



REACTIVE RECYCLING

By Nexam Chemical

Christer Svanberg
CTO Nexam Chemical

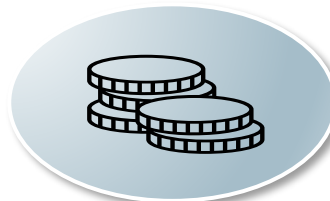




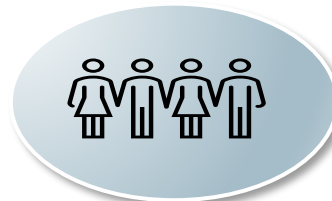
Founded 1990 / 2009
Spin-off from Perstorp (Chemical AB)
Registered at NASDAQ First North



HQ: Lomma, Sweden
Production: SWE, UK, HU, PL
R&D: SWE, UK



Annual turnover: ~200 MSEK



Employees: ~50

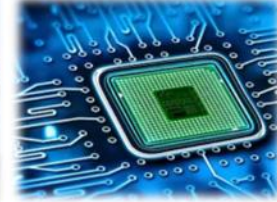
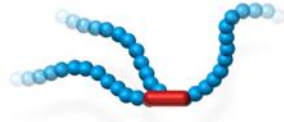
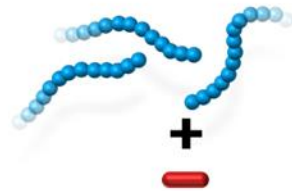


