

# Covestro materials demonstrate functionality of an auto-injector



- High flow Makrolon<sup>®</sup> PC & Bayblend<sup>®</sup> PC + ABS
- Low Friction Makrolon<sup>®</sup> PC
- Low Friction Makrolon<sup>®</sup> PC
- Medical Glass-Filled Makrolon<sup>®</sup> PC
- High flow Makrolon<sup>®</sup> PC & Bayblend<sup>®</sup> PC + ABS

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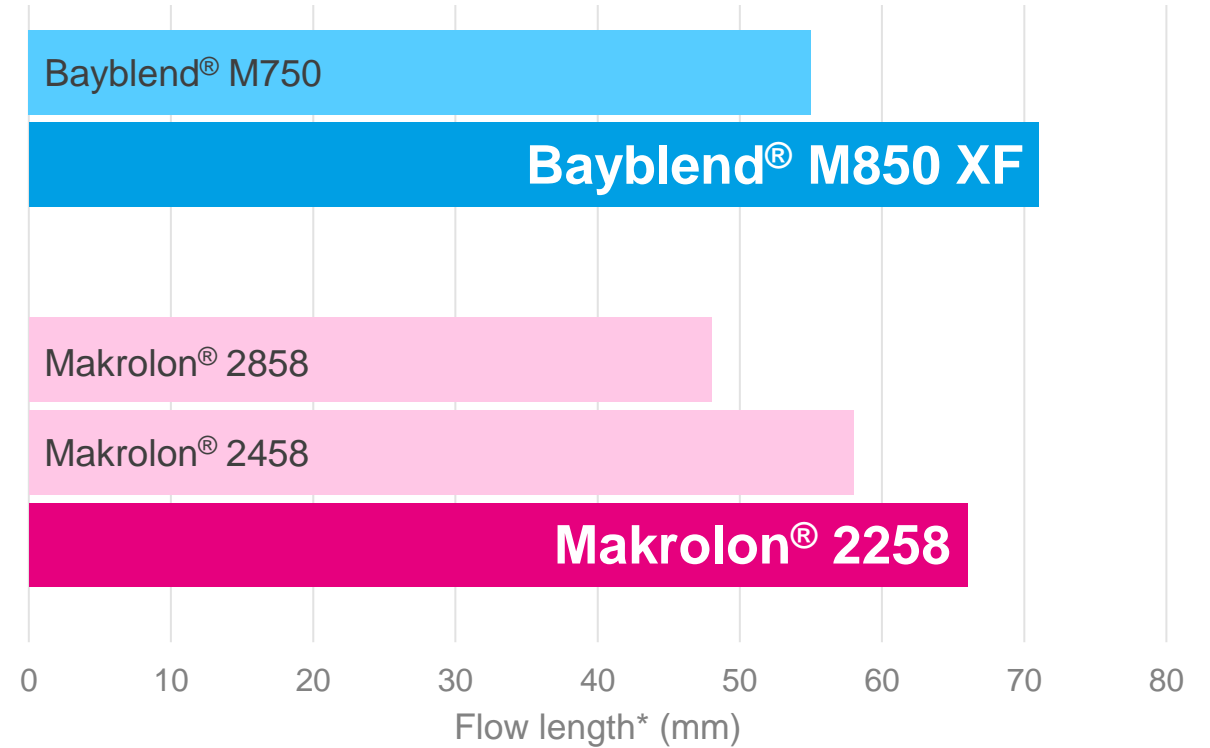


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# High flow Makrolon<sup>®</sup> and Bayblend<sup>®</sup> materials



- Enable thin wall molding to reduce weight
- Maintain toughness
- Transparent and opaque options available to support a variety of designs



For thin wall devices that require toughness

\* Flow length for 1mm wall thickness. Conditions used according to datasheet molding recommendations

