

WEBINAR



Measurable Benefits of Specialty Nylons in Water Management Structural Applications and Metal-to-Plastic Solutions

Presenters

Carlito Bangcuyo



- **Product Manager, NAFTA**
 - **7 years with EMS**
 - **Various commercial and technical roles**
 - **Focus: Product portfolio, Plant operations**
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Herbert Mossauer



- **18 years with EMS**
 - **Since 2016, KAM water management, NAFTA**
 - **Various technical roles**
 - **Focus: application development in I&C**
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Topics For Today

- **Value Proposition**

- **Value In Use**
 - **Measurable benefits**
 - **Successful case applications**

- **Key Material Requirements**

- **Service makes the difference**

- **Q&A**

Value Proposition

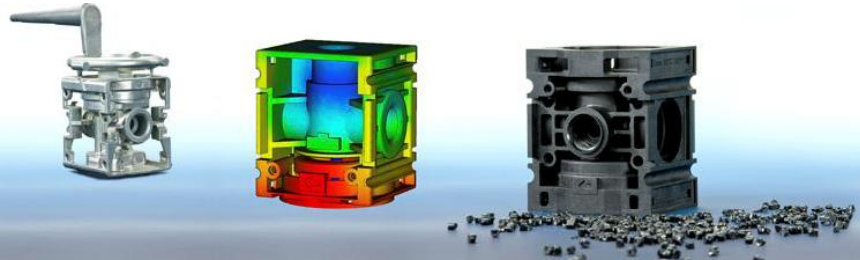
Unique polymer class often superior to off-shelf items

- **A “solutions” driven organization**
- **Leader in high performance applications**
- **Thorough project support**
- **Reliable lifetime prediction**

Are We Right For You ?

We seem to be a good fit for companies who tell us that they are:

- frustrated with not getting complete project support



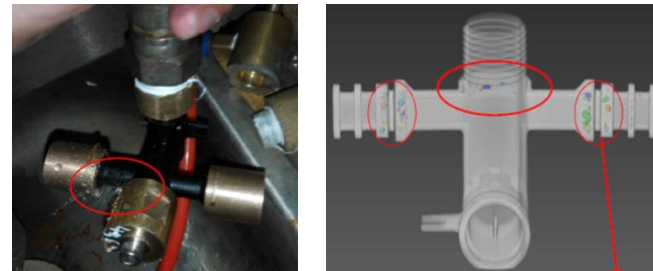
- competing on innovation and performance



- concerned about quality when replacing metals



- in need for a sustainable solution when parts fail



Value In Use



Measurable Benefits

- **Weight savings (up to 80%)**
- **Integrated Design Solutions**
 - **Simplification**
 - **Multi-functions**
 - **Differentiation**
- **Total cost savings (up to 70%)**

Metal Replacement | Water Distributor



Grilamid
EMS

- 80% weight savings
- 65% cost savings
- Lead-free
- No scale deposit

Why EMS?

- Long lasting (reliability!)

Metal Replacement | Water Distributor

Metal = 10 parts



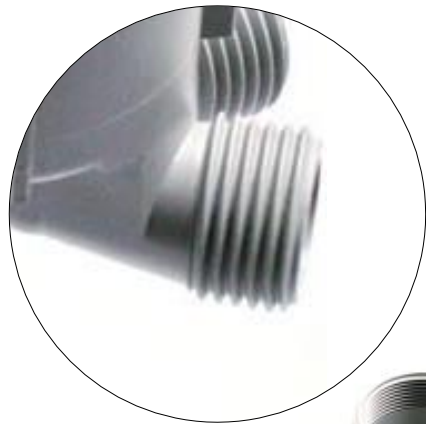
Polymer = 2 parts

- Part consolidation (10 → 2)

Why EMS?

- Ease of processing (one shot to finish solution)
- Development support

Metal Replacement | Water Distributor



- **Design flexibility & Integration**

Why EMS?

- **Ease of assembly (quick connector capable)**
- **Simplification (molded threads)**

Topics For Today

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- **Key Material Requirements**

- **Service makes the difference**

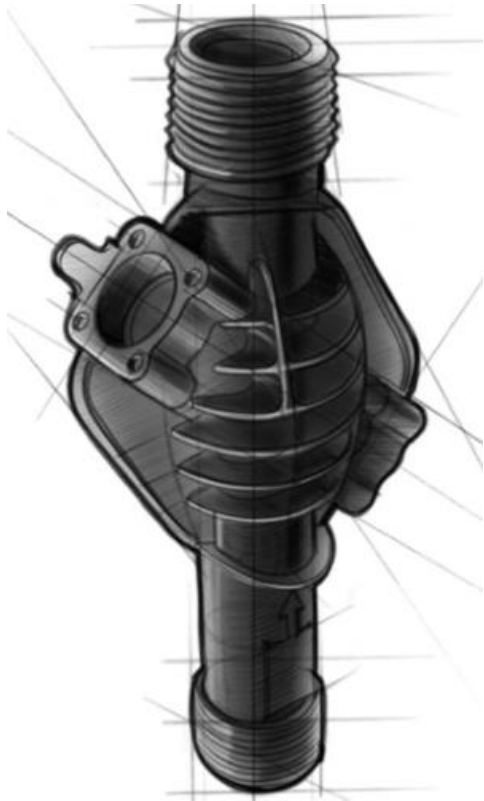
- **Q&A**

Meter | Bodies + Caps

Uniquely demanding: potential outdoor installation & non-regulated replacement

Why EMS?

- Up to 2x higher burst pressure
- Highest long-term hydrostatic strength
- Elimination of metal threads
- Smaller sections (less voids, fast cycles)
- Advanced freezing characteristics



Grilamid[®]
EMS

GRIVORY[®]
EMS

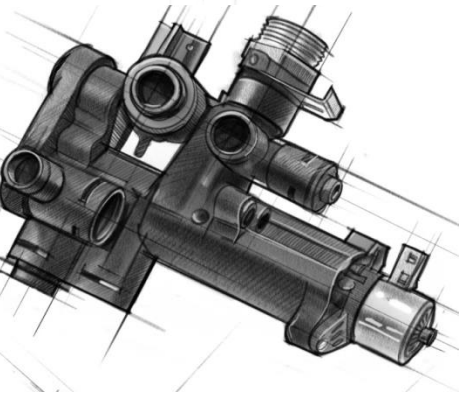
EMS
EMS-GRIVORY

Water Heater | Boiler

Application requirements meet EMS sweet spot performance profile

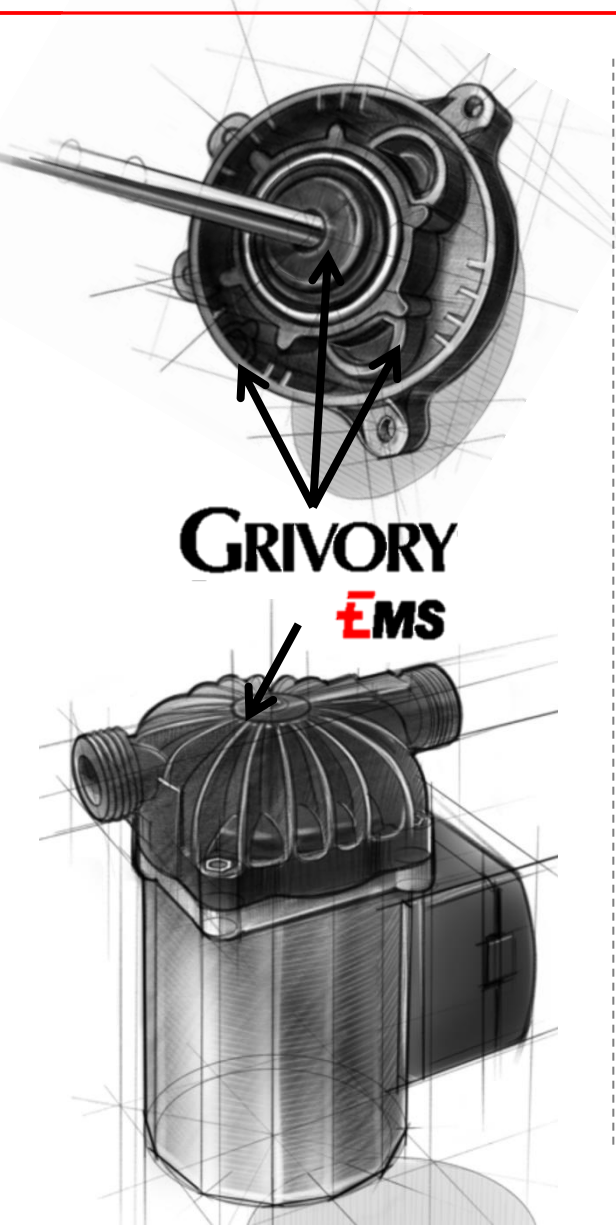
Why EMS?

- Safety against water leakage
- High HDT (1400°F dry test)
- Low thermal exp. / creep resistance
- High weldline retention



GRIVORY®
EMS

Pump | Housing & Drive Train



Cost and weight savings for traditional and new application areas

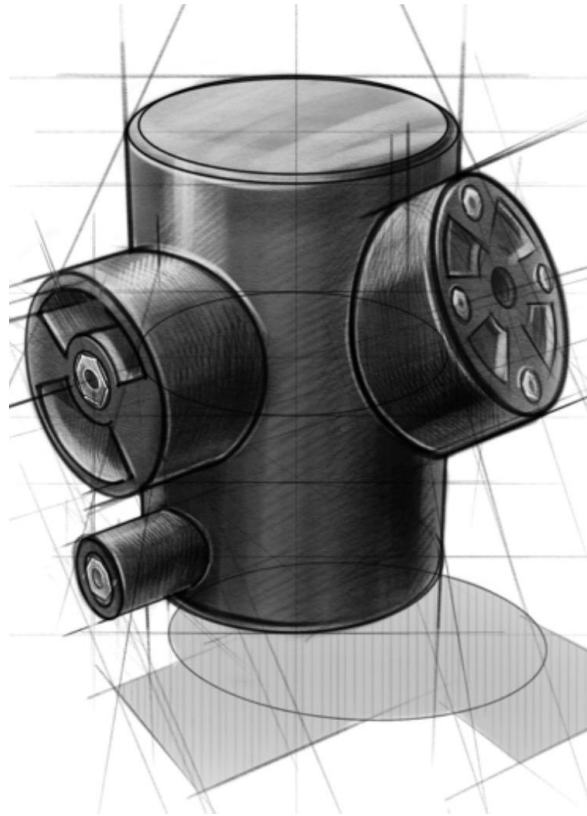
Why EMS?