**Chemical Additives &
Reactive Masterbatches
for Polymers**

Legacy Nexam Chemical

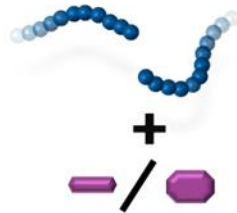
2009

Polyimides



2016

Polyesters



2021

Polyolefins



Nexam's Market Segments

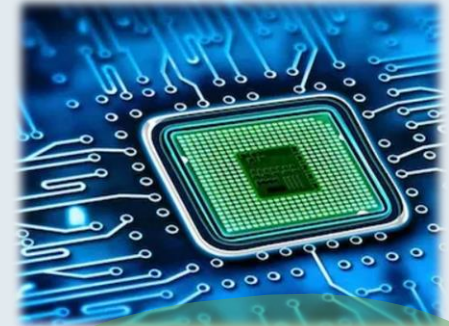
Light Weighting

Better PET foam materials for efficient wind blades



High Temperature

High temperature composites for fuel savings in aeromotive



Aesthetics

Enabling component manufacturers to use more recycled plastics



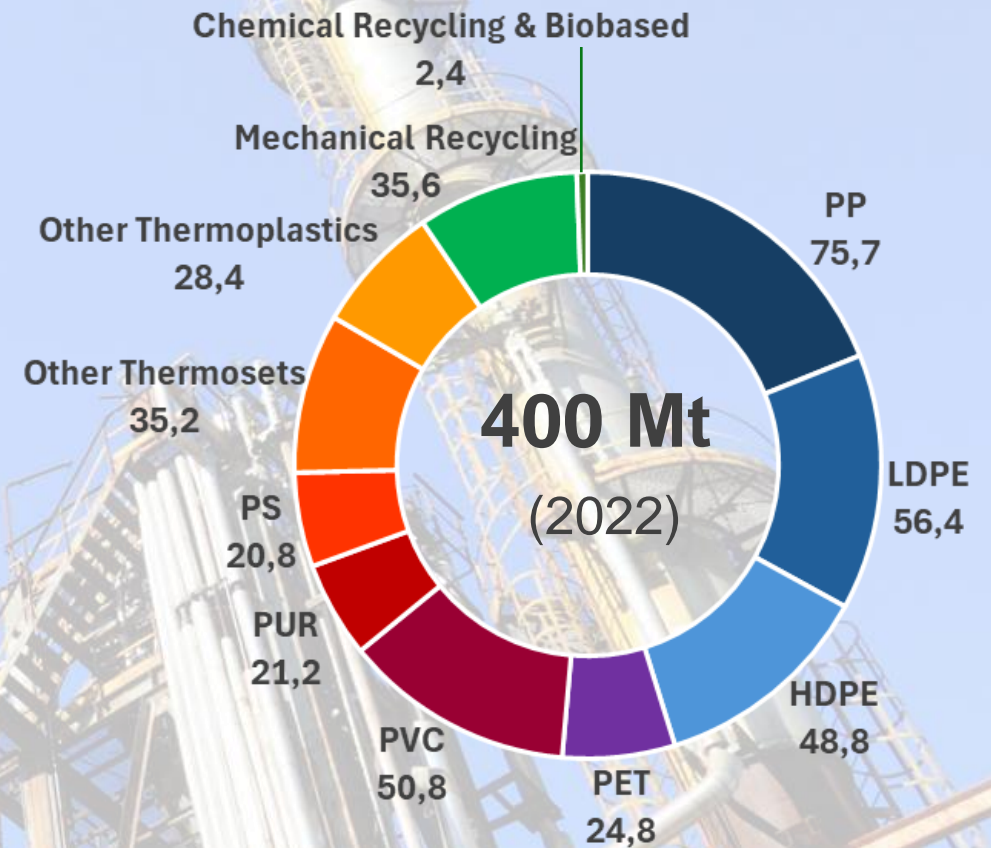
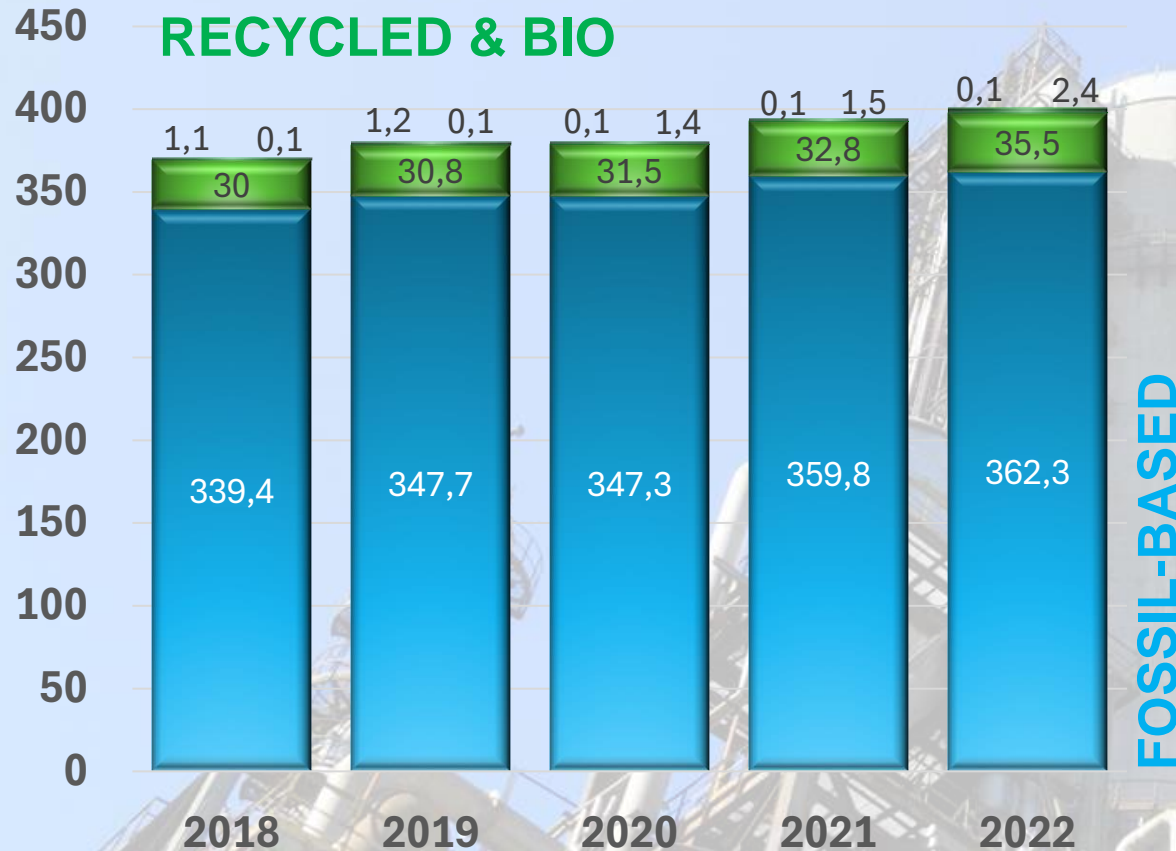
Recycling

