

# Evonik Business Line Interface & Performance

## Additive Solution for Plastics Recycling

Interface & Performance  
Business Line  
Compounds Team



**LEADING BEYOND CHEMISTRY  
TO IMPROVE LIFE, TODAY AND TOMORROW**

# Evonik aligned to sustainability

## Sustainability as part of portfolio and strategic management processes

### Excellent Rankings

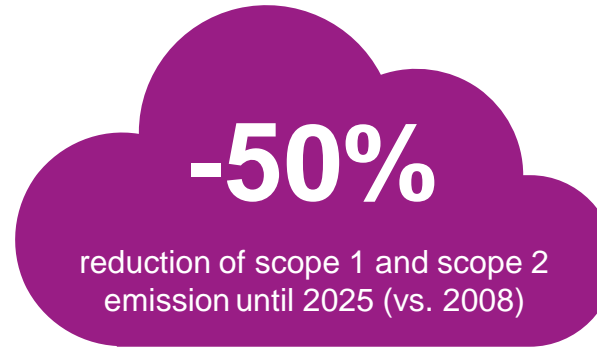


### Sector leading rankings

Evonik amongst leaders in all relevant ratings<sup>1</sup> – “AA” MSCI ESG rating, EcoVadis “Platin” rating, “B-” ISS Oekom and “A-” CDP rating

1: See presentation back-up for rating details

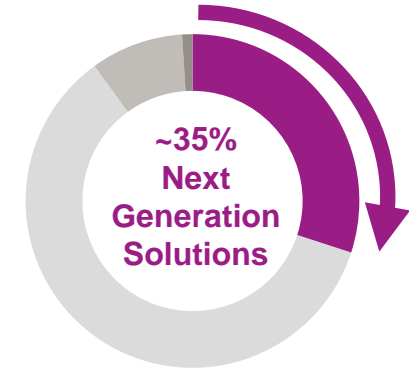
### Environmental Targets



### Ambitious environmental targets

Evonik’s sustainability strategy 2020+ with ambitious climate and water targets

### Portfolio Management



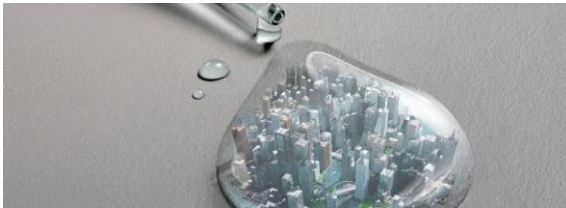
### Portfolio aligned to sustainability

~35% of sales with products and solutions with a clearly positive sustainability profile that is above or well above the market reference level; integration of sustainability into strategic management processes and decisions

# Leading Beyond Chemistry – Growth divisions of Evonik

Specialty chemicals portfolio with strong positioning and attractive financials

## Specialty Additives



Wide range of additives for **maximum performance** which make the key difference

## Nutrition & Care



Sustainable solutions for basic human needs in **resilient end markets** like pharma, personal care and animal nutrition

## Smart Materials




Innovative materials that enable **environmentally-friendly solutions** for mobility, environment and urbanization

**Strong positioning ...**

**... and attractive financials<sup>1</sup>**

 Sales: €3,225 m

 Margin: 27%

 ROCE: 16%

 Sales: €2,992 m

 Margin: 19%

 ROCE: 8%

 Sales: €3,235 m

 Margin: 16%

 ROCE: 6%

1: FY 2020

# Five leading & versatile Business Lines In Specialty Additives Division

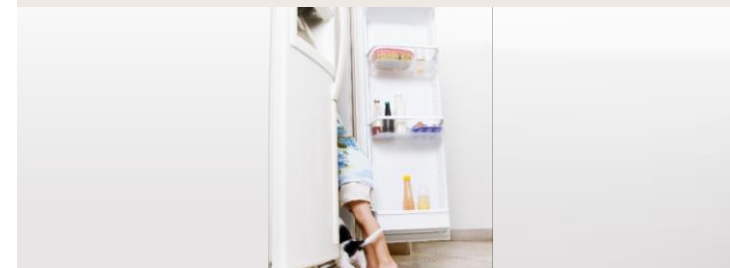
## COATING ADDITIVES

Visionaries have no rivals: Coating Additives the no.1 supplier of high performance solutions for coatings & inks