- 40% cost savings
- Consistently high pump efficiency
- Longer rubber diaphragm life

Why EMS?

- Tougher at weldlines vs. PPS & PPO (overmolded metal inserts / bearings)

Flow Control | Backflow Valve



More robust solution for a conservative industry

Why EMS?

- **Ease of manufacturability**
 - ⇒ wide processing window (0.85" walls, 2.25lbs)
 - ⇒ enhanced ductility (overm. inserts)
- **Outdoor usage (UV, freezing)**

Grilamid®
EMS

EMS
EMS-GRIVORY

Faucet | Thermostatic Mixing Valve



High functionality in a small space

Why EMS?

- Stronger sections and weldlines
- Ease of manufacturing
- High ductility when integrating snap-fits
- Exceptionally little wear
- Smooth surface finish (O-ring friendly)

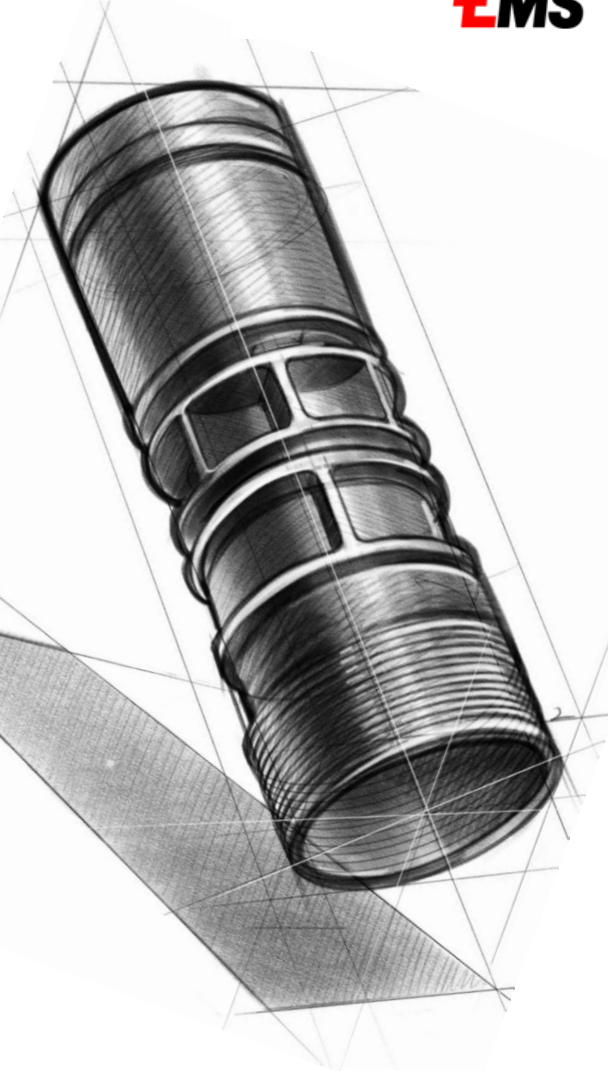
Faucet | Stem (Cage)

GRIVORY®
EMS

Metal-like feel no jiggling and loosening for stems and fixation elements

Why EMS?

- **+50% thread strength and pre-force retention vs. PA66 & PPE**
- **Leaner parts with stronger features**
- **Safe use of self-tapping screws**



EMS Structural Grades

Grilamid[®]
EMS

Long chain nylons

Grilamid LV (PA12)

Grilamid LBV (modified PA12)

GRIVORY[®]
EMS

Partial aromatic nylons

Grivory GV (PAPA)

Grivory HTV (PPA)

Key Material Requirements



- **Water resistance**

⇒ swelling, hydrolysis, chlorine

- **Pressure resistance**

⇒ short and long-term

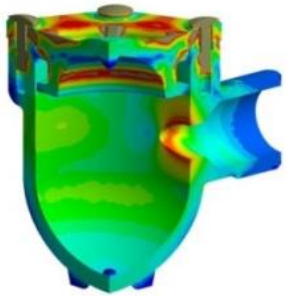
- **Load resistance**

⇒ assembly, piping system

- **Ease of manufacturing**

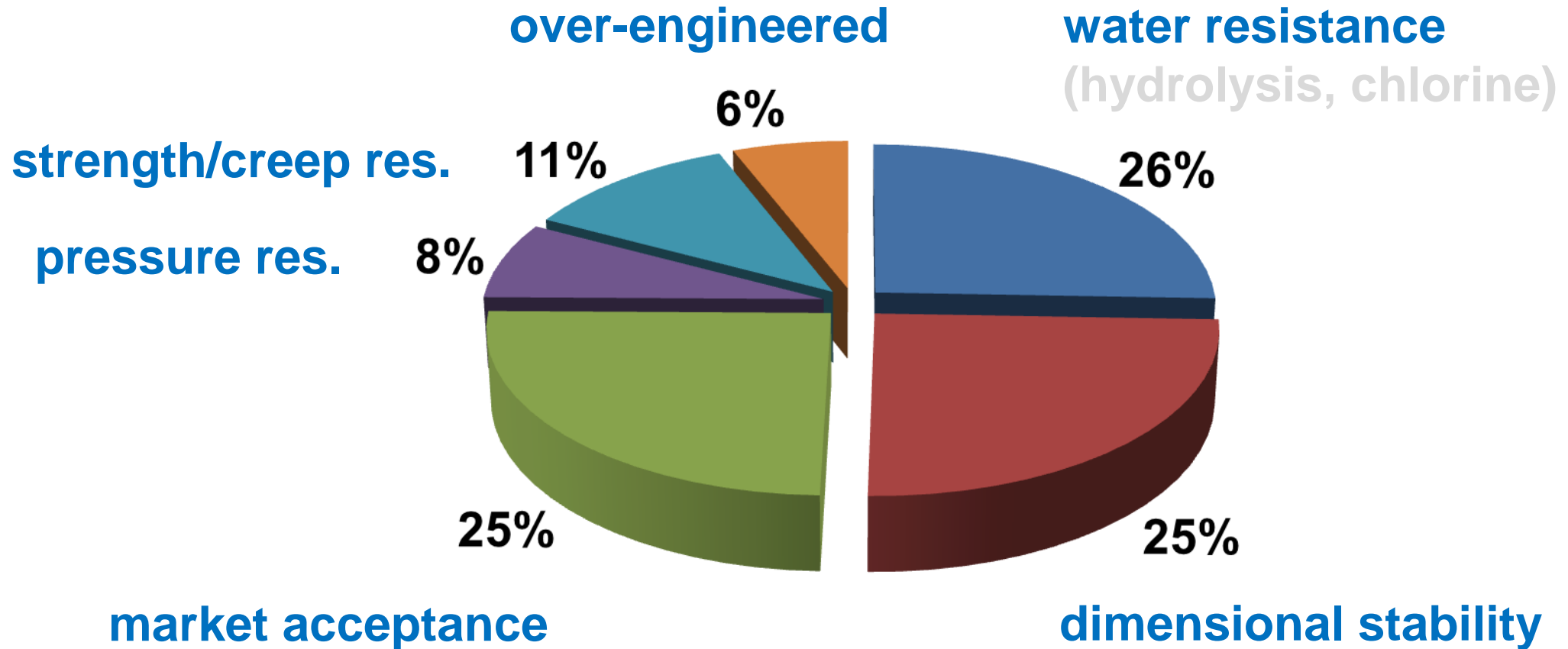
⇒ productivity, complexity

- **Approvals**



Limitation Using Nylons in the US?