Upgrading and increasing value of recycled plastics






Global Plastic Production



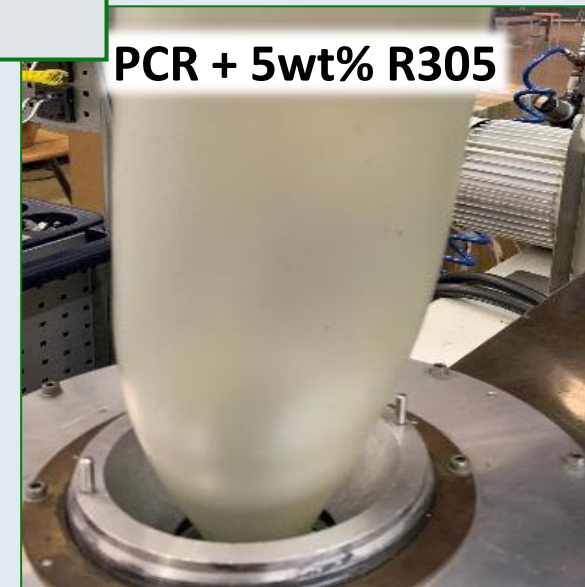
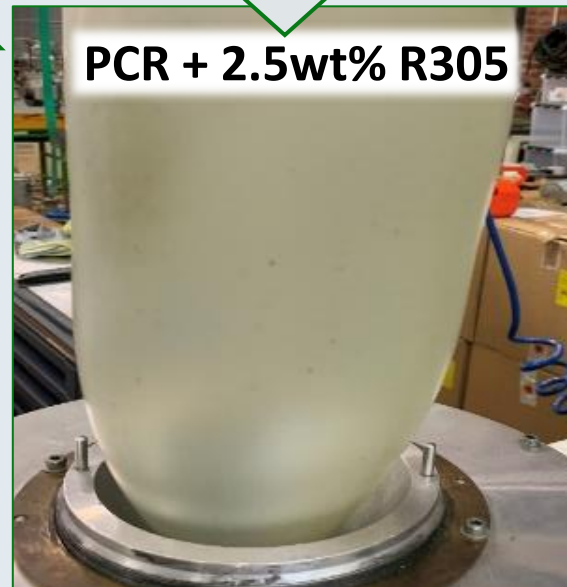
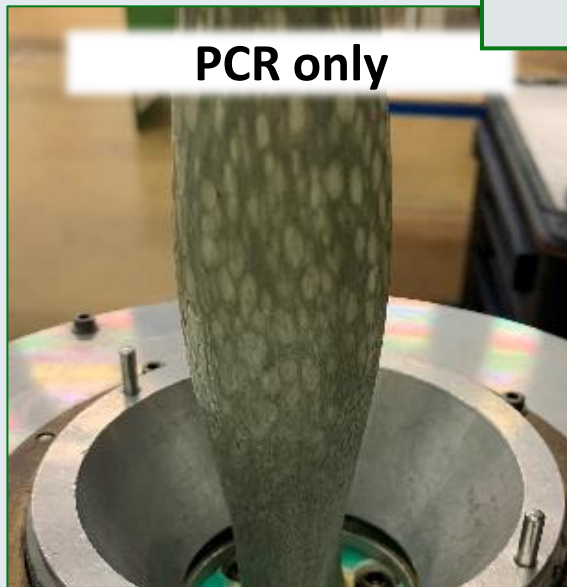
Recycling of Plastics

