



Thermoplastics and Composites for the Oil and Gas Industry



Oil and Gas Industry



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Competence in Plastics

The Röchling Group, which is headquartered in Mannheim, includes a large number of locations in countries all over the world. With a workforce of several thousand employees, we manufacture our products in close proximity to our customers and markets. Our three company divisions, Industrial, Automotive and Medical, generate billions in sales every year on the European, American and Asian continents.

Röchling Industrial

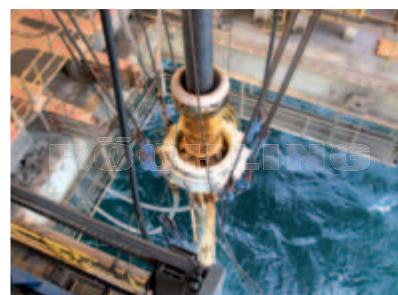
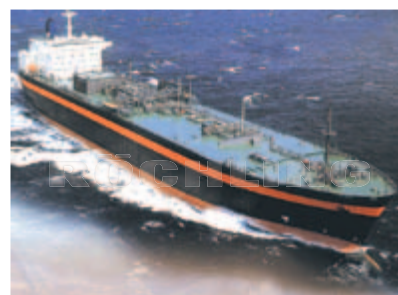
The **Industrial** division supplies almost every sector of industry with optimal, application-oriented materials. To achieve this, Röchling has probably the world's biggest product portfolio of thermoplastics and composite materials. The company manufactures a range of semi-finished parts such as sheets, rods, tubes, flat bars, finished castings and profiles as well as machined and assembled precision components.

Your ideas become high quality components

This one-of-a-kind, international network of companies provides you with the material expertise of one of the most innovative manufacturers of semi-finished plastic parts, machined components and composites as well as outstanding industry know-how and machinery that is unparalleled in the world.

You benefit from the synergies of the global locations of the Division. We look forward to meeting your most challenging needs.

www.roechling.com



Oil and Gas – real hardness test

Materials for the most demanding environments

Oil and Gas exploration occurs in some of the most demanding environments on the planet, with demands on materials including:

- Corrosive seawater
- Abrasive (sand/rocks) conditions
- Exposure to sour gas and completion fluids
- Fluctuating weather conditions including, high (desert) and low (arctic) temperature environments

Röchling offers materials which provide solutions to these and more environmental challenges.

Speak to us to find out more!

Reliable and durable

When working miles from land, equipment must work safely every time. Materials from Röchling offer the highest levels of quality and our internal labs can supply supporting documentation (such as 3.1 certificates according to EN 10204).

Röchling materials:

- Are naturally corrosion resistant
- Offer extreme wear resistance
- Have excellent chemical resistance
- Exhibit thermal stability in low and high temperature environments
- Are weather resistant (UV)

Machined components and semi-finished products

Röchling offers one of the widest ranges of thermoplastic and composite materials available. With its global presence, we are able to quickly meet your requirements anywhere in the world.

Our semi-finished materials and machined components, to customers drawings, will keep key equipment operating under the extreme and demanding conditions found during Oil and Gas exploration and production.

Typical materials offered by Röchling for use in the Oil and Gas Industry

Thermoplastics

- SUSTAPEEK (PEEK)
- SUSTAPVDF (PVDF)
- SUSTAMID (PA)
- SUSTARIN (POM)
- SUSTADUR PET (PET)
- SUSTAKON (PK)
- SUSTATRON PPS (PPS)
- **Fibracon**® PTFE
- **Polystone**® P (PP)
- **Polystone**® M (UHMW-PE)
- **Polystone**® D (HMW-PE)

Composites

- **Durostone**® – glass-fibre reinforced polyester or epoxy laminates
- **Lignostone**® cryogenic, **Lignostone**® HII/2 30, **Lignostone**® LII/2 – laminated densified wood
- **Durolight**®, **Durolight**® S, **Durolight**® S1, **Durolight**® S2, **Durolight**® S3 – thermally insulating pipe supports from -196 °C to +200 °C



Your advantages

- Naturally corrosion resistant materials
- UV and weather resistant
- Long-lasting and low maintenance: resistant to corrosive salt water and hydrocarbons
- Weight reduction (easier install/usage)
- Noise reduction during operation

Proven materials for topside applications

Oil and Gas production in offshore environments puts materials under some of the most demanding conditions found on the planet. These often include intense UV radiation, corrosive salt water and abrasive sand (winds), not to mention the extreme thermal conditions found in both arctic and tropical environments. Yet all environments require the safe and efficient operation of equipment every time.

