Our research is particularly relevant for new offshore oilfield developments with the emphasis on IOR (increased oil recovery) requiring reliable, compact and efficient subsea installations and components.

Why SINTEF
- Independent Research Institute
- Highly skilled personnel with long experience
- Unique laboratory facilities, combining high pressure with high voltage
- Can assist from research to commissioning
- We are solution-oriented

Customers
- End users, like oil and gas companies
- Manufacturers of subsea components and equipment
- Manufacturer of materials for subsea applications

Applications
Identify the optimal materials and design for high voltage subsea equipment. Ageing and (type) testing of subsea model and full scale components and materials, typically:
- Insulation materials
- Power cables
- Motor winding
- Connectors
- Penetrators
- Pressure tolerant power electronics (VSD)
- Transformers
- Capacitors

Example of research
Electrical treeing in silicone cable joints in high hydrostatic pressure
Observing the growth of electrical treeing with high speed and high resolution optical and electrical measurements.
Acetone ageing of XLPE insulated miniature cables at high pressure up to 500 bars at 90°C
Investigate the growth of water trees in cable insulation under high hydrostatic pressure.
Testing of electrical motor insulation under high pressure and high voltage in raw natural gas
Multifactor ageing for testing the combined effect of electric, chemical, humidity, pressure and temperature stress on electrical insulation materials.
Developing of pressure-tolerant power electronics
A full converter phase leg has been built, submerged in dielectric liquid, and tested in full operation up to 300 bar.
Pressure vessels
- Approximately 30 operative vessels
- From 0.08 litres to 2000 litres
- Up to 1000 bar pressure
- Temperature control from -20 to +200°C
- Voltage range 0 - 150 kV with in-house developed cable penetrators
- Safety cells for testing with hydrocarbon gas mixtures
- High focus on HSE

Pressure vessel for larger components - 1
- Component testing
- Volume 2000 litres
- 40 bar / 30°C

Long pressure vessels - 2
- Two pressure vessels for 30 bar and 60/90°C
- Volume 700 and 820 litres
- Typical application: Cables and cable accessories

300 bar pressure vessels
- Material and component ageing
- Dimensions 300 x 1000 mm (D x l), 71 litres
- Dimensions 300 x 1500 mm (D x l), 106 litres
- T = 0 - 200°C
- Stainless steel 17/4 PH
- Tubular lining of corrosion resistant material can be inserted for use in harsh environments

500 bar pressure vessels - 4
- Breakdown voltage testing
- Partial discharge measurement
- Dielectric characterization
- Dimensions 200 x 500 mm (D x l), 16 litres
- T = 0 - 200°C
- One pressure vessel with optical windows - 5
- Stainless steel 17/4 PH
- Tubular lining of corrosion resistant material can be inserted for use in harsh environments

1000 bar pressure vessels
- Similar tests as the other pressure vessels
- Dimensions 400 x 2000 mm (D x l), 250 litres
- T = 0 - 200°C
- Stainless steel 17/4 PH

Small pressure vessels for material ageing and diffusion measurements
- Volume 1 litre - 6
- Dimensions 80 x 800 mm (D x l)
- P_max = 300 Bar
- T = 0 - 200°C
- HAUSTELL alloy C-276
  - One of few alloys resistant to chloride gases and liquids
  - Exceptional resistance to strong solutions of oxidizing salts
  - Suitable for many aggressive chemicals
- Volume 0,08 litres - 7
- Dimensions 20 x 250 mm (D x l)
- Material: Ti grade 5
- 500 bar / 0 - 150°C

Pressure vessels for power electronics - 8
- Volume 19 litres
- Suitable for small converters / phase-legs
- Dimensions 200 x 605 mm (D x l)
- 500 bar / 0 - 125°C
- Volume 70 litres
- Suitable also for full 3 phase converters
- Dimensions 300 x 1000 mm (D x l)
- 300 bar / 0 - 70°C

1000 litres high pressure vessel “Garfield”
- Component testing
- Installed at the Tiller safety laboratory
- Inner diameter 0.8 m
- Inner length 2 m
- 500 bar / 0 - 150°C
- 4 high voltage penetrators up to 150 kV

High voltage laboratory penetrators - 9
- Unique possibility for combined high voltage and high pressure testing
- In-house, specially developed for laboratory use
- Tested for 500 bar/30 kV, 300 bar/100 kV
- Water cooled for operation at high temperature, tested up to 150°C