

# NORNER THE POLYMER EXPLORERS

Industry Science Meet-up at UiO

22.11.2017

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# Norner - The Polymer Explorers

## Our Vision

We will strengthen our position as

- ❖ a global market leader of Industrial R&D services in Polymers
- ❖ by exploring opportunities and discover Sustainable solutions





# Advanced technology centre

Your insurance for efficient and relevant service

1977 → Saga Technical Centre

1984 → Statoil R&D Centre

1994 → Borealis Innovation Centre

2007 → Norner AS

2015 → SCG acquired 100 % of the shares





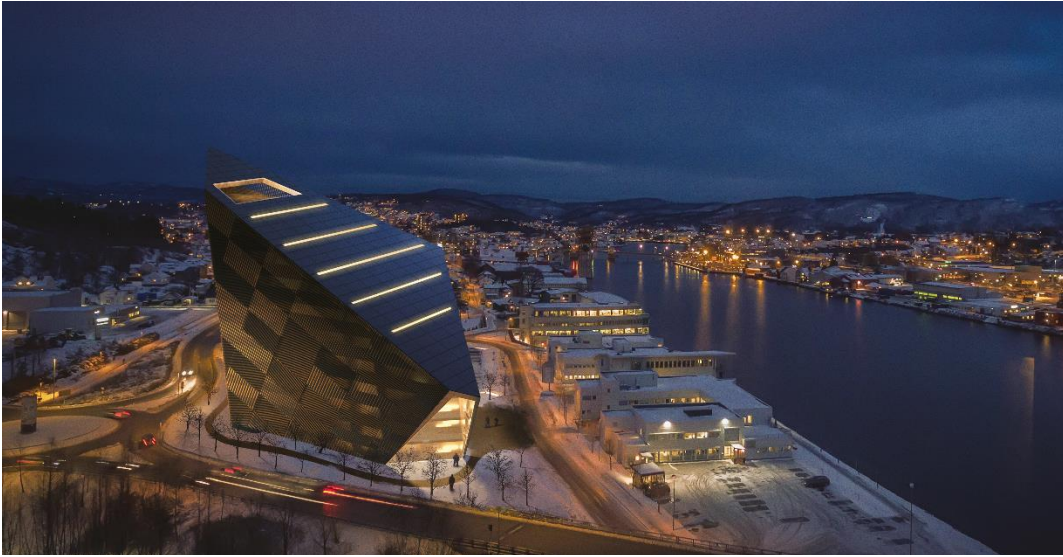
A three-tiered white wedding cake is shown against a light grey background. The cake is decorated with a diamond quilt pattern using thin gold lines and small gold beads at the intersections. Each tier is separated by a border of white frosting pearls. A large, light grey circular label is centered on the middle tier, containing the text "NORNER" and "10 years" in a black serif font. The top tier is partially visible at the top of the frame.