Based on a survey conducted during the registration

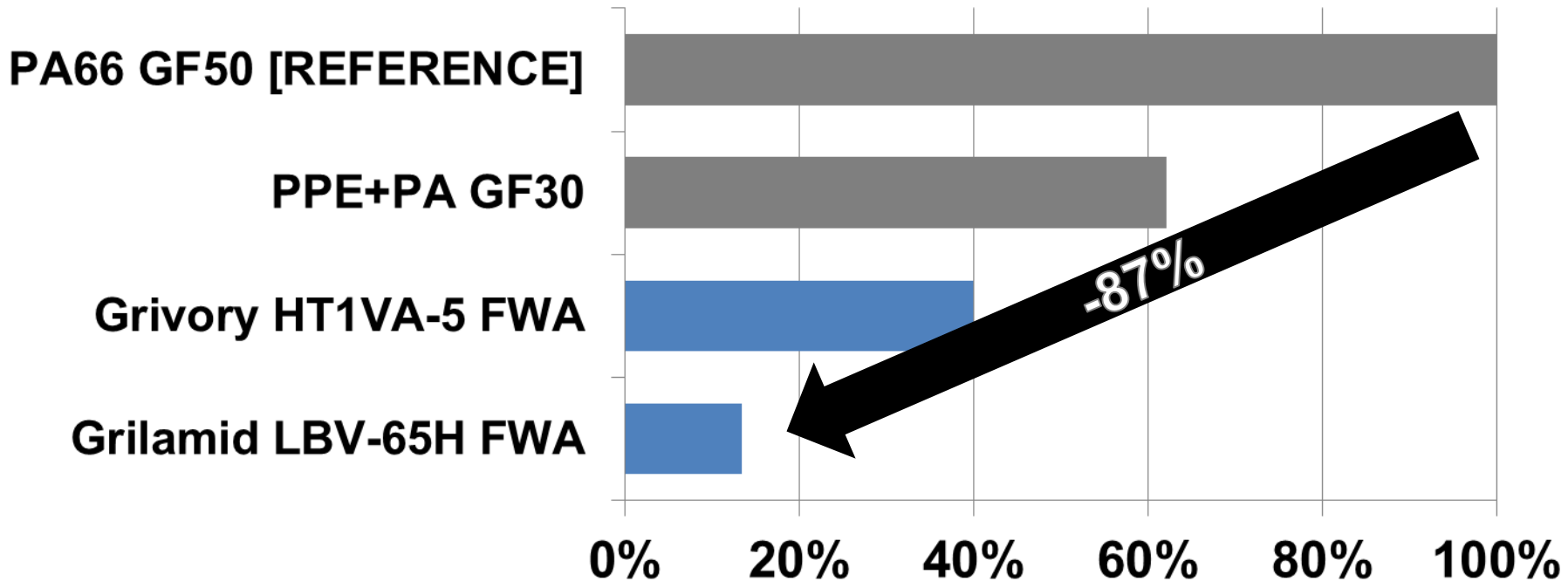


Swelling | Nylon-Based Materials

Typical pressure vessel setting

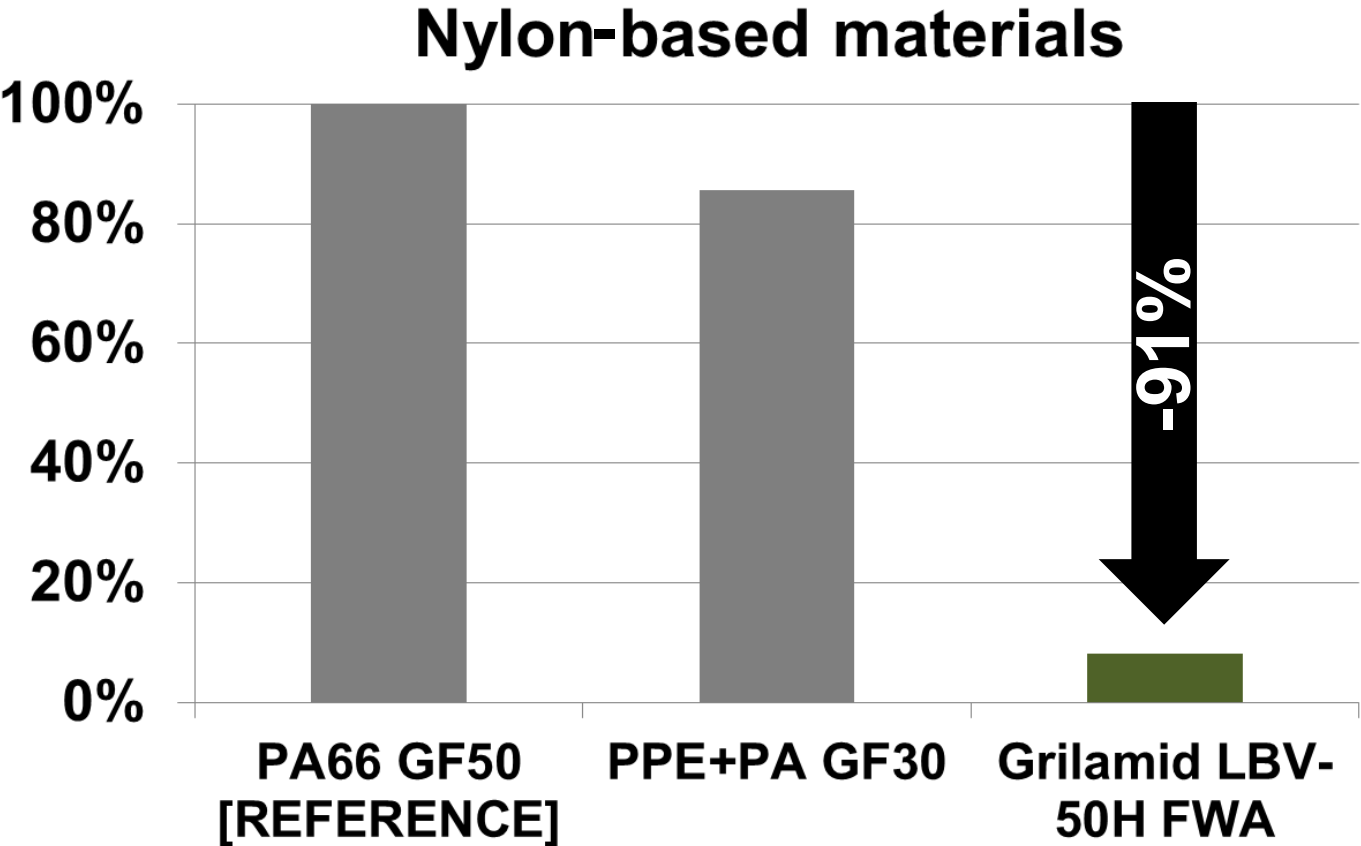
(one side water contact, random GF orientation)

Tolerance Range



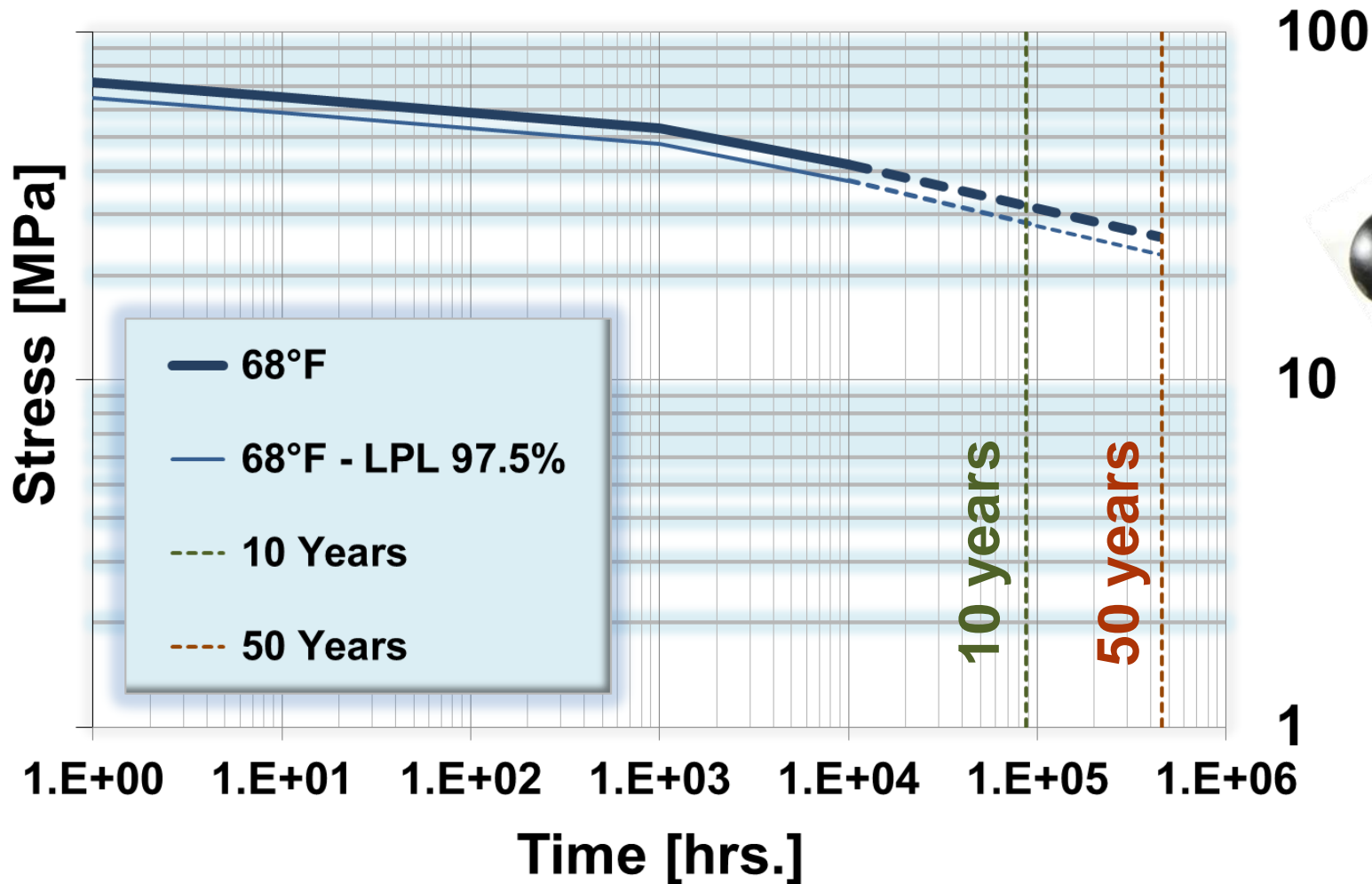
Chlorine Resistance

Nominalized Weight Loss
[6'720 hrs. at 140°F & 10ppm ClO,
fully submerged ISO527 tensile bars]