Typical applications include:

- Catwalk shuttle components
- Cable clamps
- Structural supports
- Grating, fencing
- Launch and recover system (LARS) components
- Cable lay equipment (sheaves/sheave segments)
- Diablo rollers
- Tank supports

Product examples:

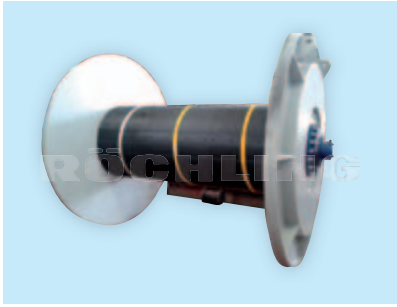


Tank supports and pipe supports

Lignostone® cryogenic is a laminated densified wood which offers exceptional properties, making it ideal for use as tank supports (picture), chocks, fixed blocks and sliding blocks in LNG transport vessels as well as pipe supports. Low thermal conductivity, low weight, a low coefficient of friction and an ability to withstand high mechanical loadings are some of the advantageous properties that Lignostone® cryogenic offers. Beside this the material is suitable to operate in environments with temperatures from -196 °C to +90 °C (-320 °F to 194 °F).

Approved quality

Lignostone® cryogenic is approved by LR, BV, NKK, GL/DNV, IHI and JMU.



Winch drum shell

Installation and retrieval of equipment from subsea environments leads to high demands on cables. To help mitigate this Röchling's range of SUSTAMID materials can lead to an increase in cable life. This is due to the low coefficient of friction and excellent wear resistance of SUSTAMID materials, further enhanced by the excellent impact resistance and significant weight reduction compared to steel.

Typical material:

SUSTAMID 6G (PA 6G),
SUSTAMID 6G MO (PA 6G + lubricant),
SUSTAMID 6G ESD 60/90
(PA 6G – for charge critical environment)



Bend restrictor/spacer

Bend restrictors encase and protect pipelines, umbilical's and cables during operation; as excess bending could lead to failure of the cable/pipe. SUSTAMID 6G can be readily coloured and cast to a size to offer an economical solution with long life and high mechanical properties.

Typical material:

SUSTAMID 6G (PA 6G)



Slide pads/skid pads

Movement of production equipment around a rig, ship or the sea floor can lead to damage by abrasion and contamination. Polymers offer significant advantages (low friction, high wear, impact resistant and self-lubricating) for all sliding applications.

Typical material:

LubX®, SUSTARIN C (POM-C),
SUSTADUR PET (PET),
SUSTAMID 6G (PA 6G),
SUSTATRON PPS (PPS),
SUSTAPEEK (PEEK),
SUSTAPEEK GLD 140 (PEEK)



Fenders

Mounted on fender systems, sliding sheets made of our special material Polystone® FM protect quay bulkheads and ships during mooring and harbour manoeuvring and during idle periods. The ready-to-mount sheets are characterized by high abrasion and wear resistance and are resistant to corrosion, UV radiation and weathering.

Typical material:

Polystone® FM



Your advantages

- Long-lasting: resistant to corrosive salt water, oil, gas and resources
- Low maintenance due to wear resistance and tribological properties
- Corrosion and weather resistant
- Weight reduction allows easier install/access
- Noise reduction during operation

Proven materials for transportation and pipelines

Transportation of hydrocarbons has its own challenges. Röchling materials have been proven in the most demanding applications from cryogenic to high temperature as well as NORSOK M-710 approved grades.

Typical applications include:

- Pipe-in-pipe centralisers
- Pipe supports
- Thermal insulation
- Corrosion protection
- Fasteners
- Tube guides

Product examples:



Durostone® fasteners

Oxidation of steel fasteners leads to the need for regular replacement or the use of costly titanium or super duplex grades. An alternative to these are Durostone® fasteners, which are not affected by oxidative degradation. Durostone® fasteners offer high strength and are naturally corrosion resistant, as well as highly weather and chemical resistant, but weight ~75% less than an equivalent sized steel fastener.

Typical material:

Durostone® fasteners (glass fibre composite), SUSTAPEEK CF 30 (carbon fibre reinforced) fasteners also possible.