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# Medical Glass-Filled Makrolon<sup>®</sup> polycarbonate

a range of options for devices that demand **superior** and **lasting strength**

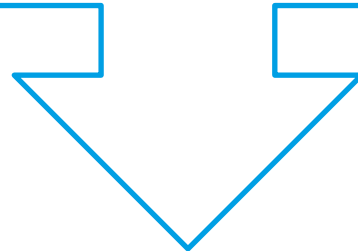


## High-flow series

**Makrolon<sup>®</sup> M410 GF**

**Makrolon<sup>®</sup> M420 GF**

**Makrolon<sup>®</sup> M430 GF**



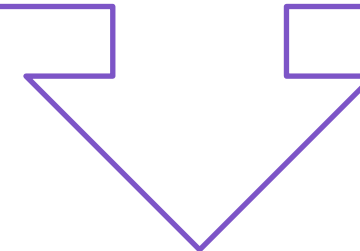
*For filling larger or thinner parts*

## High-performance series

**Makrolon<sup>®</sup> M810 GF**

**Makrolon<sup>®</sup> M820 GF**

**Makrolon<sup>®</sup> M830 GF**

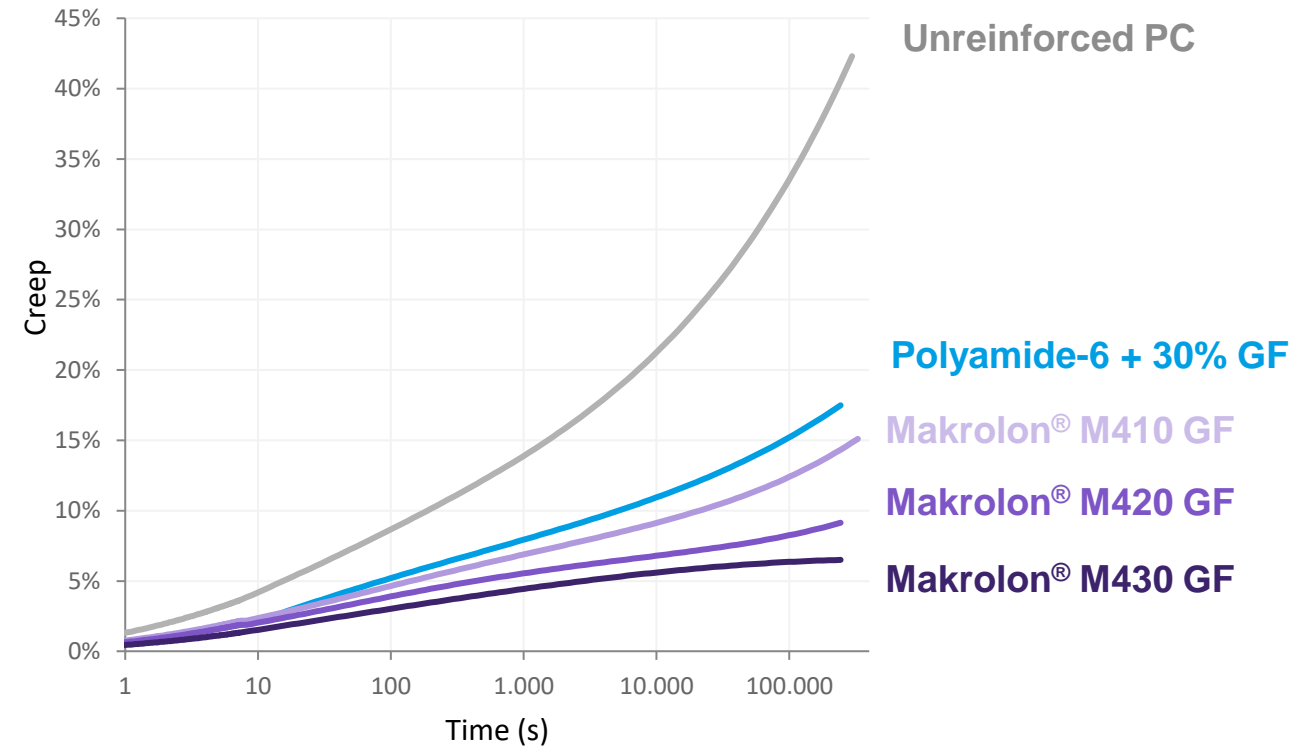


*For better impact properties*

# Medical Glass-Filled Makrolon<sup>®</sup> polycarbonate



- Delivery of high volume and more viscous biologic drugs require different materials
- Stronger components required to maintain dimensional stability under spring load



