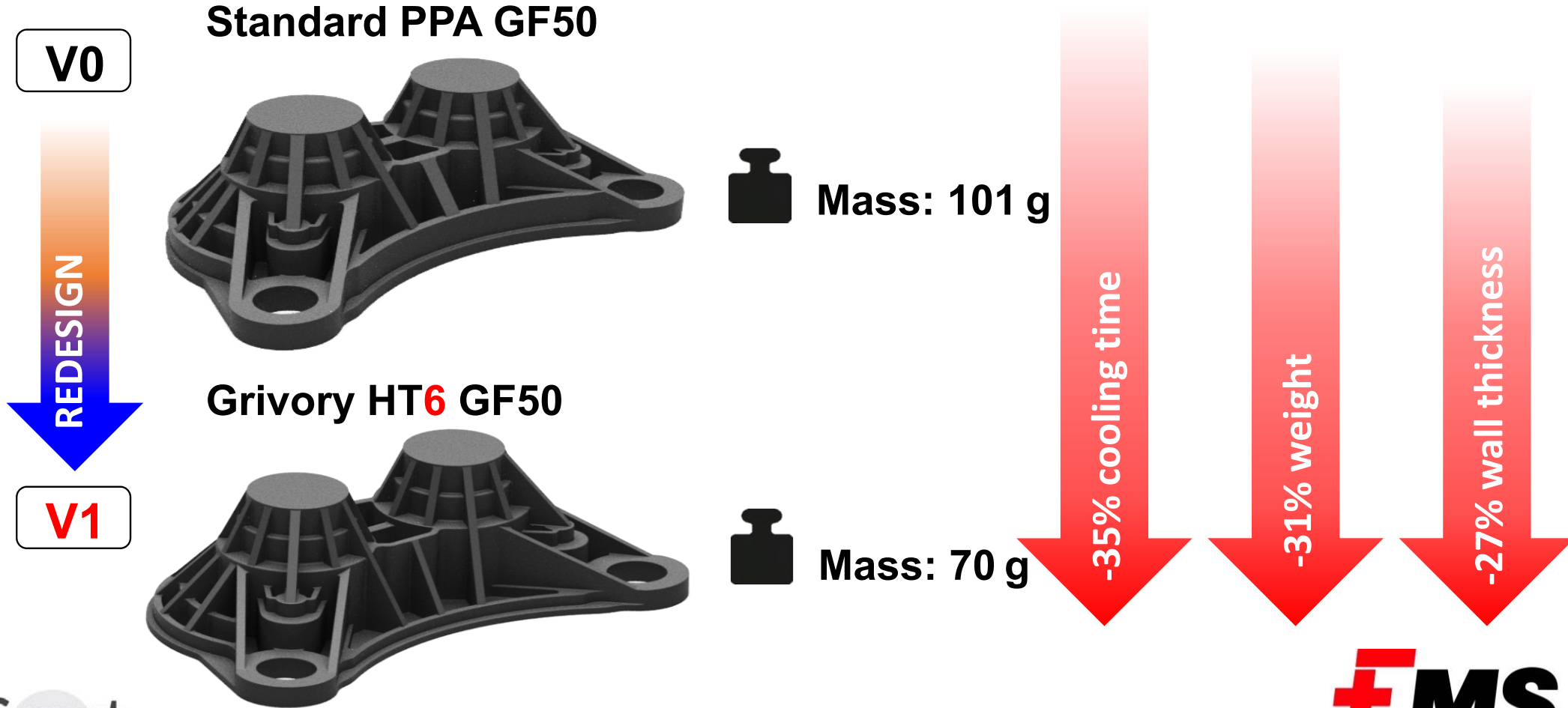
Same deformation with 31% less material

Total Deformation (mm)



Deformation scale: 20

Grivory HT6: Stiffer & Lighter





15-16
MAY
2019

MUSEO ALFA ROMEO, ARESE MI

Summary

- **Grivory HT consolidated material for Metal Replacement since 20 years**
- **2018: Boosted Performance up to 140 °C**
- **Exceptional Heat Deformation Resistance**
- **Extreme Creep Resistance**
- **Thinner Wall Thickness = Faster Cycle Time**
- **Further Weight & Cost saving**



Disclaimer

The information contained in this publication is based on our present knowledge and experience. The given figures and data are guidance values and do not represent binding material specifications. No warranties of any kind, either express or implied, including warranties of merchantability or fitness for a particular purpose, are given regarding products, design, data and information. The customer is not released from his obligation to investigate the products fitness and the suitability for the intended application, compliance with legal requirements and intellectual property rights. We reserve the right to change the information at any time and without prior notice. The information in this publication is not to be considered a contractual obligation and any liability whatsoever is expressly declined. For further questions about our products please contact our experts.