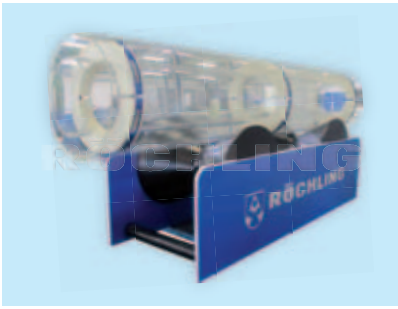


Tube Guide/Pipe supports

Pipe supports and tube guides made of our thermoplastic materials like SUSTARIN C, Polystone® M, Polystone® G and SUSTAPEEK offer you a number of advantages over traditional metal alternatives. With thermoplastic materials being naturally corrosion resistant, having low coefficients of friction and a ductile nature being of benefit when clamped around pipelines/umbilical's. These advantages combine to increase the ease of operation of the equipment.

Typical material:

Polystone® M (UHMW-PE), Polystone® G (HD-PE), SUSTARIN C (POM-C), SUSTAPEEK (PEEK)



Pipe-in-pipe centralisers

As well as offering a standard PiP centraliser, Röchling having listened to the demands of the industry and have developed a proprietary centraliser to reduce friction during pull-through on the flow line.

Typical material:

SUSTAMID 6G (PA 6G),
High Friction Centraliser,
Design (HFE Centraliser)



Ball valve seats

Flow lines and production equipment all depend on seals and valve seats to operate. Because of our broad material range, we can offer the optimum material depending on the chemical, thermal and mechanical requirements.

Typical material:

NORSOK M-710 tested
SUSTAPEEK (PEEK),
NORSOK M-710 tested Fibracon® PTFE
and filled Fibracon® PTFE,
SUSTAMID 6G (PA 6G),
SUSTATRON PPS (PPS),
SUSTAKON (PK),
Polystone® M (UHMW-PE)



Insulating load bearing pipe supports

Durolight, a fibre reinforced insulating composite was developed to meet the thermal and mechanical requirements of load bearing supports in LNG applications (from -196 °C to +200 °C) making it an excellent choice for pipeline insulation and as thermal breaks.

Typical material:

Durolight®,
Durolight® S,
Durolight® S1,
Durolight® S2,
Durolight® S3

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Cryogenic pipe supports

Lignostone® HII/2 30 is a laminated densified wood which offers exceptional properties, making it ideal for use as load bearing cryogenic supports. Low thermal conductivity, low weight, a low coefficient of friction and an ability to withstand high mechanical loadings are some of the advantageous properties of Lignostone® cryogenic has. Beside this the material is suitable for operation in environments with temperatures from -196 °C to +90 °C (-320 °F to 194 °F).

Typical material:

Lignostone® HII/2 30



Your advantages

- Naturally corrosion resistant materials
- Weight reduction (reduced need for costly buoyancy)
- Long-lasting and low maintenance: resistant to corrosive salt water and hydrocarbons
- Economic advantages: Possibility for cathodic protection free equipment

Proven materials for subsea applications

Plastics in subsea environments offer many efficiency and economic advantages over traditional materials by being naturally corrosion resistant and weighing up to 50 % less than aluminium.

Typical applications include:

- Pipeline-systems
- ROV components
- Subsea connectors
- Support structures
- Signage
- Tree and wellhead equipment

Product examples:



Durostone® fasteners

In offshore environments, oxidation of fasteners can rapidly happen, unless costly titanium or super duplex grades are used. An alternative to these are our Durostone® fasteners, which are not affected by oxidative degradation like steel. Durostone® fasteners offer high strength and are naturally corrosion resistant, as well as highly weather and chemical resistant, but also only weight approximately 75 % less than an equivalent sized steel fastener.

Typical material:

Durostone® fasteners (glass fibre composite)



Subsea tree caps

Protection of the wellhead using a polymer cap offers an efficient, naturally corrosion resistant and insulating solution to traditional metallic solutions.

Typical material:

SUSTARIN C (POM-C),
SUSTAPVDF (PVDF),
SUSTAPEEK (PEEK)



Subsea structure – pipe flange

Compared to metallic flanges polymer flanges (such as SUSTAPEEK) can lead to significant weight reduction, especially when combined with polymer flowlines. They also offer excellent chemical resistance and have a broad temperature range.

Typical material:

NORSOK M-710 approved,
SUSTAPEEK (PEEK),
Durostone®



Sensor body housings

A radio transparent housing made from polymers to protect the delicate electronics from corrosive sea water or sour gas environments can be achieved with Röchling materials.

Typical material:

SUSTARIN C (POM-C),
SUSTAPEI (PEI),
SUSTASON (PPSU, PES, PSU),
SUSTAPEEK (PEEK)



High voltage electrical connectors

Polymer electrical and communication connectors are the optimum solution with good electrical resistance, low moisture absorption, high dimensional stability and impact resistance for Dry-Mate and Wet-Met systems.