 **REACTIVE
RECYCLING**
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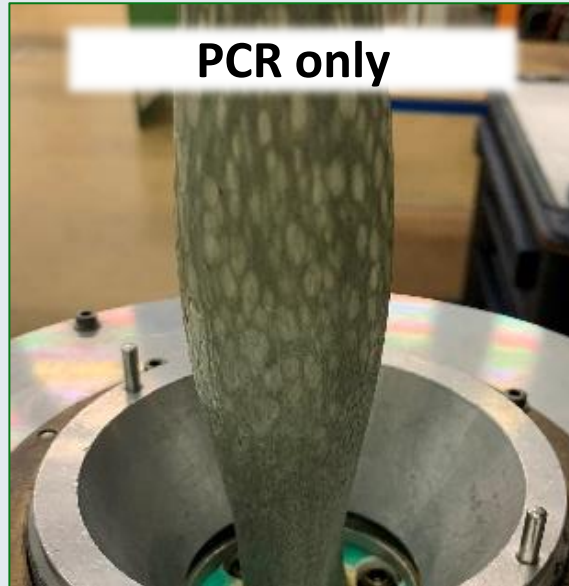


- Existing equipment
- Activated by heat

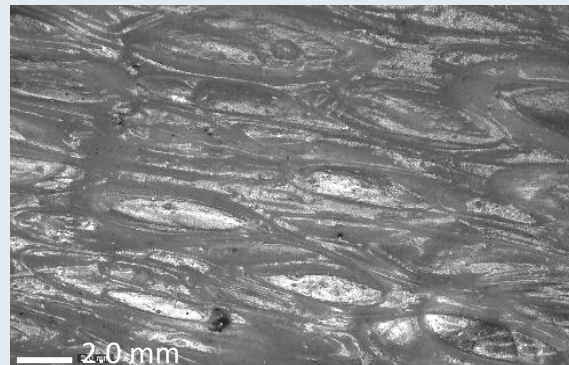
r-LDPE – PCR example



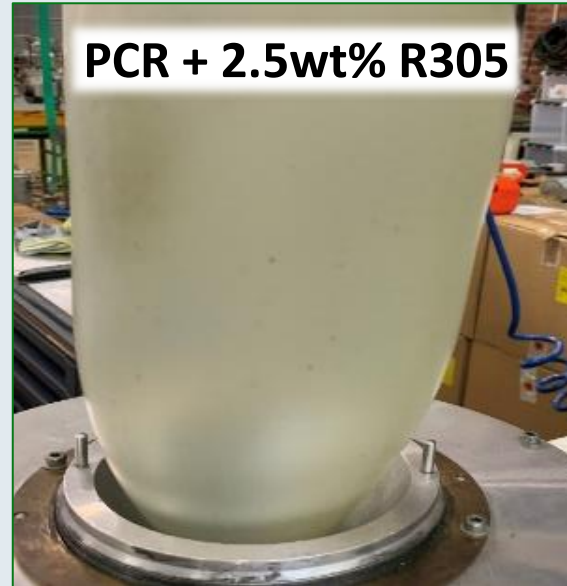
r-LDPE – PCR example



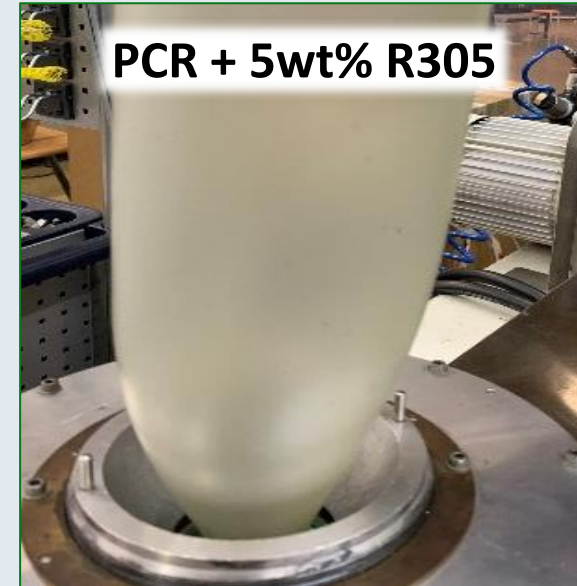
MFR* **~4 g/10min**



**Optical
Microscopy**



MFR* **~2 g/10min**

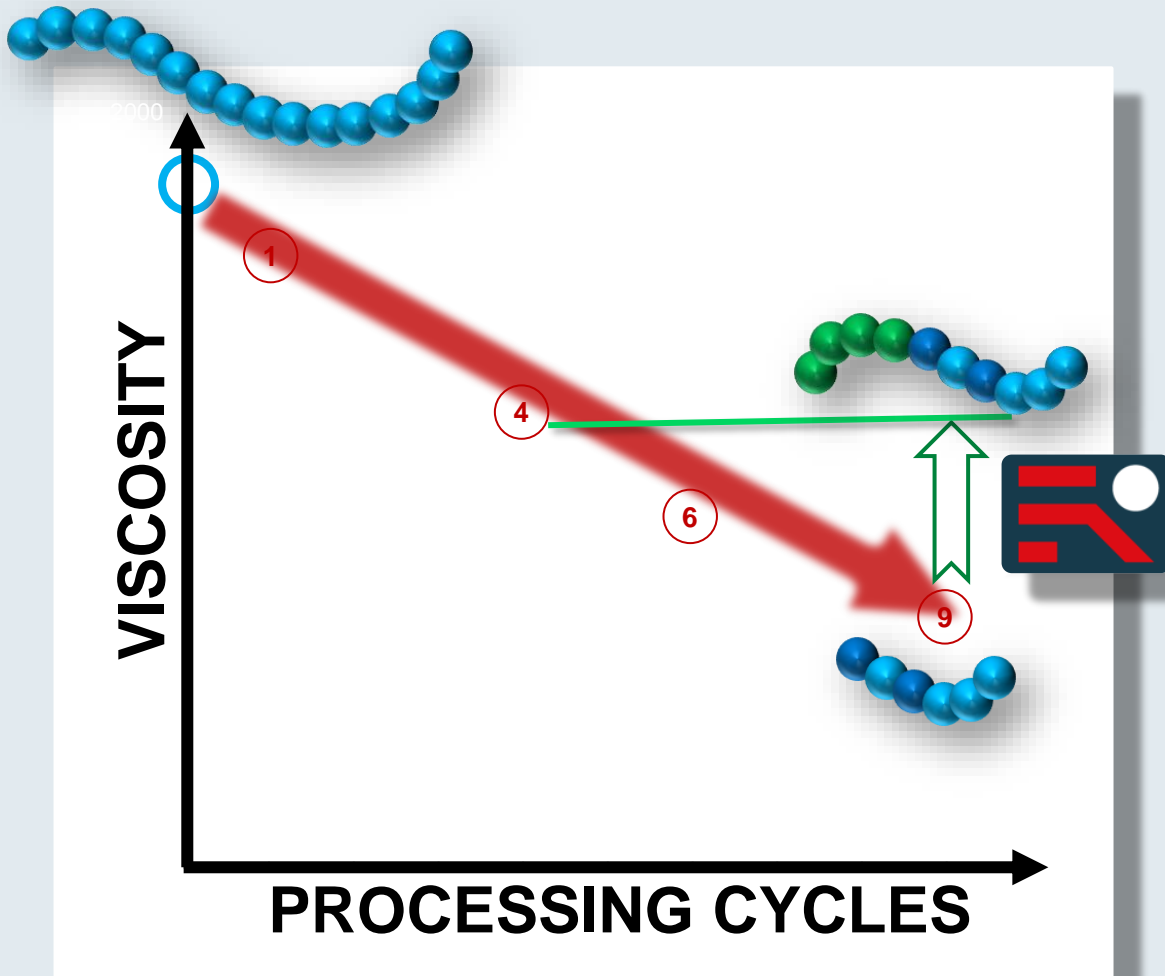


MFR* **~1.2 g/10min**



* MFR: 190C, 2.16 kg

Simulation of Recycled PP



Multiple extrusion cycles to simulate recycling process

Polymer highly degraded after 9 cycles!



→ 9th cycle back to 4th cycle!



Reactive Recycling

a WISE industrial PhD student project

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Secondary Objective: *Understand the mechanism*



Primary Objective: PhD

Amin Keivanshokouh

- Top-ranked student in Applied Chemistry and Polymer Chemistry in Iran
- Moved to Sweden June 2020
- Got a position in QC at Nexam Chemical 2020.
- Moved on to R&D in November 2022.
- Always had the ambition to do a PhD.