NORNER  
10 years

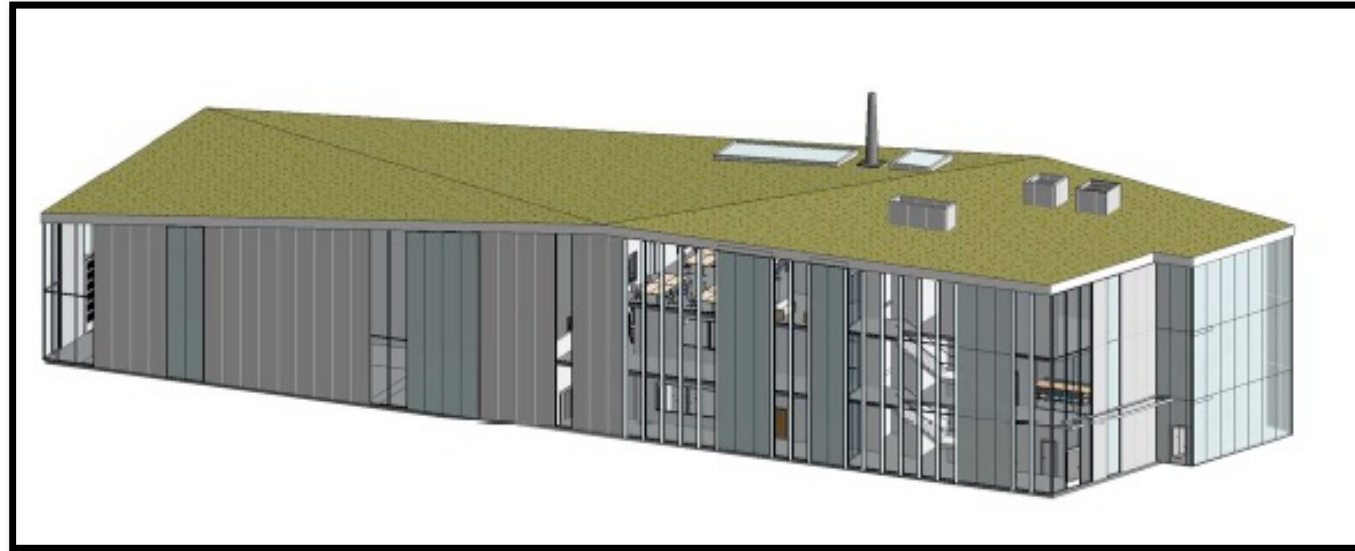
EST 4



# NEW FACILITIES 2018/2019



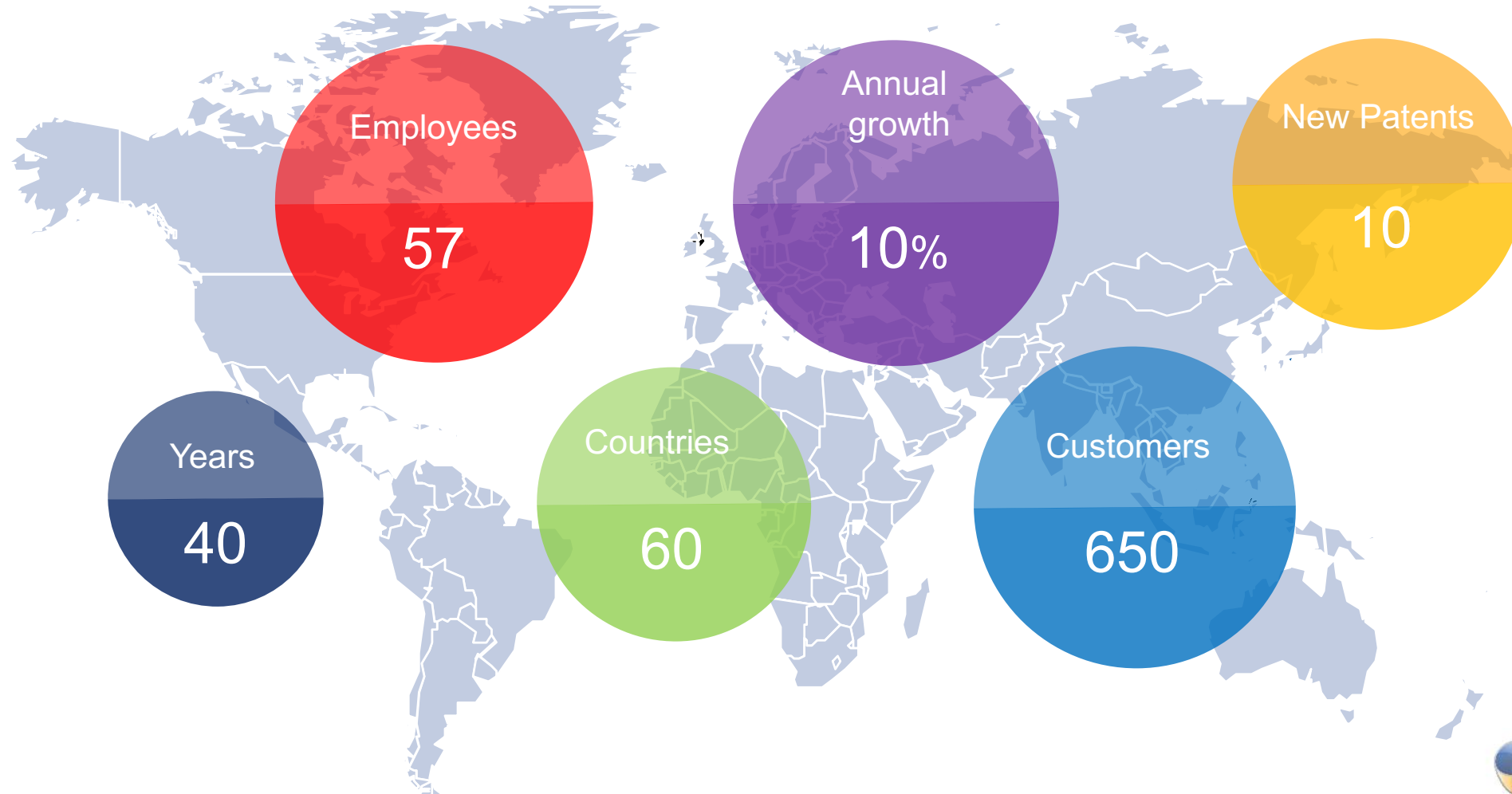
Norner share Size about 1700 m<sup>2</sup>