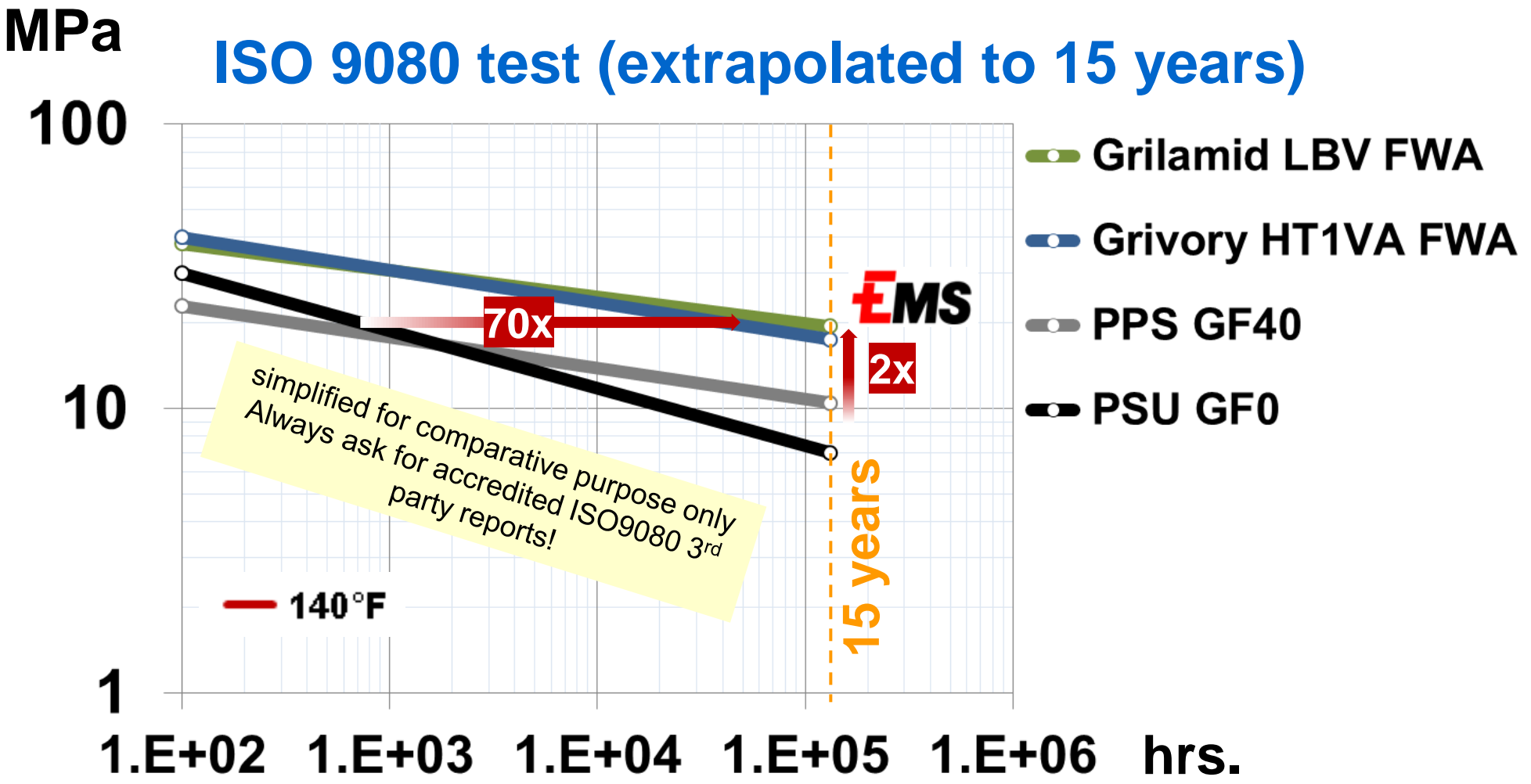


Long Term Hydrostatic Strength (LTHS)

ISO 9080 test (~ASTM D2837), Grivory HT1VA-4 FWA



EMS Nylons | Superior Creep Rupture



EMS materials under one-sided water contact
 Source: SKZ (EMS), published source on WWW (PPS, PSU)

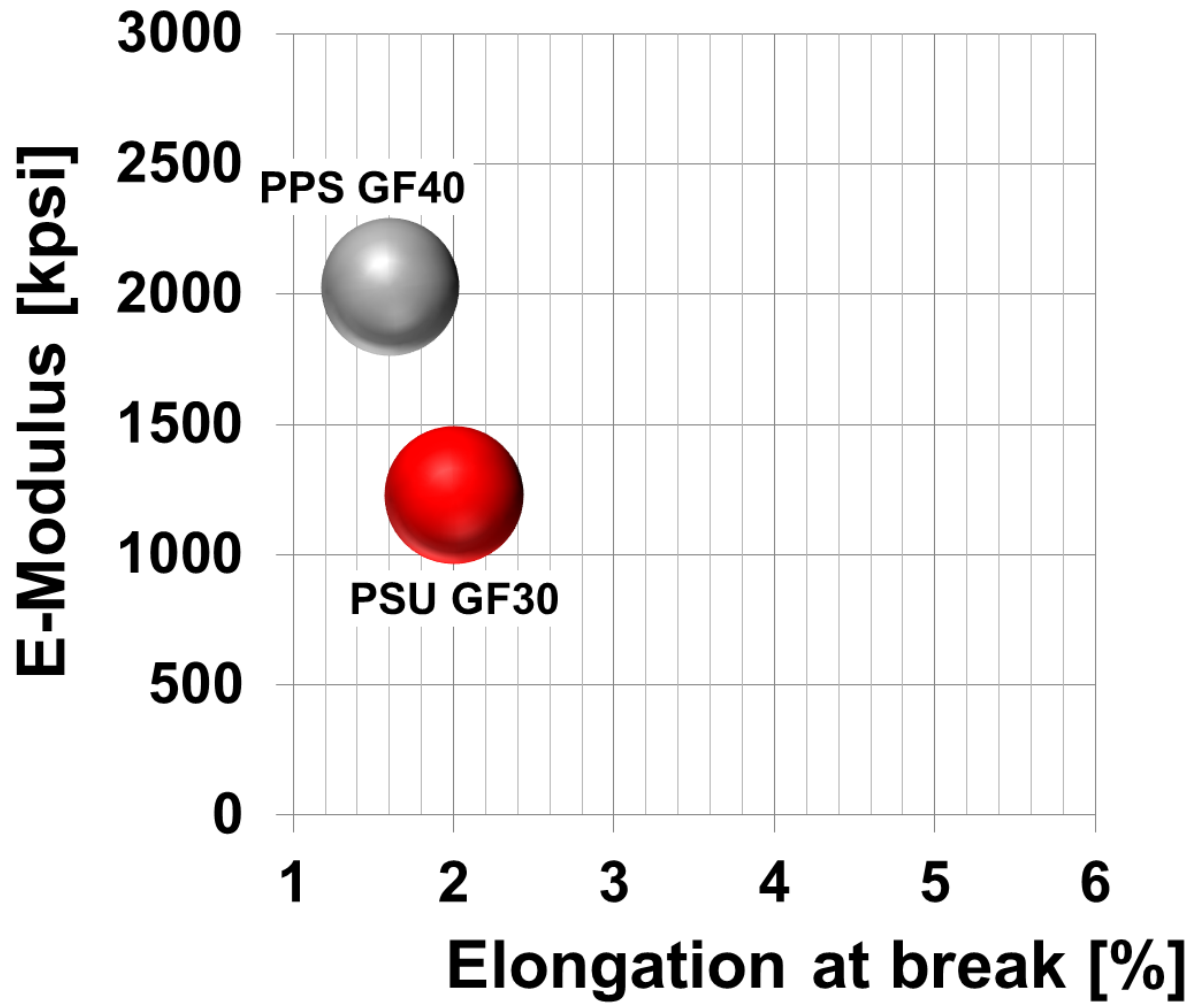


Grilamid LBV | Superior Robustness



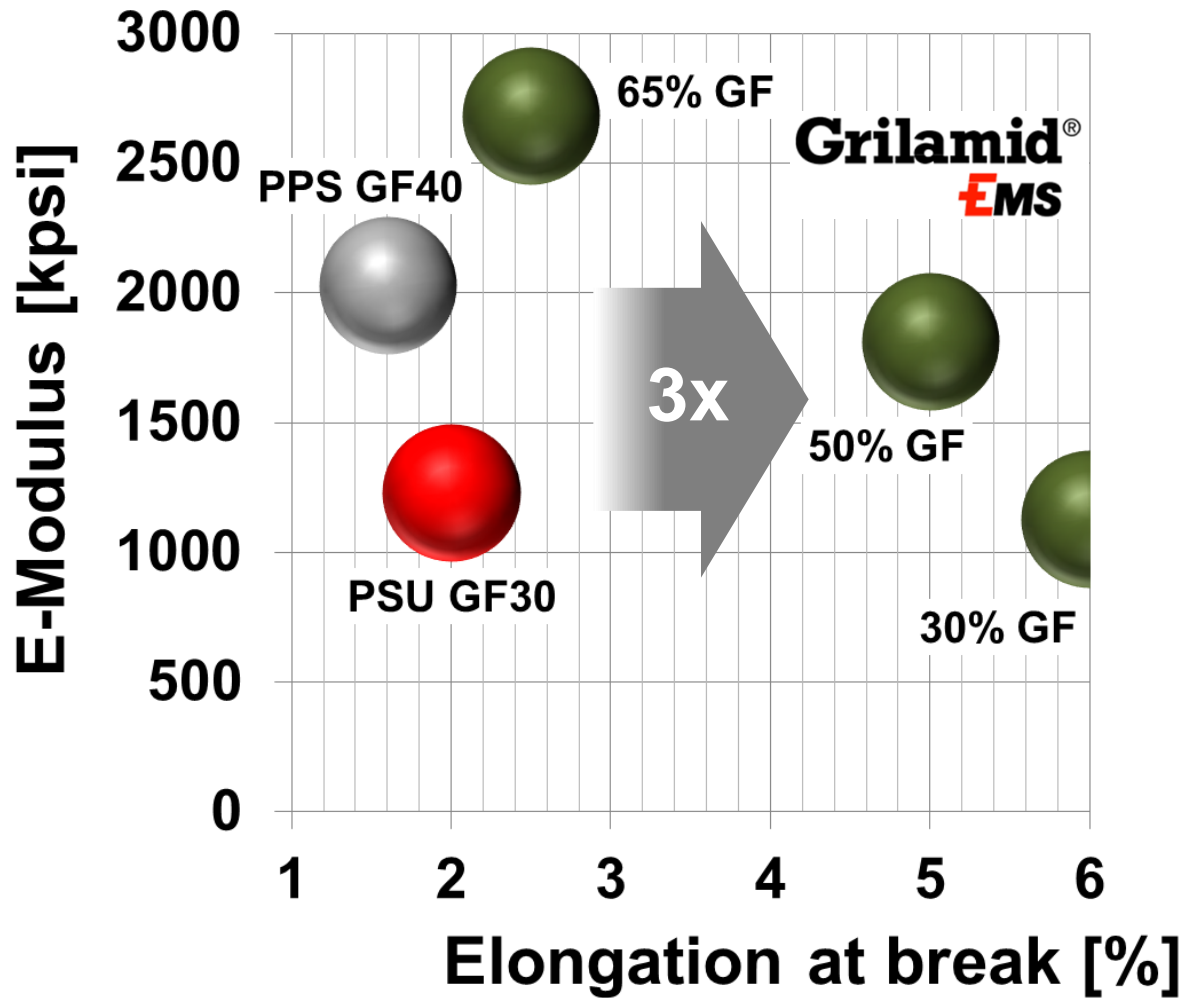
Most desired profile
=
Combination of high
Stiffness
and
Toughness