Fulfilling a life-long dream



Industrial PhD Grant from WISE enables:

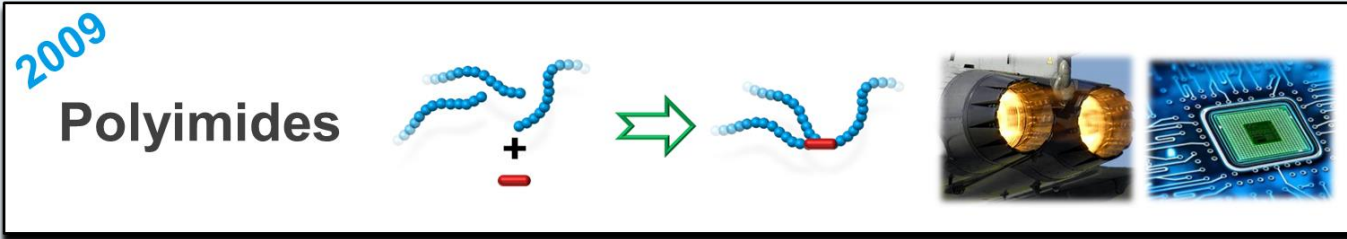
- Amin to fulfill a life-long dream
- Strategic growth for Nexam by building an expert internally



REFLECTIONS

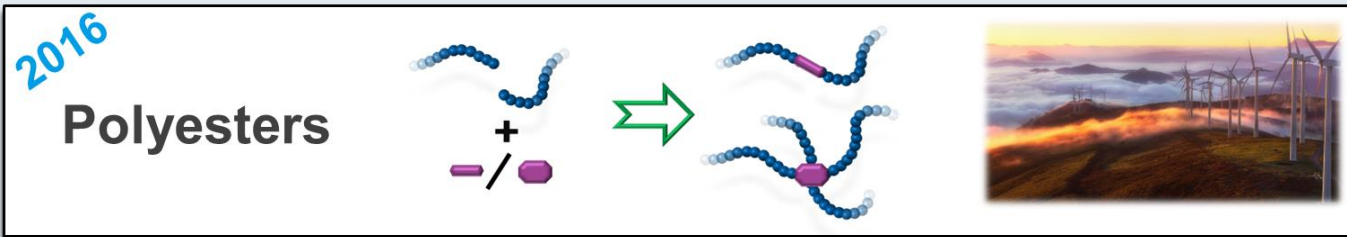
Collaboration with Universities & Institutes

Innovate
UK



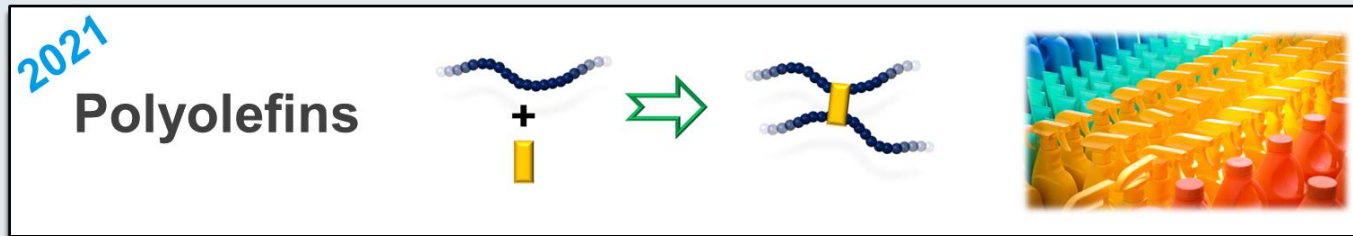
University of
Sheffield

Vinnova



Rise

WiSE



Chalmers

Collaboration Needs

- **Access to something that we do not have**
 - Academia: deep scientific understanding
 - Institutes: technical skills and testing facilities
 - Industry: value chain know-how

- **We only enter into projects if:**
 - We would do this anyhow
 - Clear view on our contribution

- **Successful consortium are based on trust**

Improvements?

- **Simplify/Standardize process for agreements**
 - Based on understanding the driving forces:
 - Academia: Publish
 - Industry: Competitive Edge (Patent, Know-How...)

- **Grant for Research Equipment (Companies)**



NEXAM CHEMICAL

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