



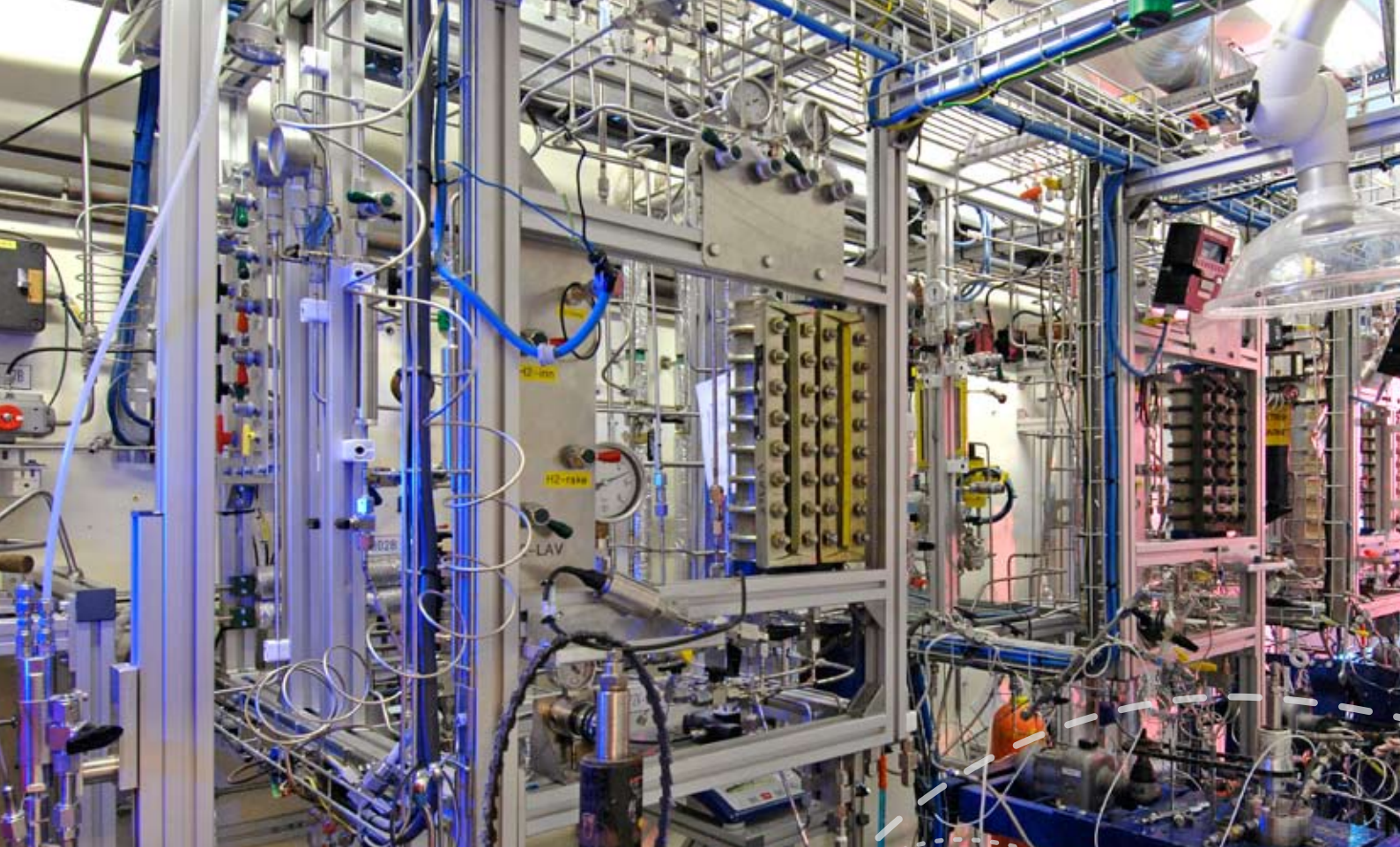
**norner**<sup>TM</sup>

Innovation through Insight



# Industrial polymer and plastics institute

We provide value to the polymer industry



# Partner for the petrochemical industry

*Our innovation centre provides services in polymer technology to the petrochemical and plastics, building on 30 years of experience*

*Tine Rørvik, Managing Director*





## Projects

- Product development and improvement
- Polymerisation trials with application testing
- Product mix optimisation and sourcing
- Additive qualification and specification
- Additive sourcing and selection
- Catalyst synthesis and qualification
- Material selection and verification
- Claim and failure investigations
- Durability and life time testing
- Tailor made seminars and training

## Facilities

- Polymerisation reactors
- Catalyst synthesis laboratory
- Plastics processing centre and compounding
- Polymer and plastics test centre
- Chemical and polymer analytics
- Additive performance test centre

## Innovation

- Project management
- International network
- Innovative materials
- IPR & FTO studies
- Patenting for clients

Industry



# Polymerisation and polymer research

With our industrial background and more than 140 patents for our clients, we understand the needs from the industry.