Improved creep resistance for longer device shelf-life

# Covestro materials demonstrate functionality of an auto-injector

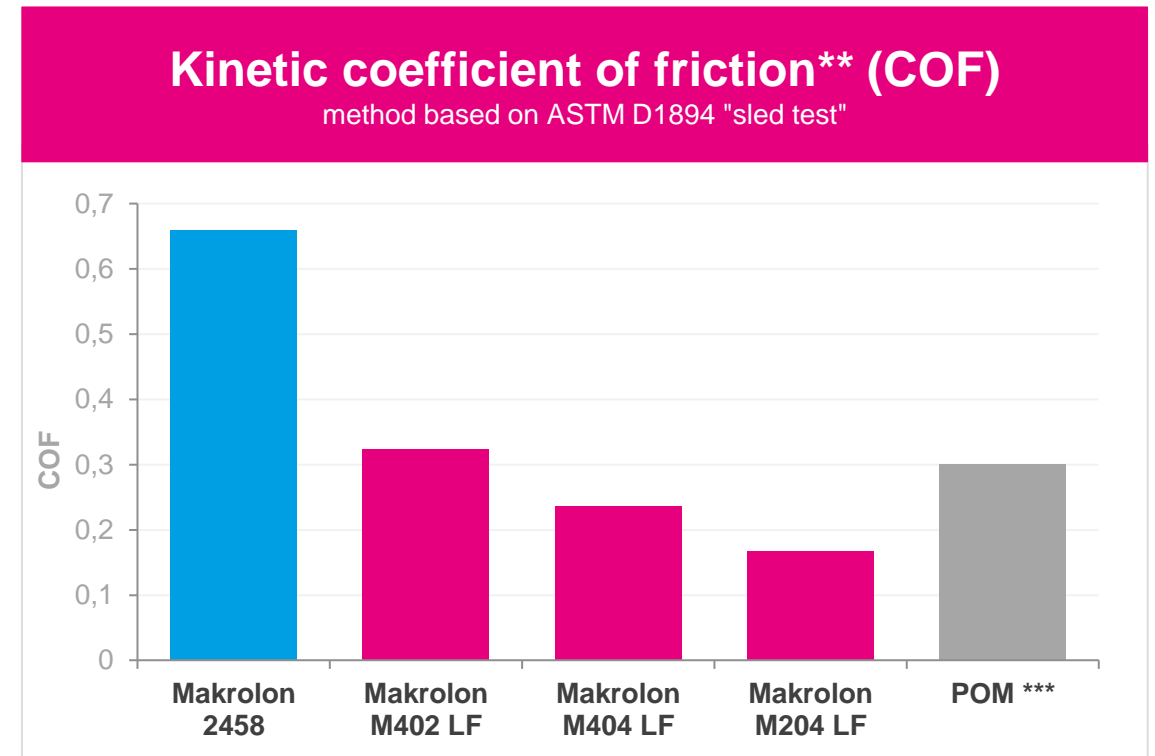


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# Low-Friction Makrolon<sup>®</sup> products can reduce deployment force



- With similar or better COF as POM\*
- Reduces inconsistency with:
  - Manual application of a lubricant to devices
  - Including additives at the press