Typical material:

SUSTAPEEK (PEEK),
SUSTAPEI (PEI),
SUSTASON (PPSU),
SUSTARIN C (POM-C)



ROV Components

Remote Offshore Vehicles (ROVs) are continuously being designed to operate in ever increasing depths. To aid this, we supply numerous corrosion resistant, key components used to assemble an ROV. PP & PE are used for the frames to replace steel & aluminum. POM, PA and PEEK are used for mechanical components for the robot arm and are used for the light housings. All Röchling materials help to reduce weight and maintenance work of the vehicles and extend its lifetime as well.

Typical material:

Polystone® D (HMW-PE),
Polystone® P (PP),
SUSTAMID 6G (PA 6G),
SUSTARIN C (POM-C),
SUSTAPEEK (PEEK),
Durostone® (glass fibre composite)



Your advantages

- Long-lasting and low maintenance: due to excellent chemical resistant
- Economic production processes
- Increased sealing efficiency
- Reduced risk of damage to critical (riser) equipment

Proven materials for downhole applications

Downhole environments are some of the most demanding involved with oil and gas production with a cocktail of chemicals such as hydrocarbons, H₂S, production fluids, lubricants and grease in combination with high temperatures (> 120 °C) present. Depending on the exact environmental conditions we can advise you on the suitability of engineering plastics or high temperature materials for your application.

Typical applications include:

- Seal and valve seats
- Back-up rings
- Frac balls
- Centralisers

Product examples:



Anti-extrusion (back-up) rings

When Fibracon® PTFE seals are used, a back-up ring is often required to ensure the Fibracon® PTFE seal is kept in place. Röchling offers SUSTAPEEK and SUSTATRON PPS for these applications, with fibre filled grades possible for greater load environments. Both SUSTAPEEK and SUSTATRON PPS offer high maximum usage temperatures, impressive mechanical properties and excellent chemical resistance to typical conditions found in downhole environments. Röchling offers one of the widest range of sizes of extruded PEEK tubes available direct from stock, which enables efficient production.

Typical material:

SUSTAPEEK (PEEK),
SUSTATRON PPS (PPS)



Seals & back-up rings

NORSOK M-710 tested grades of PEEK and Fibracon® PTFE provide confidence under the most demanding sour gas conditions with nylons and PE also available for lower temperature environments.

Typical material:

NORSOK M-710 tested, SUSTAPEEK (PEEK) and Fibracon® PTFE, SUSTATRON PPS (PPS), SUSTAMID 6G (PA 6G), SUSTAMID 6G OL (PA 6G + oil), Polystone® M (UHMW-PE)

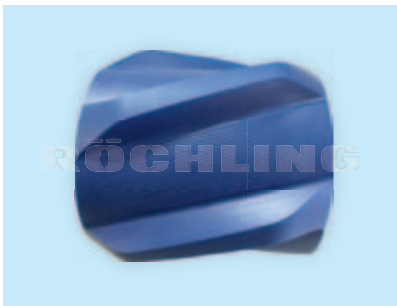


Frac balls

During hydraulic fracturing, frac balls are subjected to high pressures to ensure the release of hydrocarbon reserves. For these applications, SUSTAPEEK offers the optimum combination of chemical resistance to fracturing fluids, mechanical properties and high thermal stability. Beside this we offer you frac balls made of our Durostone® glass fibre composite material.

Typical material:

SUSTAPEEK (PEEK), Durostone® (glass fibre composite)



Riser centralisers

Ensuring the position of the drilling riser from the casing is key during drilling. With Röchling's range of polymers, low coefficient riser centralisers or slide pads offer high impact and abrasion resistance as well as being resistant to oils and grease making them efficient solutions for all environments.

Typical material:

NORSOK M-710 tested, SUSTAPEEK (PEEK), SUSTAPVDF (PVDF), SUSTAMID 6G (PA 6G), SUSTAMID 6G OL (PA 6G +oil), Polystone® M (UHMW-PE)

Competence in materials Solutions for Oil and Gas

Röchling offers you a unique range!

For more than 100 years, Röchling has specialised in the processing of plastics. Today the product range is comprised of more than 150 different types of plastics – from Standard Plastics to High Performance Plastics that withstand high operating temperatures, loads, and corrosive chemicals. The wide variety of modifications and special developments is also unparalleled worldwide.