Size 2900 m<sup>2</sup>

- Powerhouse Telemark with Office zone landscape and analytic labs
- European test Centre partnering with Industry with Plastic processing, Reactor pilots and advanced durability testing

# NORNER – KEY FIGURES



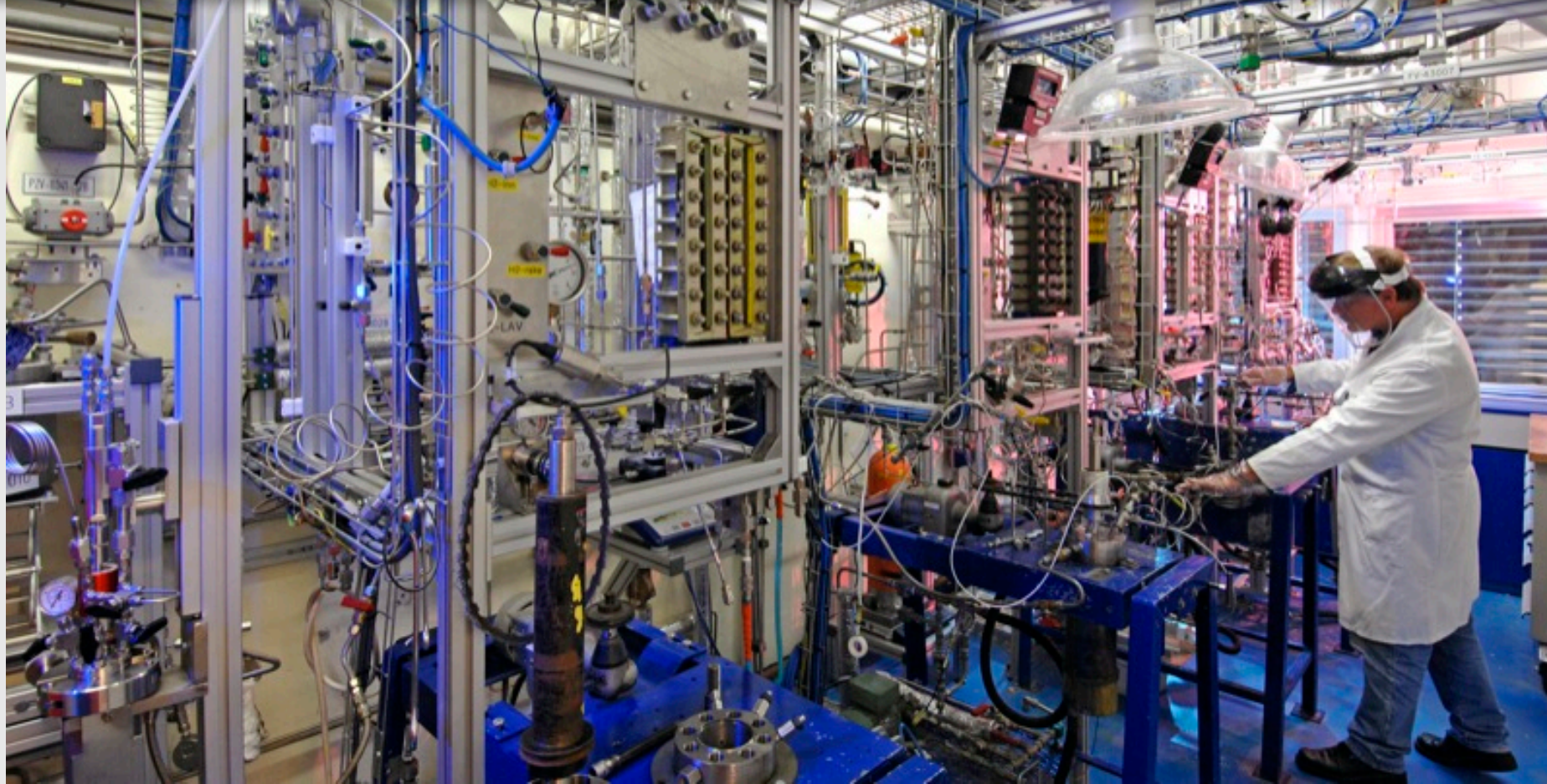
# COMPETENCE- FROM BEGINNING TO END





# Polymerisation and polymer research

Development of new products and technology





# Autoclave Test Centre

Ageing under high pressure, high temperature and aggressive conditions



# Oil & Gas Norner Services

**Norner offer services within all aspects of non-metallic oil & gas and engineering applications**

- Material selection