## COMFORT & INSULATION

Leading supplier of additives and innovative solutions for the PU industry



## INTERFACE & PERFORMANCE

Leading innovator in the design of interface properties based on a broad technology platform



## CROSSLINKERS

Leading global supplier of isophorone chemistry & technology leader in epoxy curing agents



## OIL ADDITIVES

The preferred partner for innovative efficiency solutions in lubricants and adjacent fields



## *Interface & Performance*

**We are a pioneer in interfacial chemistry  
with a broad technology toolbox in  
specialty applications**



# Evonik Interface & Performance Business Line Technical Competence in Plastics

## Extensive and strong technical competence to support customer needs



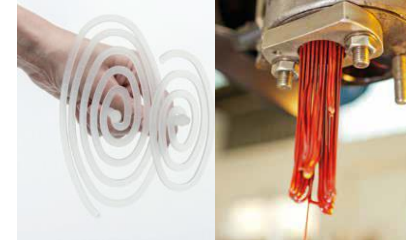
- UL 94 flame chamber
- Lowest oxygene index
- Cone calorimeter



- PTL M 31 – CTI measuring device according IEC 60112



- Five Finger Scratch Tester
- Crockmaster
- Erichsen Scratch Tester



- Melt Flow Path & Flow Index
- Anton Paar Viscosimeter
- Brabender Lab Kneader
- Filter Pressure Equipment



- Electrical & thermal conductive measurements



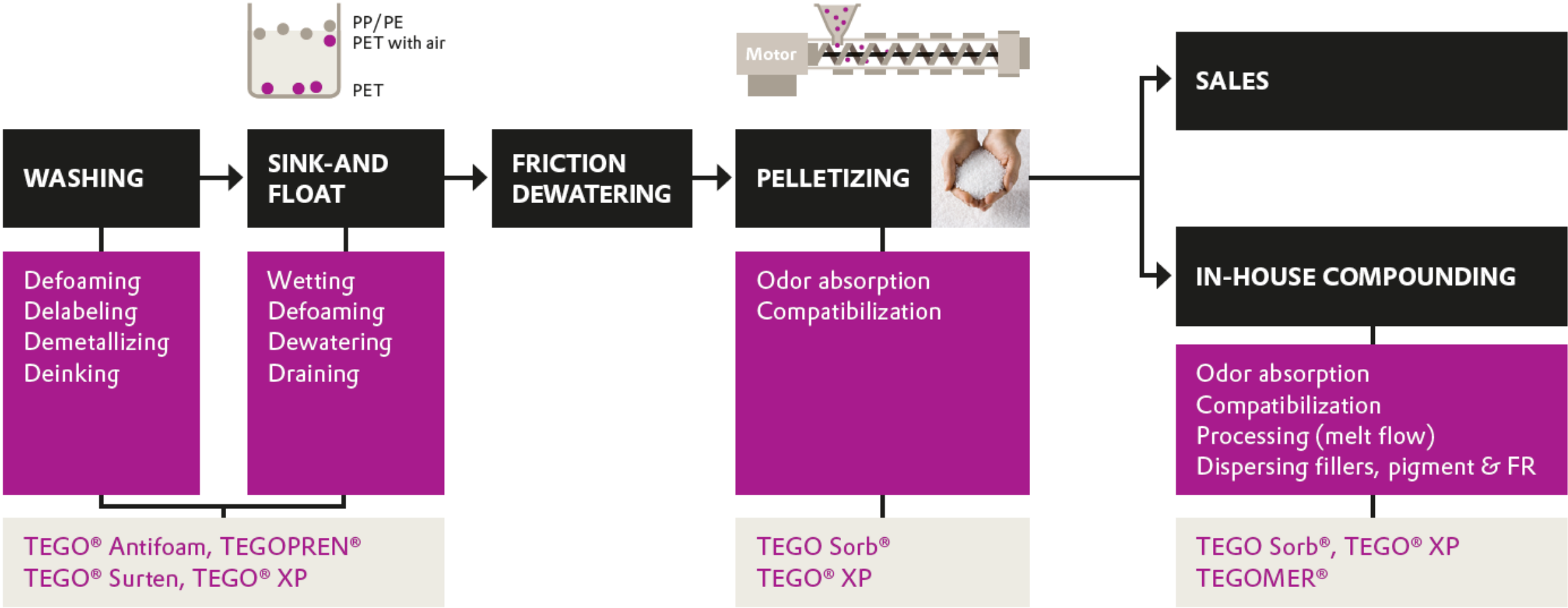
*Our technical plant is well equipped with compounding, molding, blow and cast film machines.*