To make medication **delivery easier** for patients and healthcare professionals

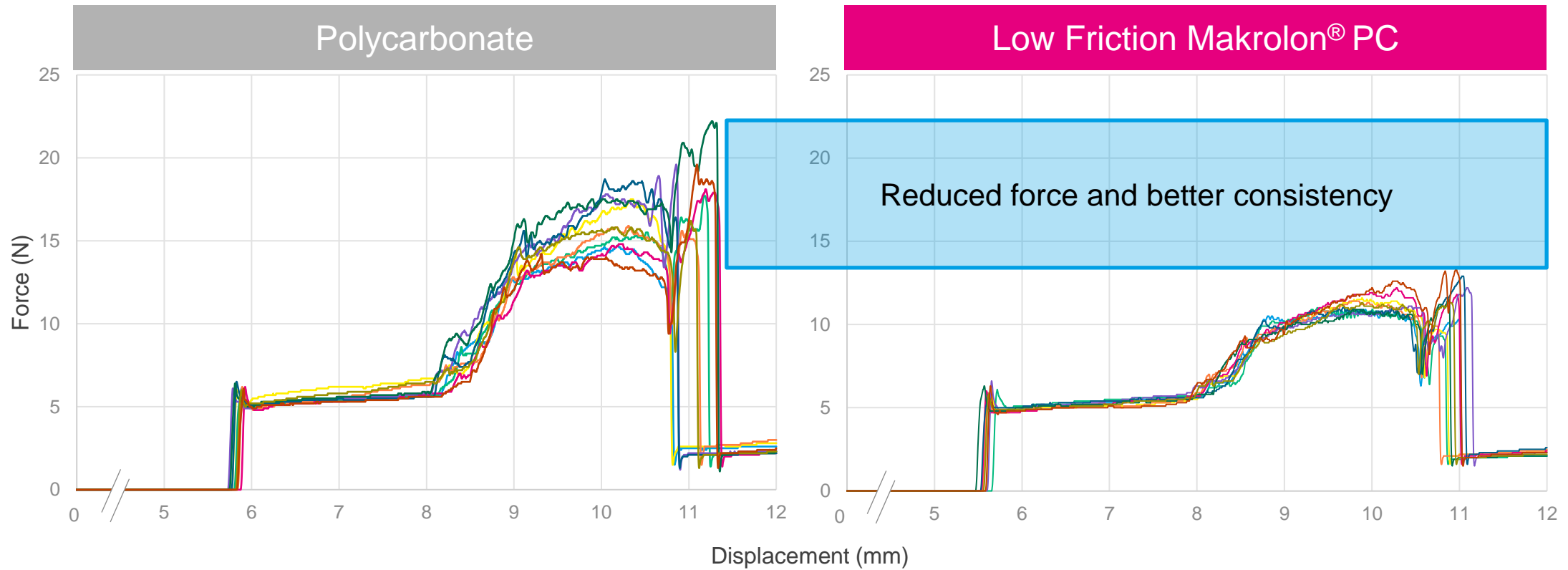
\* Polyoxymethylene (POM) commonly referred to as acetal

\*\* Self- COF

\*\*\* Typical value for POM from supplier datasheets; test methods may differ



# Low-Friction Makrolon<sup>®</sup> grade measured in device



Reduces button activation force by 33% and improves consistency by 50%

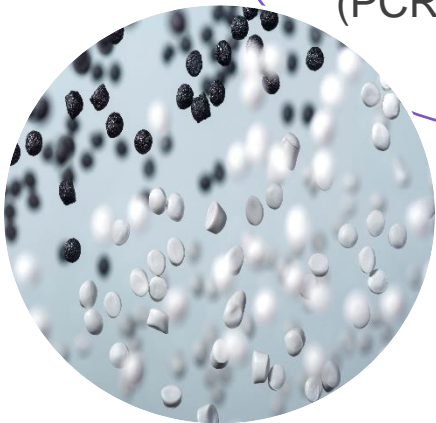
# Your go-to partner on sustainability solutions

A sustainable product portfolio with innovative services and solutions



## Certified Circular Products

- Drop-in solutions with attributed renewable content- Makrolon RE for Healthcare
- Mechanically recycled (PCR, PIR)