- Material development
- Product development
- Material testing
- Durability testing
- Pre-qualification testing
- Failure analysis (polymers and metals)





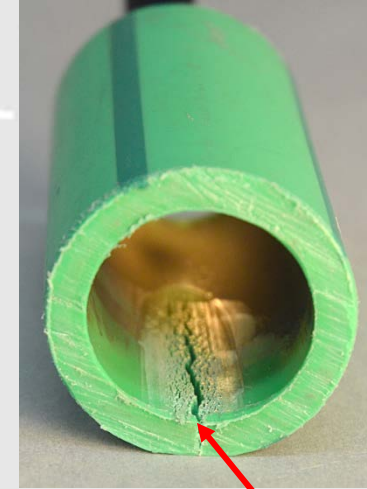
# Case 1 – Offshore pipe failure

Material ; PP / PP glas reinforced ( 3 layers )

Material failed after 2 years in service

Several methods used to map the cause of the problem ;

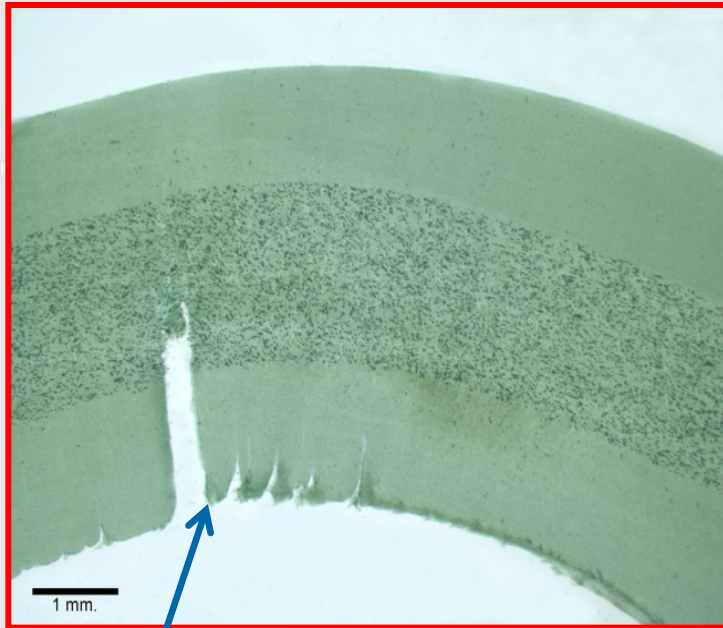
- LM ( Light microscopy )
- SEM-EDS ( Scanning Electrone Microscopy with Elemental analysys)
- OIT ( Oxidation Induction Time)
- FT-IR
- DSC