*Morten Lundquist, Manager Polymer Research*





# Projects

- Catalyst synthesis and heterogenisation
- Polymerisation and catalyst performance
- Up scaling to industrial processes
- Plastics material development and research
- Product performance improvements
- Additive optimisation and harmonisation
- Product life time investigation and prediction
- Novel polymers and new processes
- Material recipe development
- Plastics compounding and processing trials



# Facilities

- 3 EX-proof advanced reactor rooms
- 0,1 - 20l advanced steel HP reactors
- Inert handling and glove boxes
- Small and full scale processing lines
- Compounding lines
- Additive performance centre

# Support

- Analytical laboratory
- Structure/properties expertise
- Benchmarking against market leaders
- Performance and durability testing
- FTO Studies



# Product and material test centre

*Norner takes an active role in developing more durable plastic solutions.*

*Henning Baann, Manager Scientific Laboratories*





# Projects

- Performance testing of plastics
- Advice and benchmarking of materials
- Verification and consistency of properties
- Ageing tests at high pressure and temperature
- Maintenance support in material state and failure
- Developing appropriate product specifications
- Inspection plans for plastic parts and systems
- Product durability at extreme conditions
- Extraction behaviour of materials
- Quality review and supplier audits
- Third party investigations

# Facilities

- Autoclave testing laboratory
- Material performance laboratories
- Testing at various climate conditions
- Advanced microscopy laboratory
- Durability and NORSOK test centre
- Fire testing laboratory

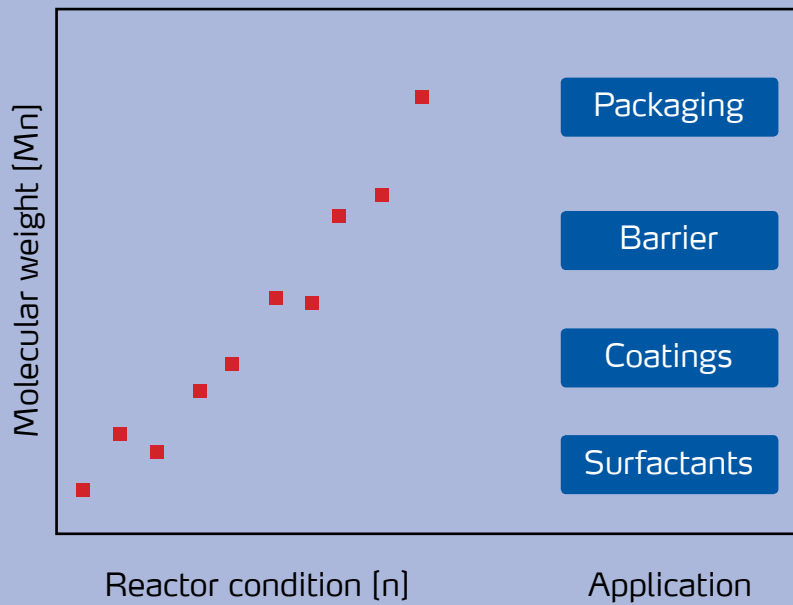
# Competence

- Plastics technology
- Material performance
- Material failure investigation
- Partnership with Exova
- ISO 9001:2008 and ISO 17025

# Novel plastics from CO<sub>2</sub>

Novel polymers made from CO<sub>2</sub> are developed by Norner with the goal to be suitable for standard thermoplastic processing applications.

Polypropylenecarbonate (PPC) is a copolymer of CO<sub>2</sub> and propylene oxide containing 40 wt% CO<sub>2</sub>. In order to be used in extrusion or moulding the polymer need a high molecular weight.