### Other evaluation methods include but not limited to:

- Defoaming, deinking, delabelling, demetallizing, dewatering test for mechanical recycling
- Impact and notched impact test
- Tensile/flexural/tier strength, elongation
- Hardness, COF modification
- Blow and cast film process / Shark skin detection
- Color and gloss evaluation
- Surface tension / Stain resistance
- Antistatic & Antifog
- Odor test

# Our Solutions for Circular Economy

## Transforming Waste into Valuable Plastics





# Our Portfolio for Mechanical Recycling covers both wet and upcycling stage

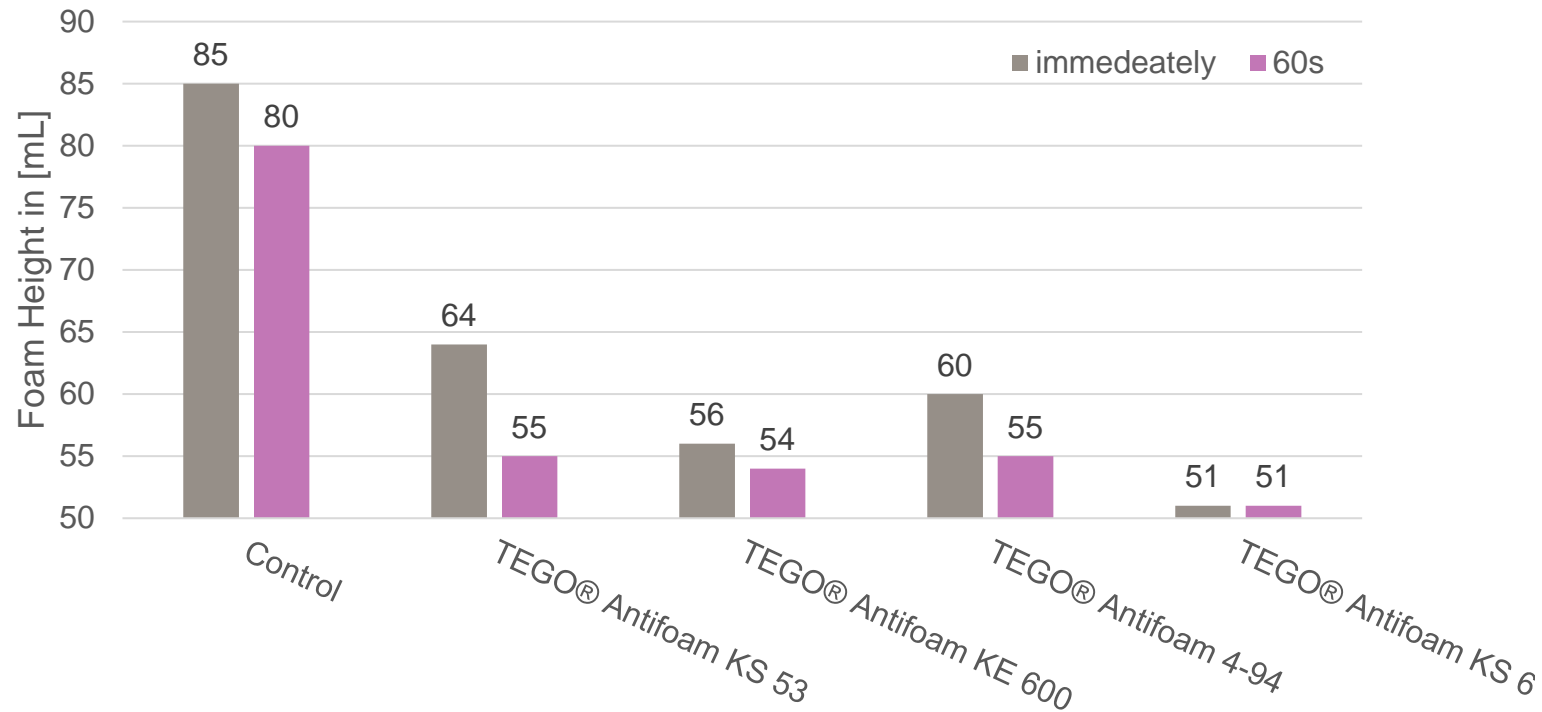
Wet stage	<b>Defoamer</b> <ul style="list-style-type: none"> <li>▪ TEGO® Antifoam KS 6</li> <li>▪ TEGO® Antifoam KS 53</li> <li>▪ TEGO® Antifoam 2291</li> <li>▪ TEGO® Antifoam 4-94</li> </ul>	<b>Wetting agents</b> <ul style="list-style-type: none"> <li>▪ TEGOPREN® 5840</li> <li>▪ TEGO® Surten W 111</li> <li>▪ REWOPOL® SB DO 75</li> </ul>	<b>Delabeling / De-inking /De-metalizing Dewatering</b> <ul style="list-style-type: none"> <li>▪ SURFYNOL® 440</li> <li>▪ SURFYNOL® 2502</li> <li>▪ TEGO® Surten W 111</li> <li>▪ Dewatering aid TEGO XP 11022</li> </ul>
Upcycling	<b>Odor Absorber</b> <ul style="list-style-type: none"> <li>▪ TEGO Sorb® PY 88</li> <li>▪ TEGO Sorb® PY 50 PE</li> <li>▪ TEGO Sorb® PY 50 PP</li> <li>▪ TEGO Sorb® PY 30 PE</li> <li>▪ TEGO Sorb® PY 30 PP</li> </ul>	<b>Processing Aids / Performance enhancer / Compatilizer</b> <ul style="list-style-type: none"> <li>▪ TEGOMER® H-Si 6441 P</li> <li>▪ TEGOMER® 6810</li> <li>▪ TEGOMER® 6850</li> <li>▪ Compatibilizer TEGO® XP 21024 &amp; 21025</li> </ul>	<b>Dispersants</b> <ul style="list-style-type: none"> <li>▪ TEGOMER® P 121</li> <li>▪ TEGOMER® E 525</li> </ul>

# Additives for Wet Stages

1. Defoamers, Wetting Agents, Delabeling, Deinking, Demetallizing
2. Dewatering Aid

# Evonik Process additives for Wet Stage – Defoamers & Wetting Agents

## Case – Foam Problems during Washing Process of r-HDPE out of PCW\*



**TEGO® Antifoams** prevent foam, e.g. in washing processes efficiently. For additional wetting properties **TEGO® Antifoams** can be combined with non-foaming wetting agents such as **TEGOPREN® 5840**.



### Shaking test:

50 ml customer solution (including 0.1% additive) is given into a 100ml shaking-cylinder. The cylinder is shaken 10 seconds vigorously 30 times. The foam height is noted down immediately and the foam collapse is measured over time.

# Evonik Value-adding Additives for Wet Stage Recycling: Deinking, Demetallizing & Delabeling



TEGO Surten W 111

Before Deinking



After Deinking



After Demetallizing



No  
additive

0.5%  
Additive 1

0.5%  
TEGO SURTEN  
W111

0.5%  
SURFYNOL  
440

Before and after Delabeling



- **SURFYNOL®**
  - **TEGO® Surten W111**
- are our best multi-function products for deinking, demetallizing and delabeling.