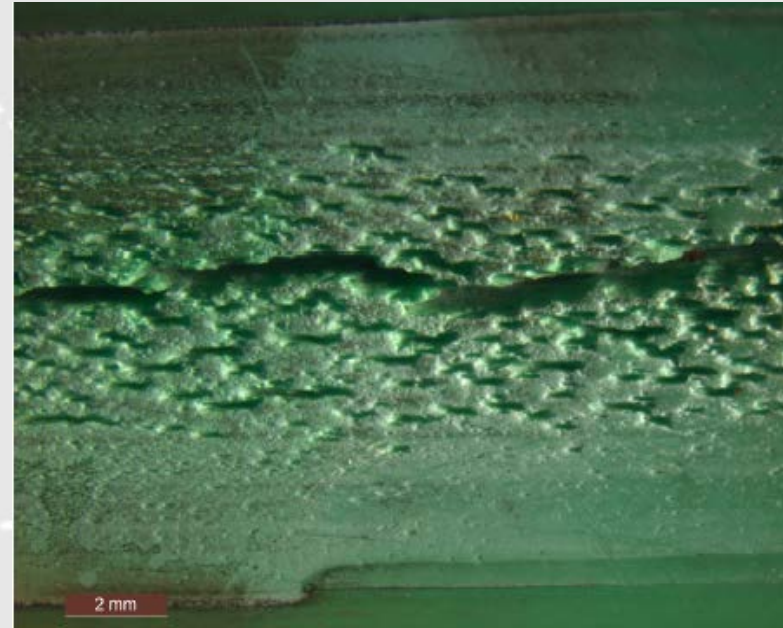
Failure

# Case 1 – Failure analyses broken pipe

Cross sectional picture



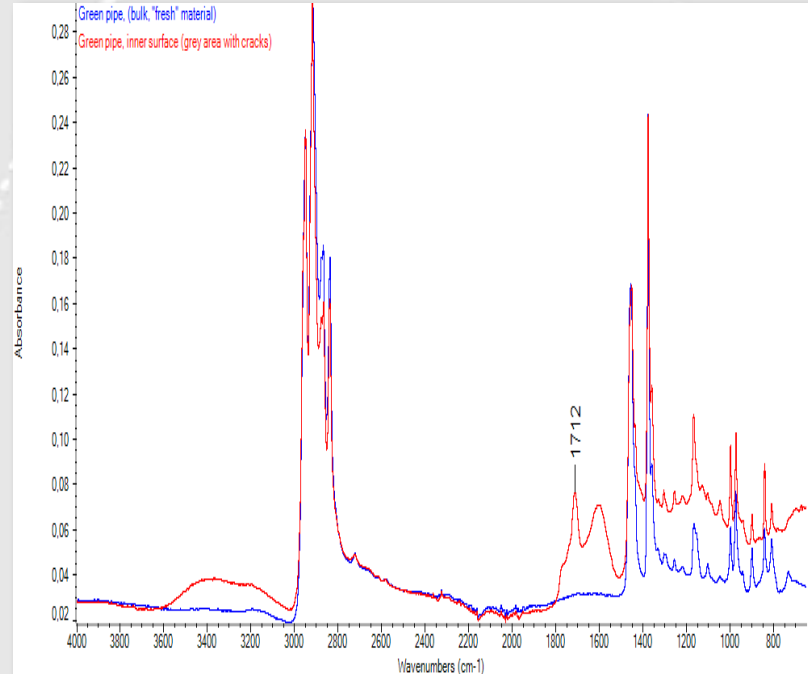
Inner side of pipe



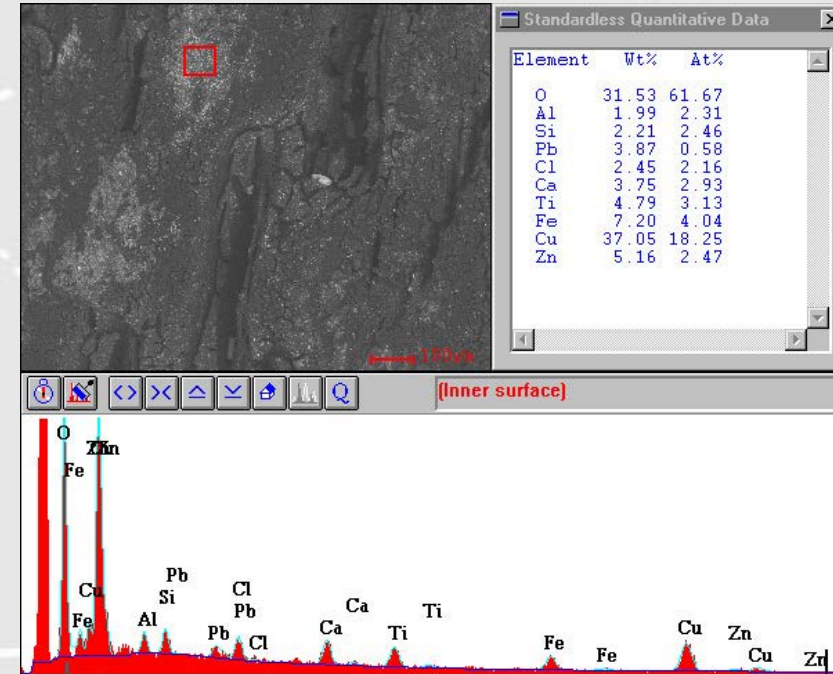


# Case 1 – Failure analyses broken pipe

FT-IR; Strong degree of degradation



SEM-EDS shows metal, mainly Copper oxide

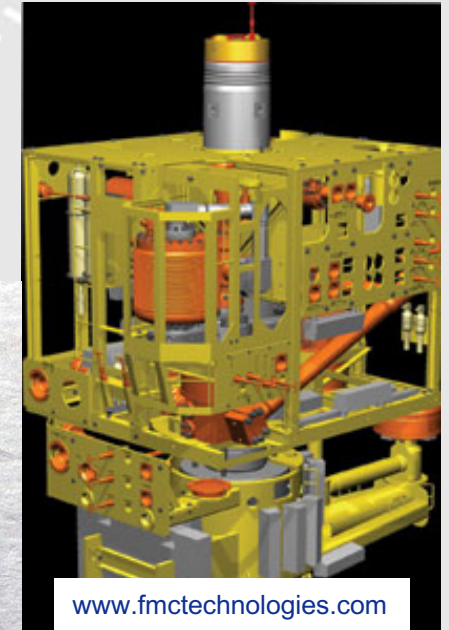


Main Cause ; Material is severely degraded

Solution ; Add metal deactivator to the PP material

# Case 2 – Seal/gasket material subsea

- Recommend material choice for seals in Christmas Trees for use below 1000m water depth
- Is there an existing solution, or is new development necessary?
  - Chemical resistance, ageing behaviour
  - Compression behaviour
  - Max and min design temperature
  - Hardness
- Norsok M-710; Qualification of non-metallic sealing materials and manufacturers
- ISO 10423; Function testing of seals



Norner proposed a material fulfilling the specifications



# Case 3 – Composite Well Intervention Rods

- The ComTrac system, developed by C6 Technologies, utilizes a light-weight, semi-stiff composite rod with electrical cables embedded for communication with downhole tools.
- Well interventions in the most challenging extended operating environments
  - temperature up to 177 °C
  - pressure up to 1 000 bar
  - length up to 10 000 m