Grilamid LBV | Superior Robustness

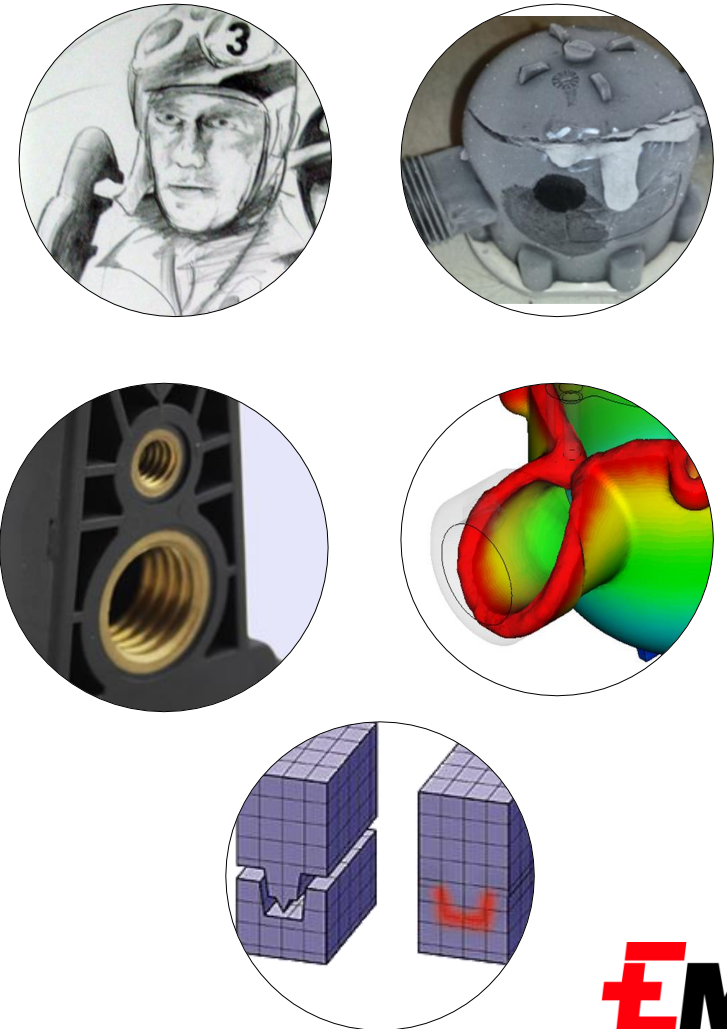


* conditioned test probes

Grilamid LBV | Superior Robustness



Relevance

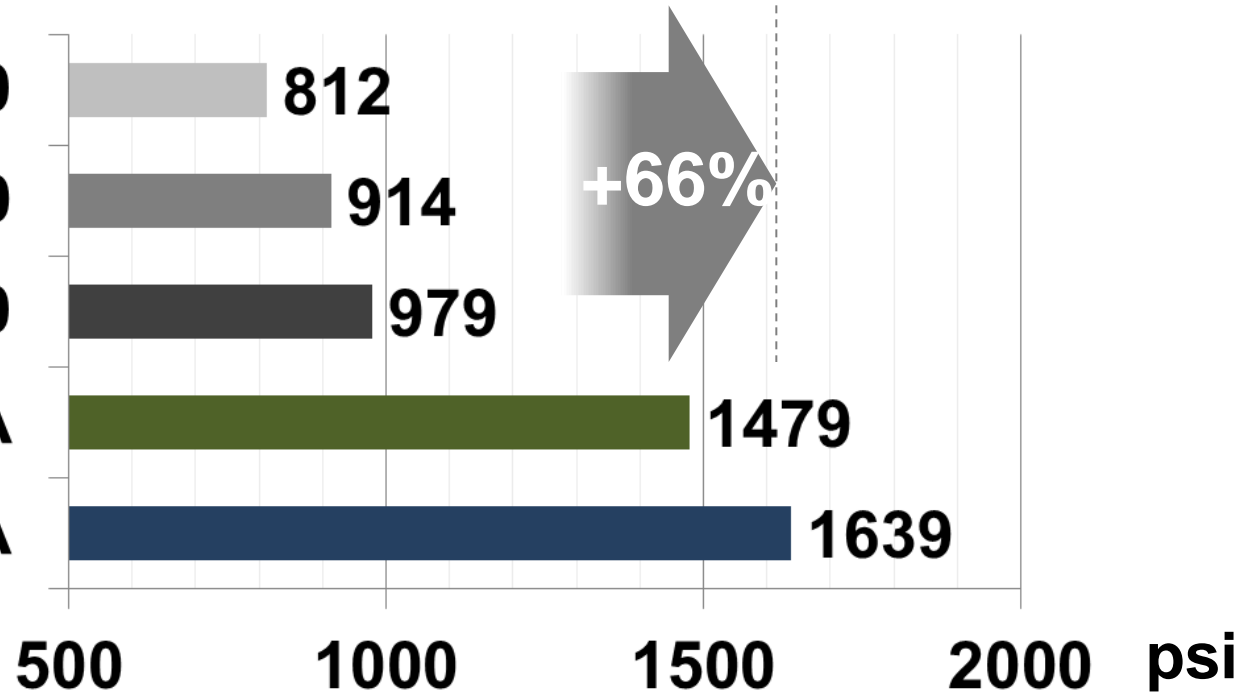


conditioned test probes

Initial Burst Pressure



PPS GF40
PSU GF30
PPE GF30
Grilamid LBV-65H FWA
Grivory GV-5 FWA

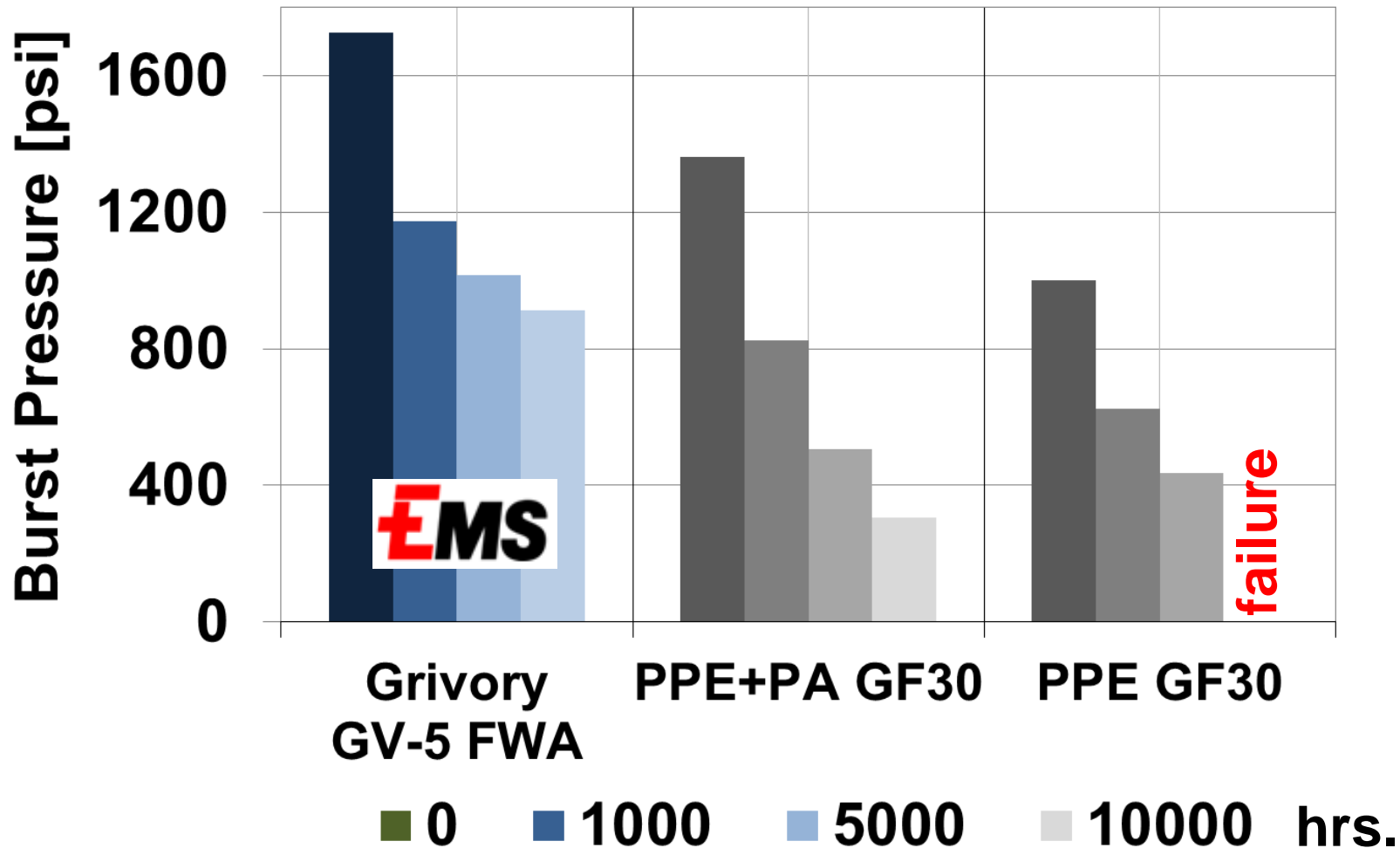


74°F, d.a.m., 2bar/sec.