## Evonik Value-adding Additives for Wet Stage Recycling: Dewatering

High water content after washing consumes more heating energy & working hours



r-HDPE or r-PP Flakes  
contain 5-10% water  
without de-watering aid



r-LDPE Film  
contains 10-15% water  
without de-watering aid

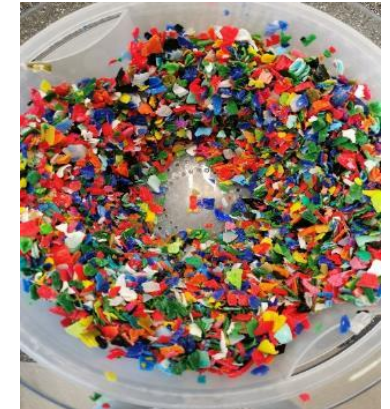
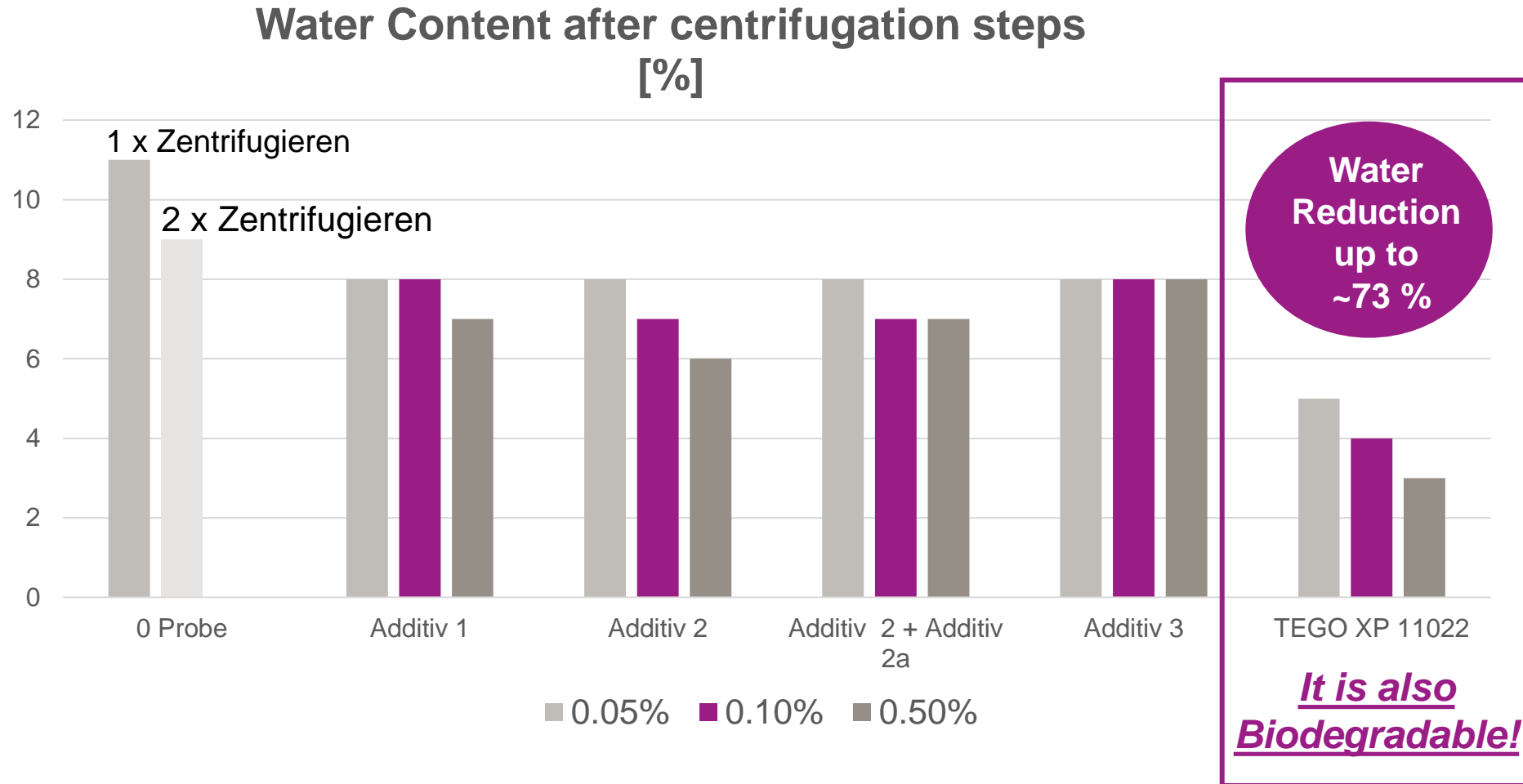