## Benefits

- Improved eco-footprint
- Efficient catalyst mapping
- Tailored polymer properties
- PPC polymer for extrusion
- Prepare for scale-up
- Reduce production cost

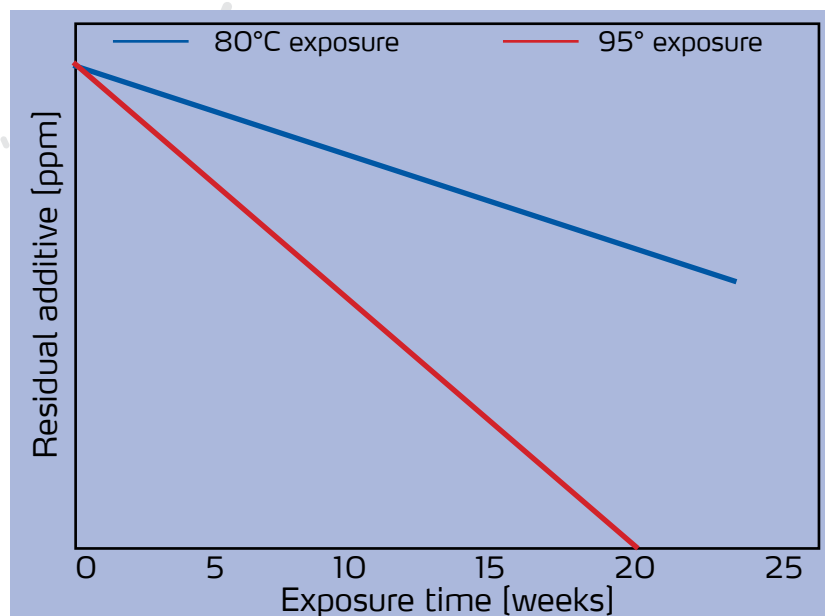
# Ageing in extracting media

Life time analyses of plastics is normally done by accelerated ageing and testing the decay of physical performance, but the additive extraction is often forgotten.

Norner additives and durability test centre can simulate the realistic life time of a product by standard exposure methods as well as investigating additive extraction by various media.

## Benefits

- Precise lifetime prediction
- Selection of additives
- Develop appropriate recipes
- Qualification to purpose
- First time right
- Reduced costs



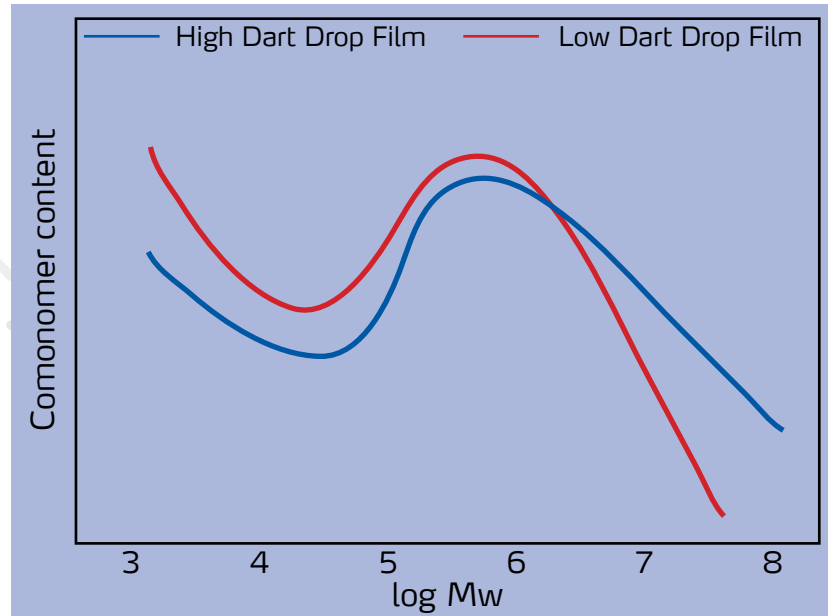
# Map critical performance

Polymers that are produced in our industrial bench scale are analysed and application tested in order to map the inherent capabilities of catalysts.

This example shows the effect of comonomer incorporation by two different PE Ziegler catalysts in bimodal operation and its effect on Dart Drop Impact of film.