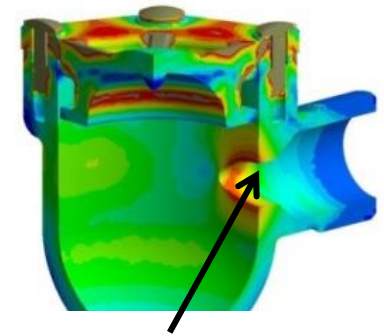
conditioned test probes

Burst Pressure Retention

Circulated pressurized water (158°F & 116psi)



EMS meter

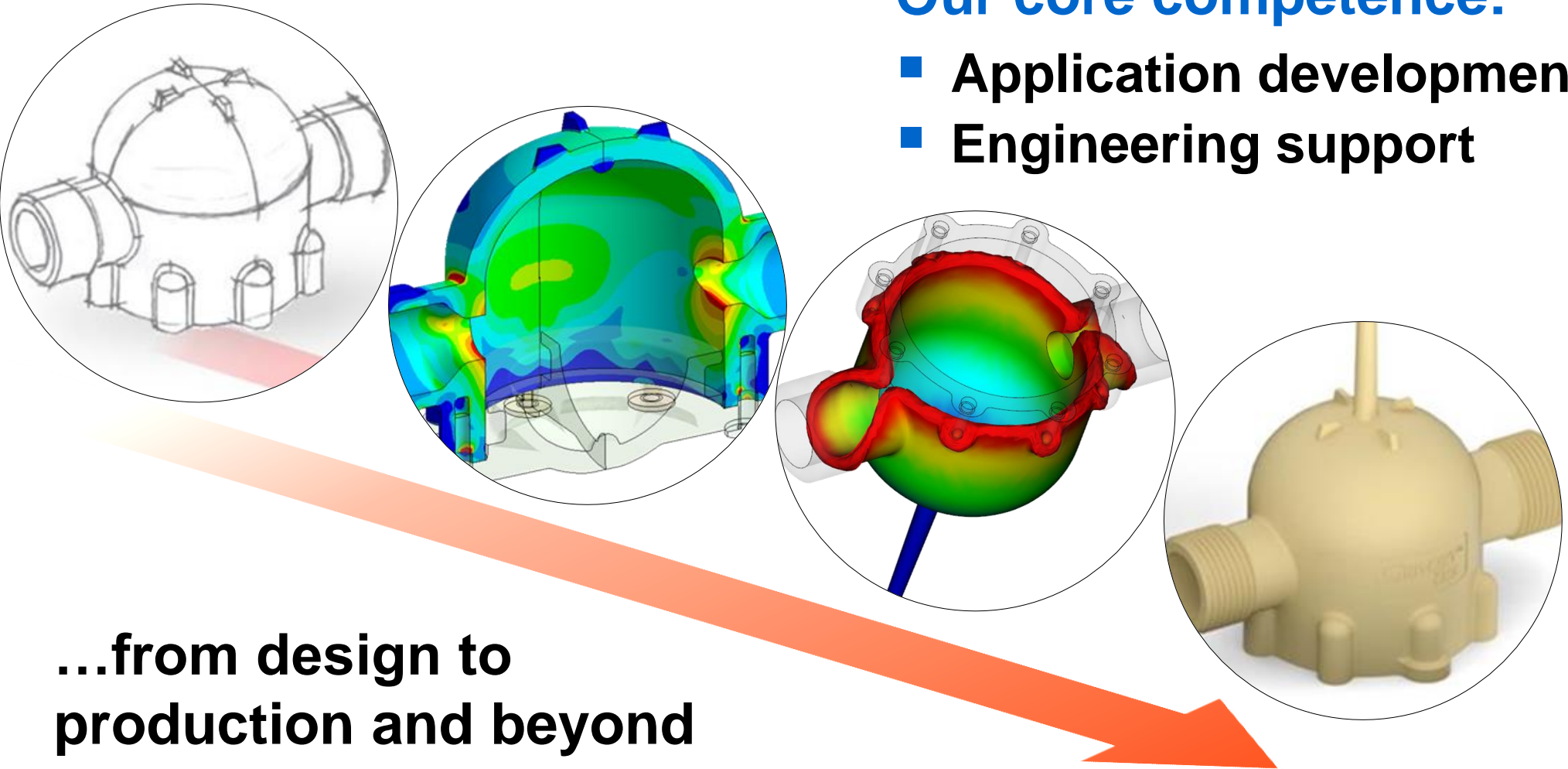


critical weldline

Service Makes The Difference

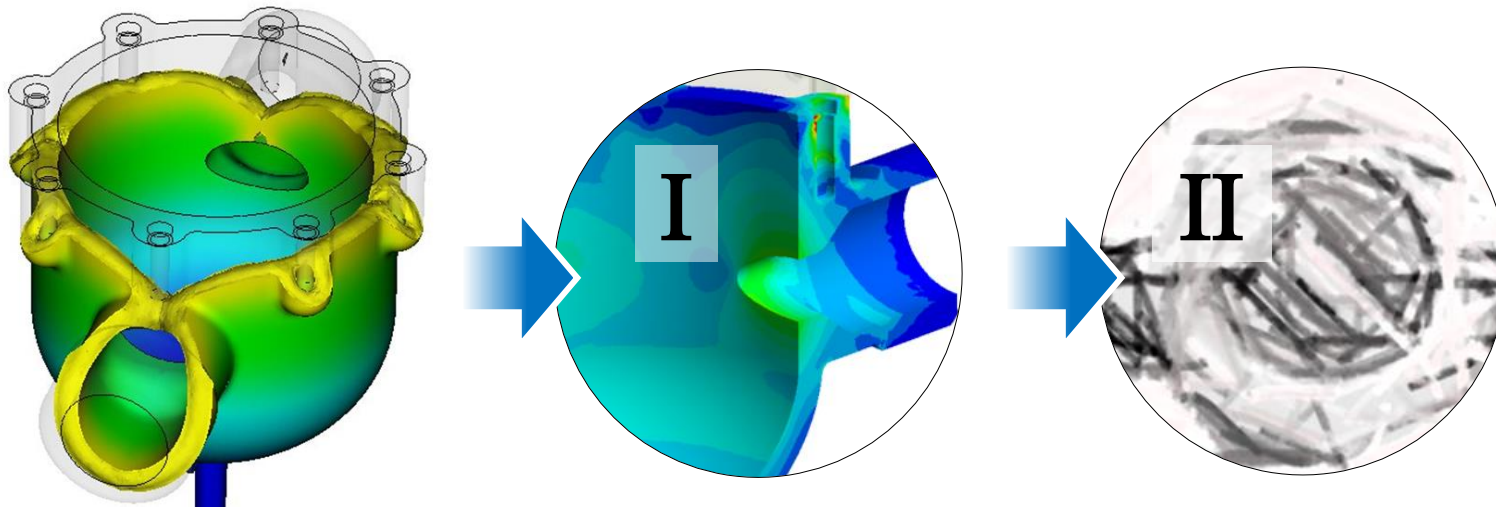
Our core competence:

- Application development
- Engineering support



Access To Patents + Advanced Design

Overcome Limitations of Weldlines



- Up to **80%** higher burst pressure
- Up to **2 orders of magnitude** more cycles & time to failure

Value Proposition

Unique polymer class often superior to off-shelf items

- A “solutions” driven organization
- Leader in high performance applications
- Thorough project support
- Reliable lifetime prediction

Switzerland



Sumter, SC

EMS
EMS-GRIVORY

THANK YOU FOR YOUR TIME TODAY!



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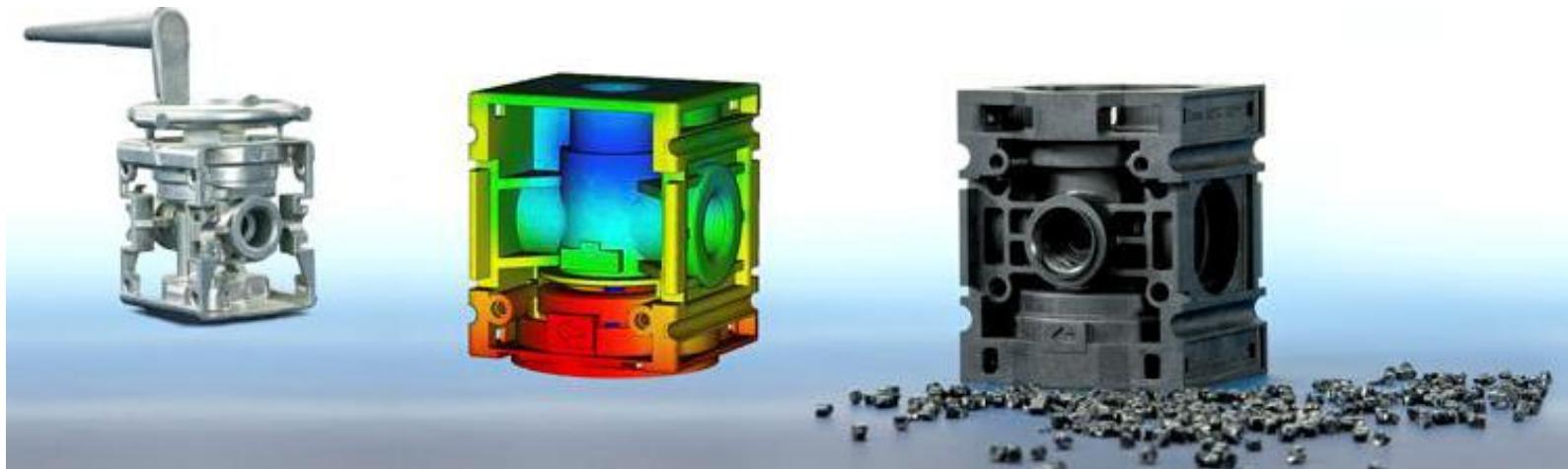
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Add-On

Add-On

Approvals

Limitless applications due to broad approvals and the compliance with all major global standards