## Services

- Design for circularity: Circular Design Strategies
- CMF design service

## Enabling circular business models

- Closed/open loop recycling
- Material tracing



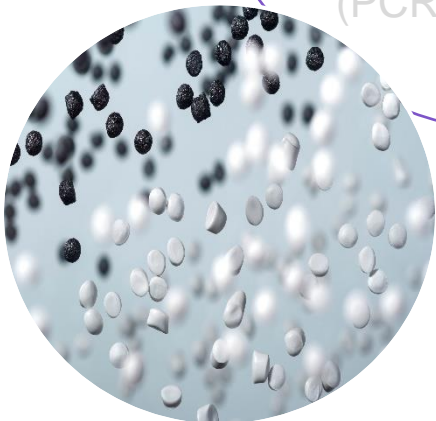
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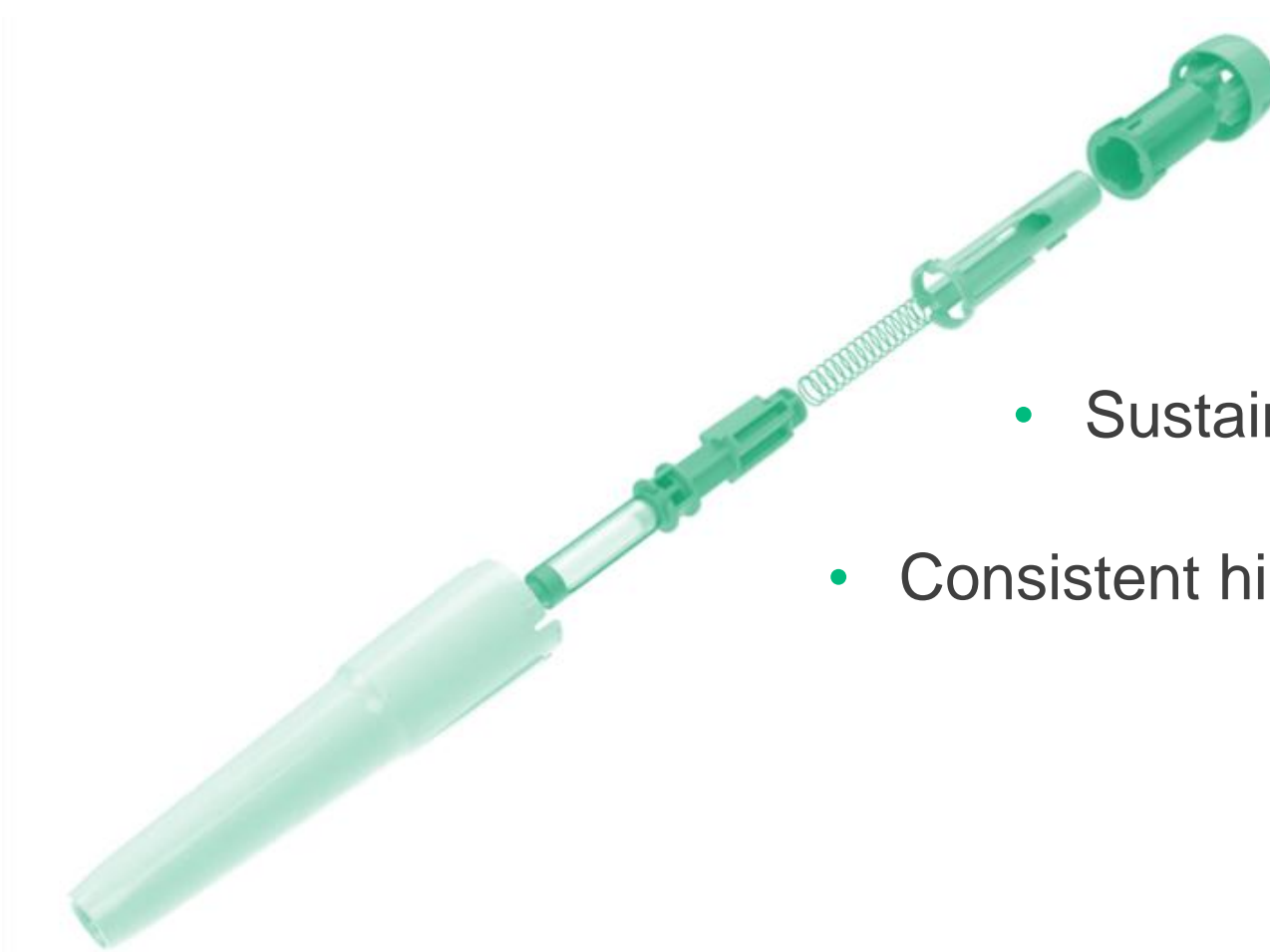
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# Medical Makrolon® RE polycarbonate

with attributed renewable content



- Sustainable drop-in solution
- Consistent high quality

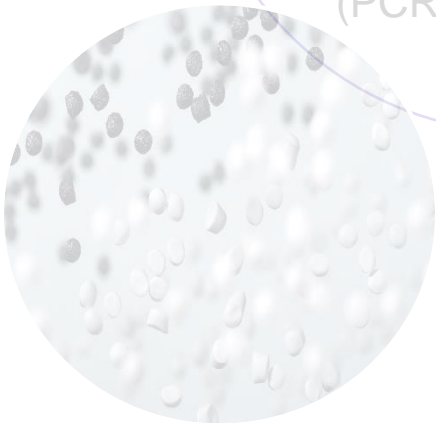
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## Services