r-PET flakes  
contain 0.5-2.0% water  
without de-watering aid



# Evonik Value-add Additives for Wet Stage Recycling – Dewatering

## Case – Flakes of r-HDPE out of PCW or PIW\*

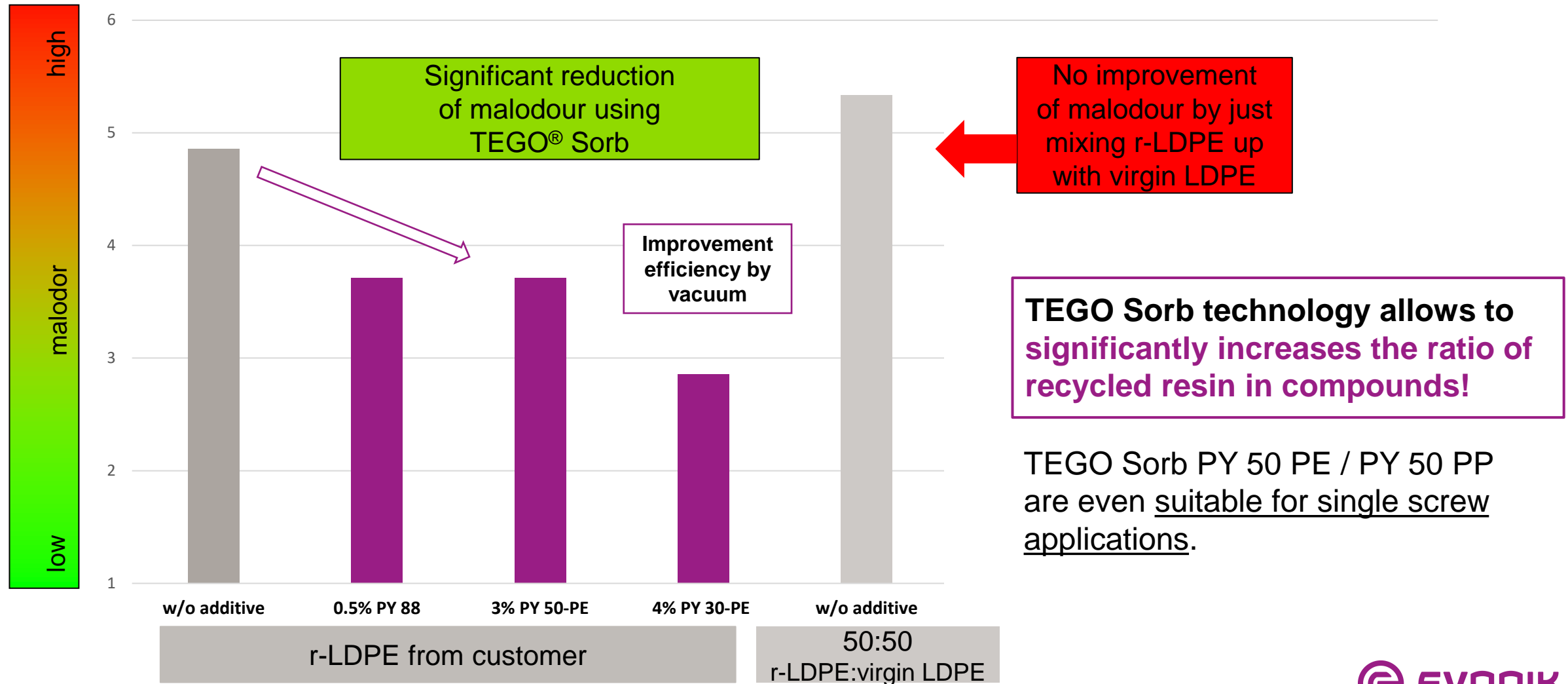


# Additives for Upcycling(Dry Stage)

1. **Odor Absorption**
2. **Compatibilisation**  
**(such as: PE in PP or PP in PE)**

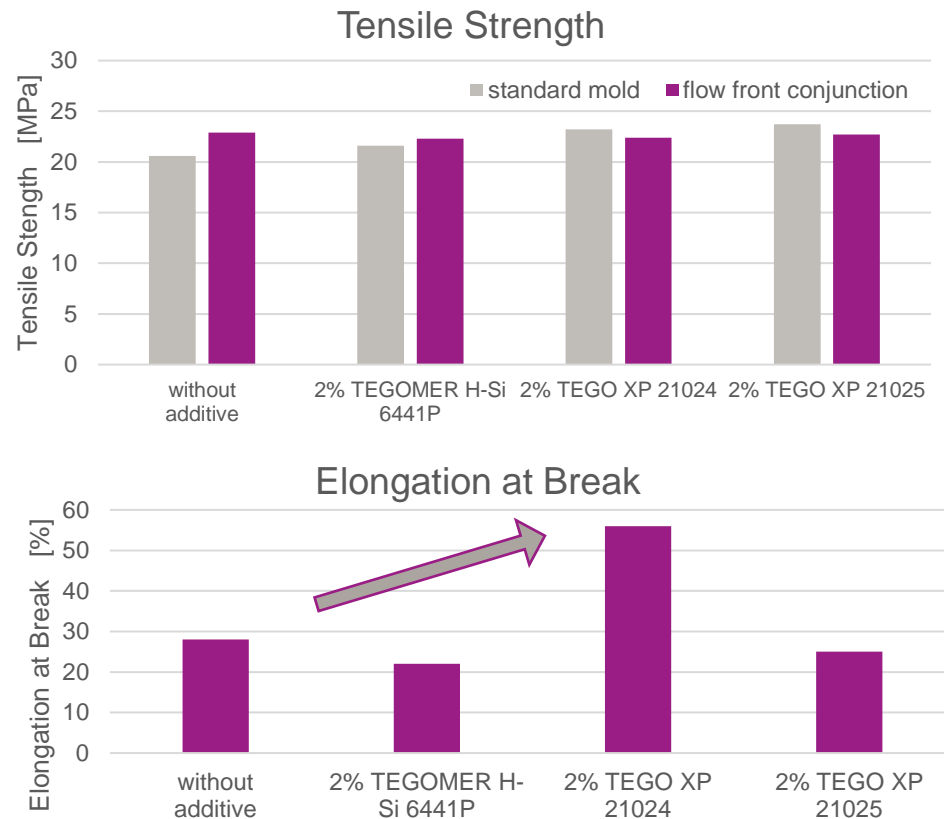
# Evonik Additives for Upcycling – Malodor reduction with TEGO Sorb

## Virgin Polymer blending does not help to reduce the malodor



# Compatibilisation of PP in r-HDPE from PCR with TEGO XP 21024

## Significantly improved welding strength



r-HDPE specimen  
without additive



r-HDPE specimen  
with 2% TEGO® XP 21024

**r-HDPE with 6% PP from the PCR stream: elongation@break improved significantly. What's even more important is weld strength improvement as illustrated with the special mould**

# Recap: Our Portfolio for Plastics Recycling for both wet and upcycling stage

Pls ask our team for samples.

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**EVONIK**

**Leading Beyond Chemistry**