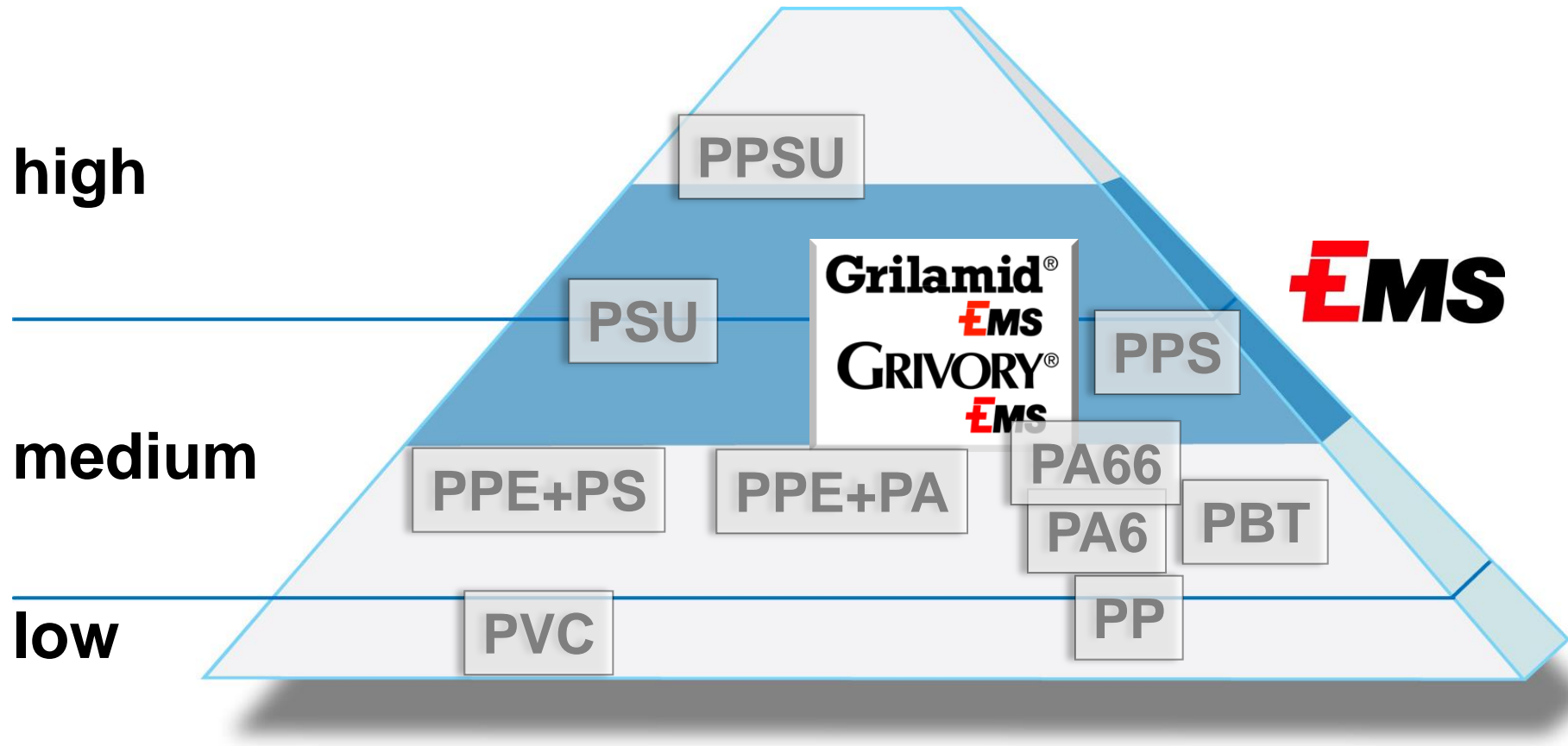
FWA = food and potable water approved grades



Structural Grades

Requirements | Residential Water Management

(≠ price indication)



What Makes EMS Nylons Different

Grilamid[®] Long chain nylons
EMS (PA12)



Grilamid LBV FWA

B... *polymer blend enhancement*

- **stiff and tough**
- **super resilient** (water, pressure, UV)
- **ease of manufacturing**

What Makes EMS Nylons Different

GRIVORY®
EMS

High temperature partially aromatic nylons (PPA)



Grivory HT1VA **A** FWA

***A...** next generation hydrolysis improved*

- excellent **hydrolysis** resistance
- excellent **creep** rupture performance
- superior **thread** strength

What Makes EMS Nylons Different

GRIVORY[®] Partially aromatic
EMS nylons (PAPA)

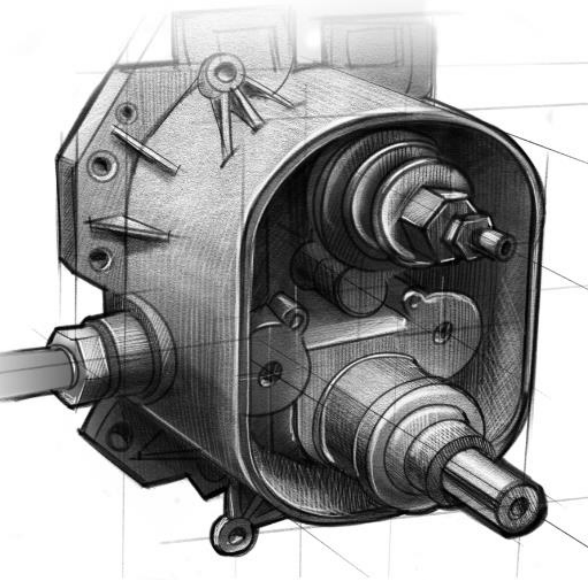


Grivory GV FWA

Economy + for non- & cold water contact

- **stronger** parts compared to **PPE & PA66**
- **superior strength** (threads, weldline, burst)
- **superior in creep rupture** (LTHS)

Shower | Smart Shower Valve



Grilamid[®]
EMS

Miniaturization, cost pressure, complex designs

New design possibilities to simplify manufacturing & ensure reliability

Why EMS?

- **Ability to handle complicated designs**
- **Unmatched multi-shot & in-mold assembly capabilities**
- **Stronger weldlines for higher burst pressure and its retention**

EMS
EMS-GRIVORY

Shower Head | Internal Components

Structural integrity and flexibility

Why EMS?

- Secure overmolding with LSR (380°F) and strong bonding
- Resistance (cleaning agents & de-scaler)
- Suitable for use with ultrasonic welding

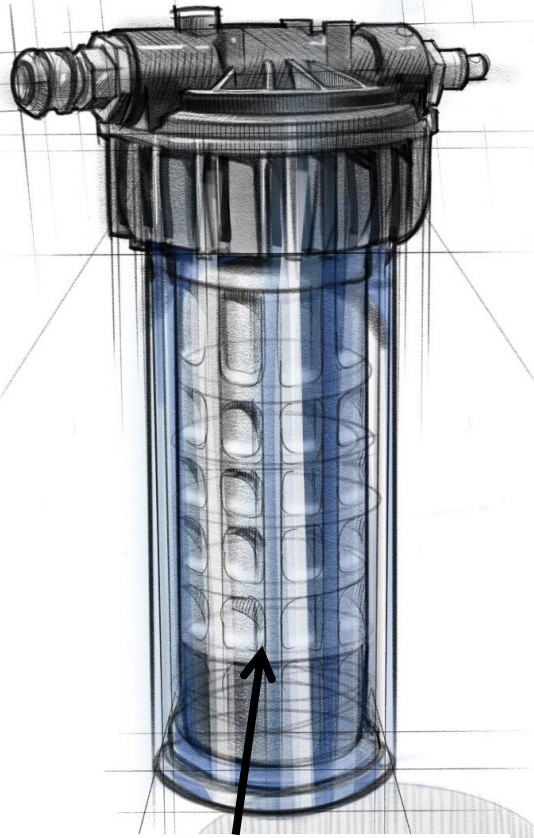


GRIVORY®
EMS

EMS
EMS-GRIVORY

Filtration | Head + Bowl

GRIVORY®
↓ **EMS**



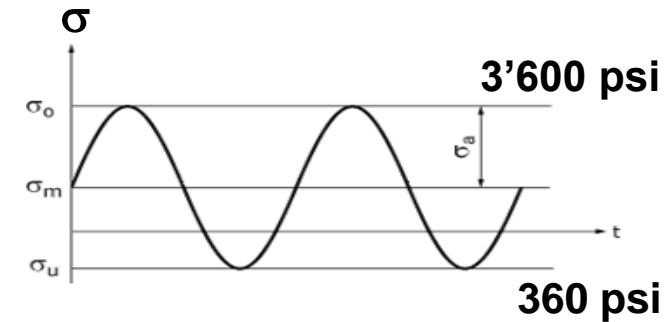
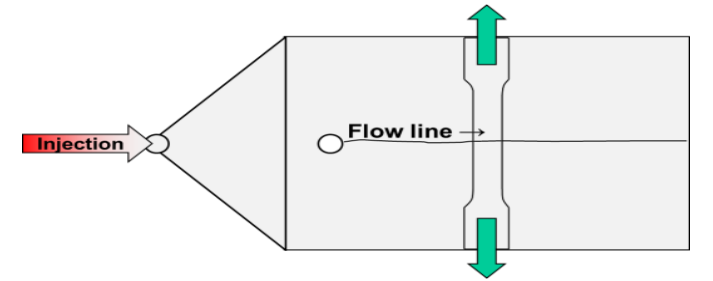
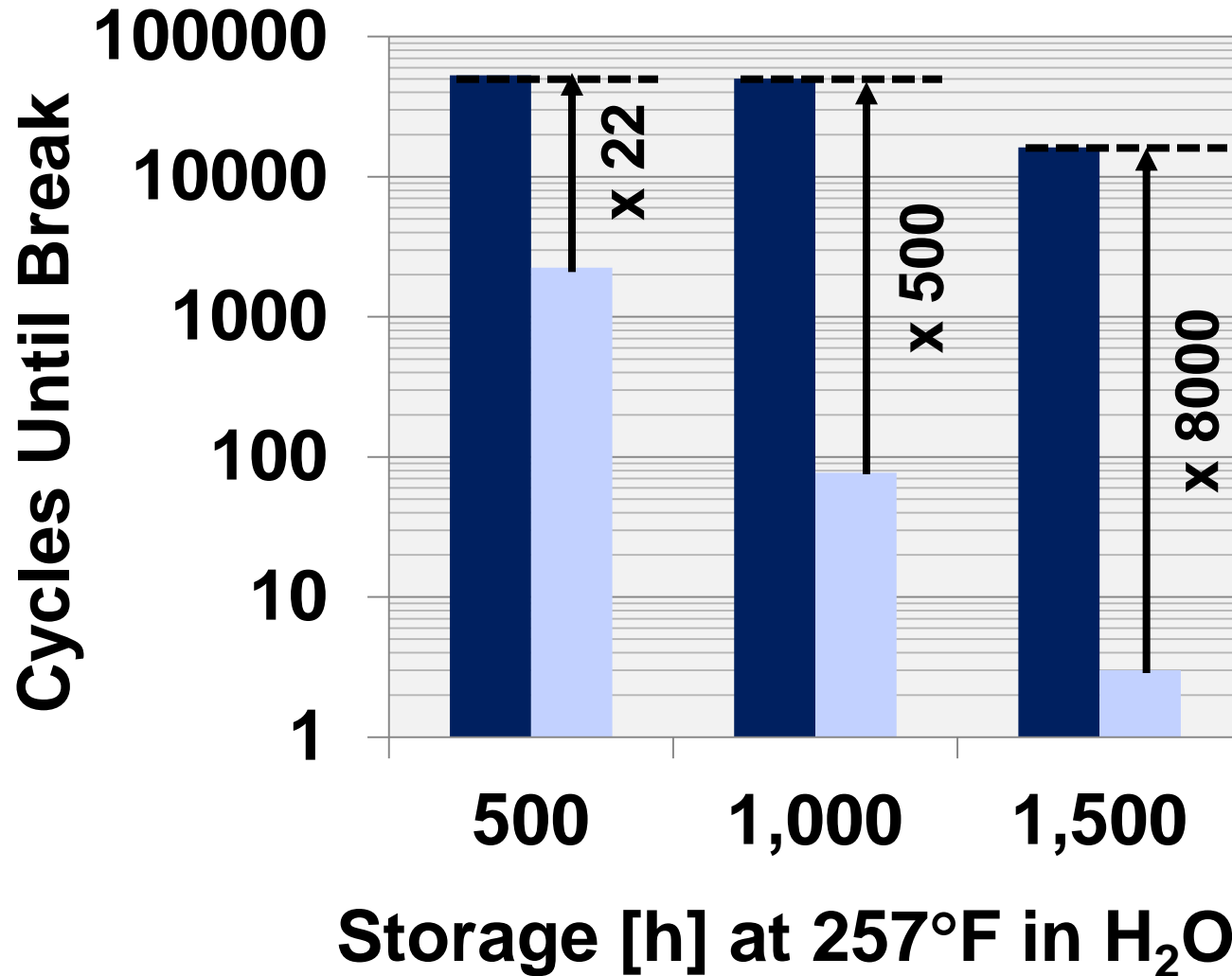
Grilamid TR®
EMS