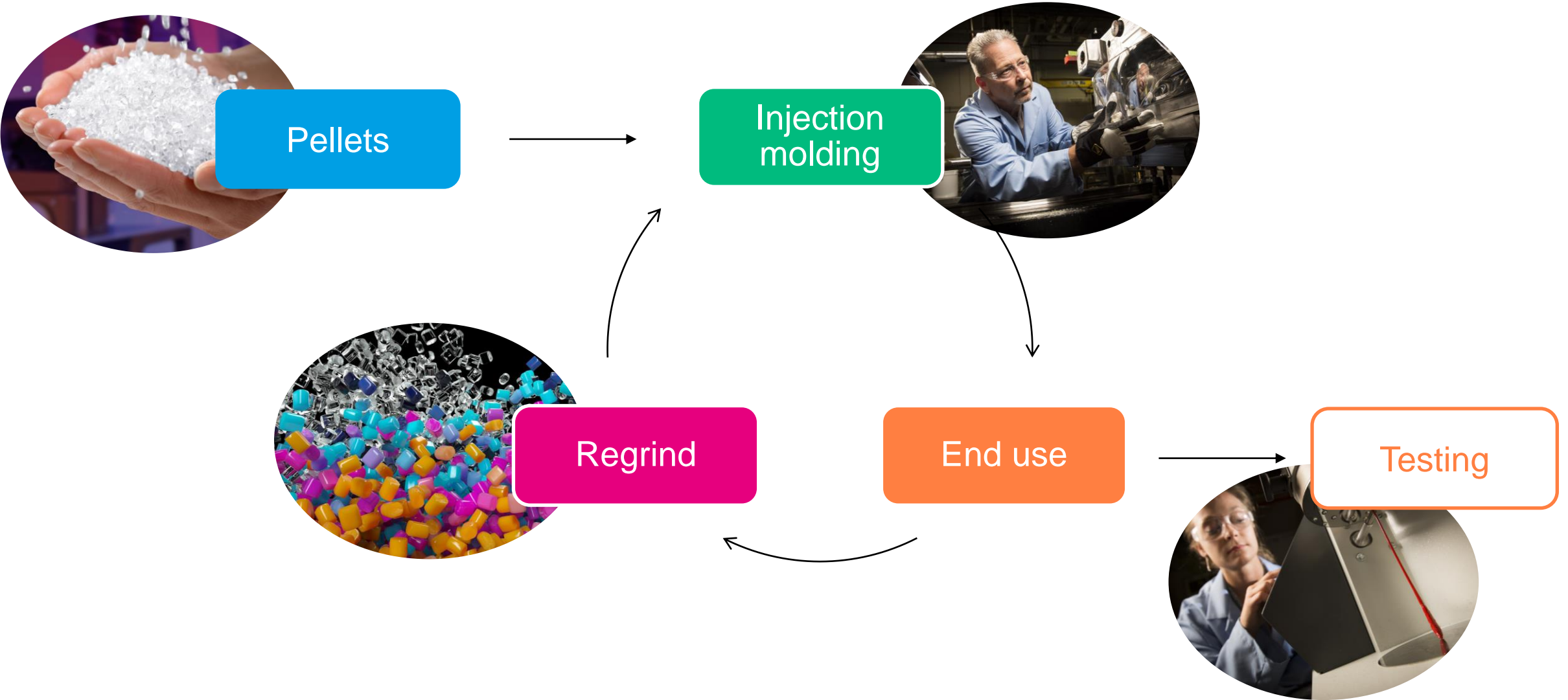
- **Design for circularity:** Circular Design Strategies
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## Enabling circular business models