## Benefits

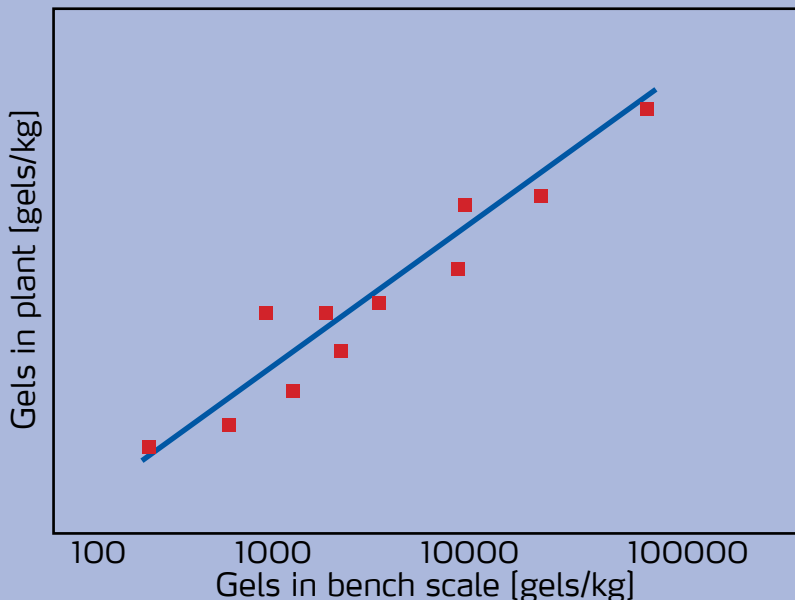
- Application know-how
- Structure/property relationship
- Increase probability of success
- Select catalyst for scale-up
- Faster time to market
- Reduced costs



# Polymer gels

Polymer gels are a general challenge in thermoplastics. One cause of gels is related to the catalyst performance in the polymerisation process.

Norner has expertise and methods to characterise the potential for gel formation from different catalysts, analyse polymer gels and do root cause analysis of gel problems.



## Benefits

- Increase probability of success
- Rapid troubleshooting
- Screening of catalysts
- Investigate process variations
- Reduce number of plant trials
- Higher speed
- Reduced costs

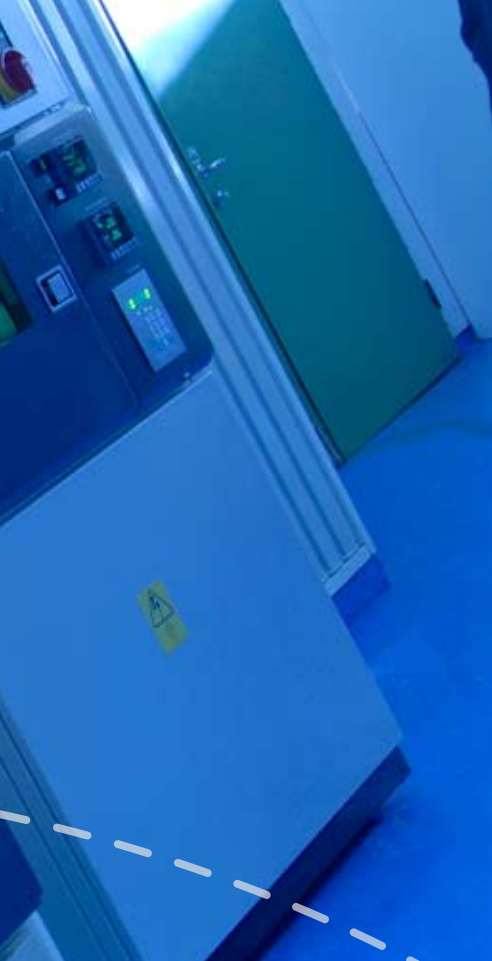


# Additives performance testing and qualification

*We support the chemical industry and polyolefin producers to improve their profit.*

*Svein H. Jamtvedt, Principal Researcher Additives*





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ication

## Projects

- Supplier qualification and specification
- Benchmarking and cost optimisation
- Optimisation of additive packages
- Verification against customer specification
- Additive sourcing and simplification
- Life time prediction and verification
- Product and failure investigations
- Additive identification and quantification
- High purity and low migration materials
- Legislation; REACH, food and medical

## Facilities

- Polymerisation and catalyst laboratory
- Small and full scale plastics processing
- Ageing and durability test centre
- Material and analytical test centre
- Chemical and polymer analysis
- Compounding centre

## Competence

- 30 years industrial experience
- International network
- Advanced laboratories
- Value chain knowledge
- Providing value to the industry

Contact us via  
[www.norner.no](http://www.norner.no)



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