Grilamid TR: Unique Clear and Resilient

Why EMS?

- Water clear and highly transparent
- Superior stress cracking resistance
- Unmatched pressure cycle resistance
- UV resistance similar to PMMA
- Safe: BPA/S free, Cal. 65 compliant

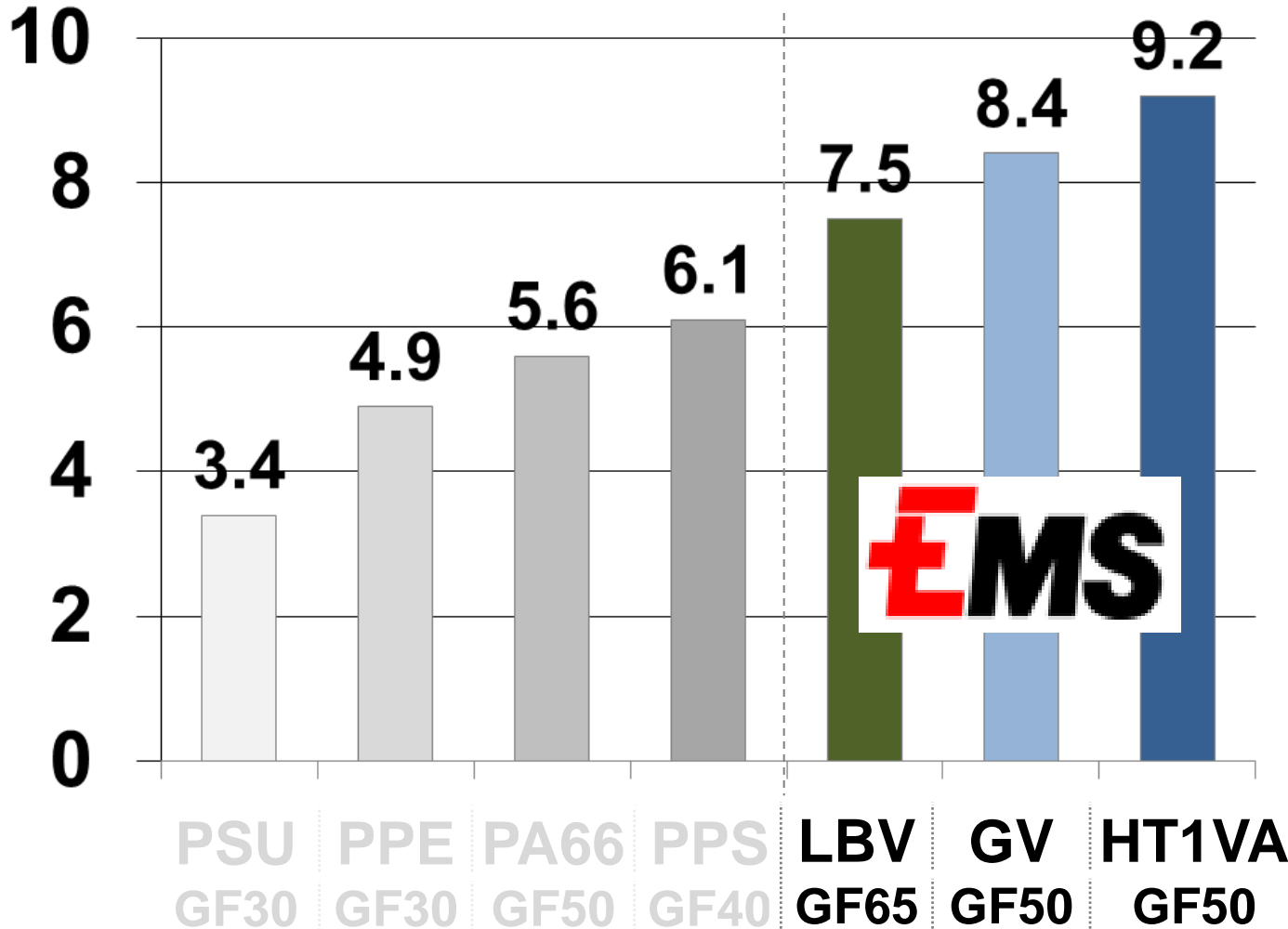
Grivory HT1VA | Superior Hydrolysis Res.



- Grivory HT1VA-4 FWA
- Conventional PPA

Assembly and Operation Safety

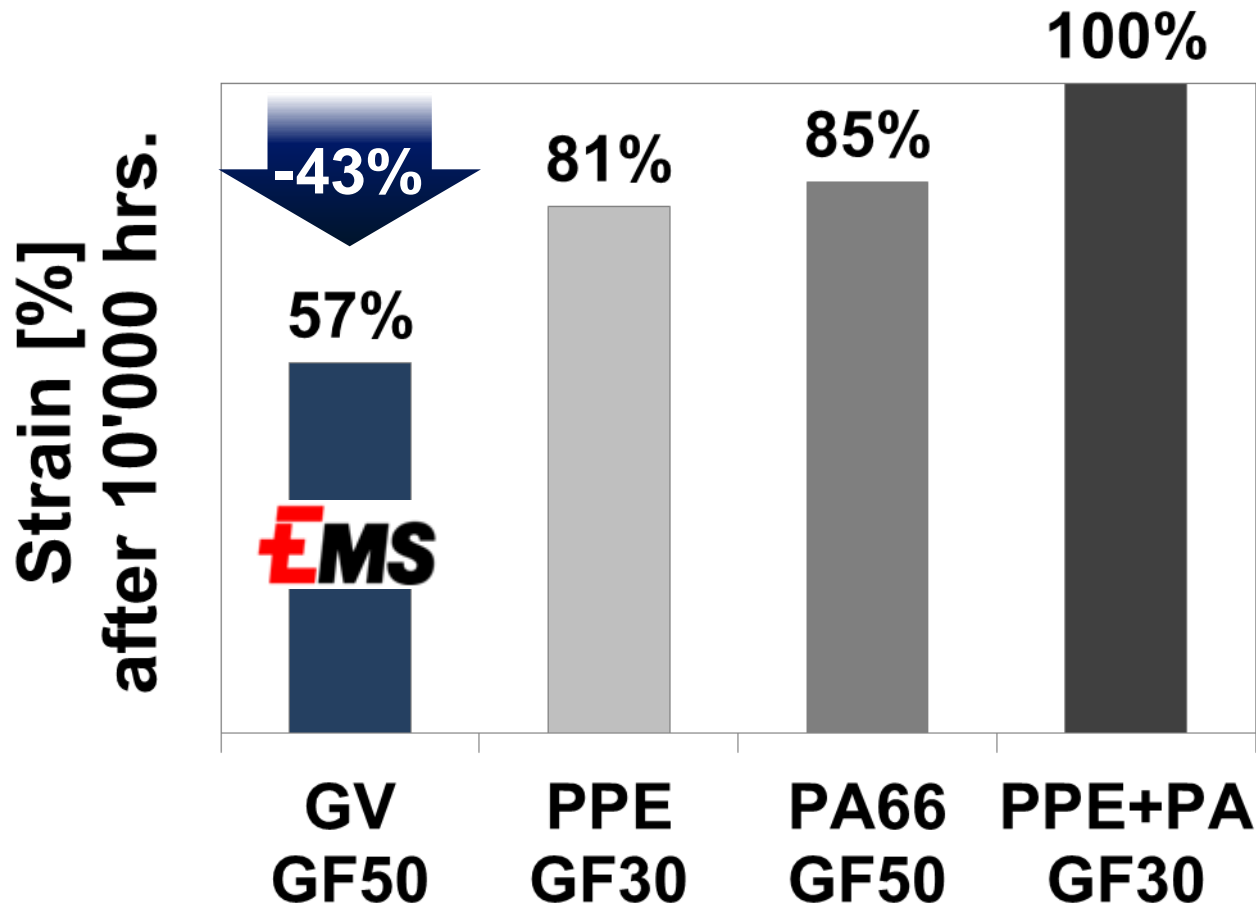
kN **EMS = highest strength** ⇒ **replace metal inserts**



M4 (0.47" tubus)
3xD screw depth
73°F, cond., 0.2"/min

Tensile Creep Comparison

Grivory GV = reduced jiggling and loosening



40MPa @ 73°F, cond.

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