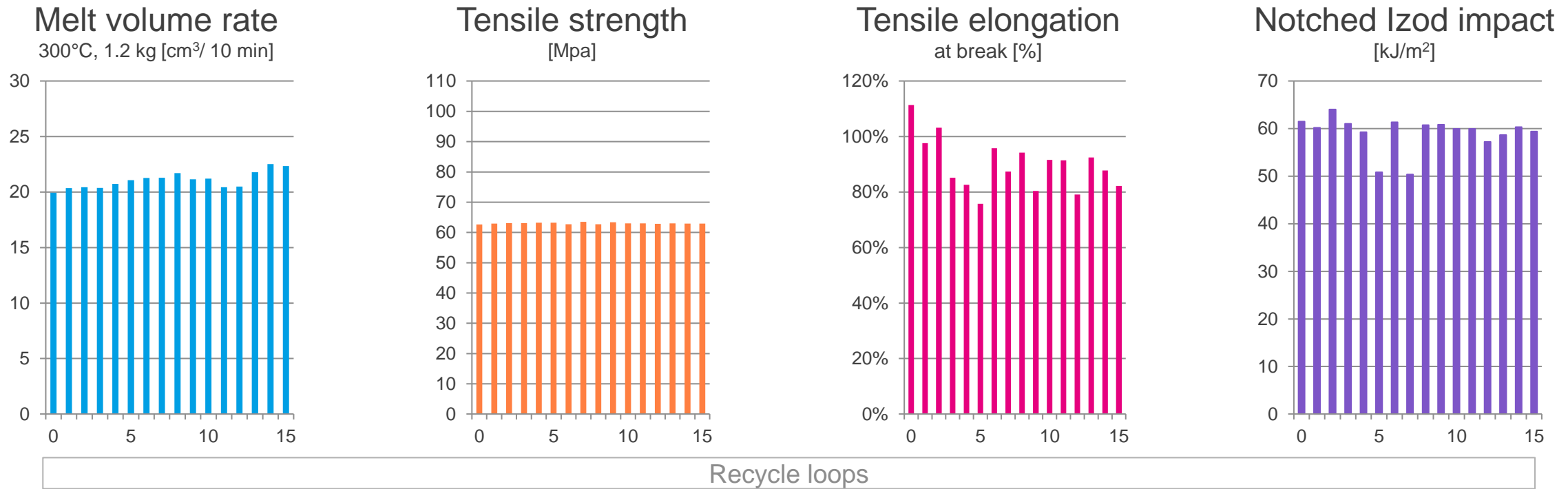
- **Closed/open loop recycling**
- Material tracing



# Simulation of closed-loop recycling



# Suitability of Makrolon<sup>®</sup> polycarbonate for closed-loop recycling



Tests indicate **100% regrind** retains key mechanical properties over 15 recycle loops



# “Unsorted” plastic is the future



## Today



- ABS
- POM
- PP
- PC
- PA

✗ INCOMPATIBLE PLASTICS

## Future



- PC
- PC+ABS
- LF-PC
- GF-PC

✓ COMPATIBLE PLASTICS



# “Unsorted” plastic is the future



## Today



A collection of various plastic parts including a blue screw, a green cap, a red pen, a brown drill bit, and several other small components, illustrating a mixture of different plastic types.

- ABS
- POM
- PP
- PC
- PA

✘ MUST BE SORTED

## Future



A single, clear plastic part with a blue cap and an orange top, representing a re-molded plastic component.

- PC
- PC+ABS
- LF-PC
- GF-PC

✓ RE-MOLDED AS MIXED OR SORTED

# Closed-loop study with “unsorted” PC - based components



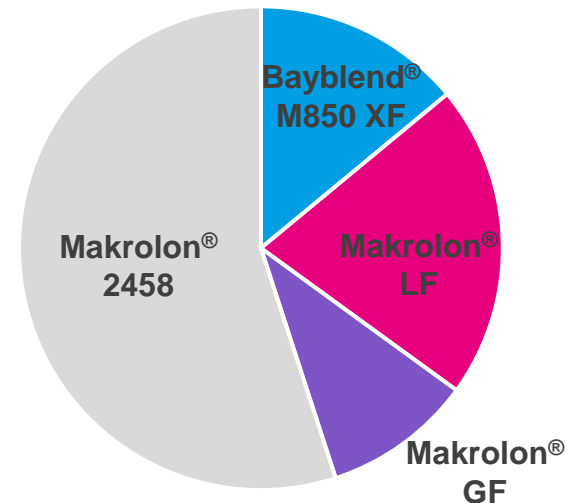
- **Cap** - Medical Bayblend® M850 XF

- **Spin wheel** - Low Friction Medical Makrolon® M204 LF

- **Button** – Low Friction Medical Makrolon® M204 LF

- **Striker** - Medical Glass-filled Makrolon® M430 GF

- **Body** - Medical Makrolon® 2458



Based on weight percentage

# Closed-loop study with “unsorted” PC - based components



## Preliminary results

- Tensile properties, impact strength showed **excellent consistency** across 9 regrind cycles
- Suggests mixing all-PC components could still deliver **consistent** properties for other applications



Consistent properties across recycle loops enables designing for sustainability



# **COVESTRO'S POLYCARBONATE MATERIALS ARE THE RIGHT CHOICE FOR DRUG DELIVERY DEVICES**



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