RCN Program: PETROMAKS 2

Project no.: 235366

Period: 2014 –2016

RCN grant: 13.6 MNOK

Norner, as the R&D partner, contributed with:

- Developed material knowledge in ultra high performing polymers
- Proposed Material solutions
- Developed processing technology
- Advanced testing and characterization using industrially relevant techniques and methods



Illustration picture;  
Composite rod

# Case 4 – High temperature thermal insulation for deepwater pipelines

- Thermal insulation is critical in assuring flow in pipeline fluid transport Keeping the temperature of the fluid high avoids solids precipitation and clogging the pipe during production shut downs and towards terminations.
- Maximum temperature rating for insulations on deepwater flowlines is currently 150 °C. Higher temperature insulation is required.
- Project target is 180 °C and 3000 m Seawater depth

Norner, as the R&D partner, contributes with:

- Material knowledge in high performing polymers
- Material solution proposals and development
- Advanced testing and development using industrially relevant techniques and methods
- Processing technology



Bedrift: SHAWCOR Norway AS  
RCN Program: PETROMAKS 2  
Project no.: 269212  
Period: 2017 – 2020  
RCN grant: 12.2 MNOK

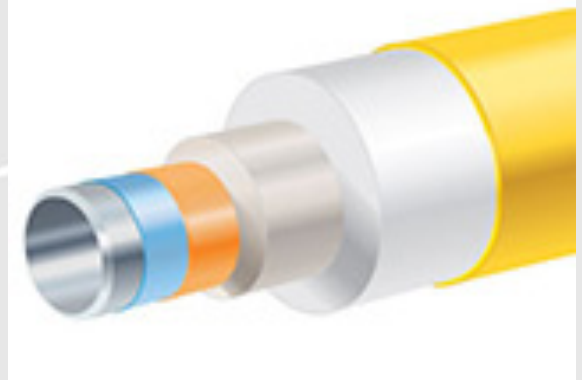


Illustration picture;  
Thermal insulation