You can benefit from this material range, the knowledge of our excellently trained plastics experts, our technological leadership, own training centres and internal materials laboratories.



Thermoplastics

High-performance plastics

150 °C
302 °F

SUSTAPEI
SUSTASON PPSU
SUSTASON PES
SUSTASON PSU

SUSTAPEEK
Fibracon® PTFE
SUSTATRON PPS
Vitrile® HTS
SUSTAECTFE
SUSTAPVDF
Polystone® PVDF

Engineering plastics

100 °C
212 °F

SUSTAPPE
SUSTANAT PC

SUSTADUR PBT
SUSTADUR PET
SUSTARIN (POM)
SUSTAVACU (PA 6 GF)
SUSTA GLIDE
SUSTAMID (PA, PA 66, PA 6 G)
SUSTAKON (PK) **Matrox®**

Industrial plastics

TroBloc®
Astrawood® Cool

SUSTAABS
MAYWO (ABS)
MAYWO (PS)
Formaterm®
Rimito®
Trovidur® (PVC)
Trovicel® (PVC)

Polystone® P (PP)
Polystone® M (PE 1000)
Polystone® D (PE 500)
Polystone® G (PE 300)
Polystone® E (PE-LD)

CubX®
Foamlite®
LubX®
Play-Tec®
Polystone® Marine-Tec
Polystone® Safe-Tec

amorphous | semi-crystalline

Important characteristics of plastics

- Corrosion resistance (sea water)
- UV resistant
- Lightweight
- High mechanical strength
- Excellent chemical resistance
- Naturally electrical & thermal insulators
- High impact resistance

All Röchling materials are available for machining.

Composite materials

Reinforcement

- Glass or carbon fibres
- Roving, mat, fleece, woven or non-crimp fabric

Resin

- Unsaturated polyester (UP)
- Vinylester (VE)
- Epoxy (EP)
- Polyurethane (PUR)

Laminated

densified wood – beech veneers (*Fagus sylvatica*) with phenolic resin



Products



Composite Fasteners

- Naturally corrosion resistant materials as alternative to costly super duplex and titanium components
- Standard sizes M8 to M30 threaded rods, further sizes possible
- Highly UV and weather resistant
- High mechanical strength and 30% lighter weight than aluminium



Thermal Insulation

- Durolight® and Lignostone® grades suitable for continuous use down to -196 °C (-320 °F)
- Glasstern grades suitable for environments up to +500 °C (932 °F)
- Very low thermal conductivity
- Weather resistant

Compression Moulded Composite Components

- Production of pressed parts up to 2200 mm x 1600 mm x 1200 mm
- Smooth surface of complex shapes
- Good mechanical strength and naturally self-extinguishing



Pultruded Composite Profiles

- Naturally corrosion resistant materials to replace structural metal components
- High strength (E-Modulus' up to 110 GPa) and low weight (1.5-2.1 g/cm³)
- Weather resistant
- Large range of sizes and shapes possible including: I/H-beam, box section, angle, channels, square hollow profiles
- Width: max. 1000 mm | Height: max. 600 mm



Advantages of our thermoplastics and composites

Thermoplastic and composites from Röchling offer the highest level of reliability and durability as well as having clear advantages over conventional materials.



Chemical and corrosion resistance

- Excellent corrosion resistance (seawater)
- Excellent resistance to sweet and sour gas environments
- NORSOK M-710 tested grades



Low weight

- Very low density materials
- Engineering and high performance plastics 1/7th weight of steel
- PE/PP grades naturally buoyant
- Composites 30% lighter than aluminium



High mechanical properties

- High stiffness
- Good impact resistance
- High dimensional stability



Flame retardant

- UL 94 (V0)
- High Limiting Oxygen Index
- Asbestos free
- Halogen free



Economical advantages

- Eliminates the need for cathodic protection
- Reduces maintenance intervals
- Increases part lifetimes



Cryogenic to high temperature

- Polymeric materials can operate in temperatures from -196 °C to +500 °C



Tribological properties

- Excellent wear resistance
- Low co-efficient of friction
- Self-lubricating grades available



Charge critical

- Naturally electrically insulating
- Grades suitable for use in ATEX environments available
- Naturally thermally insulating
- Zone I/IIA suitable and tested material (according to ISO 80079-36)

Our high standards include:

- Full material traceability, from raw material to machined component
- Internal laboratories enable cost efficient and exact material testing (e.g. 2.1, 2.2, 3.1 certificates according to EN 10204)
- Continuous quality checks carried out on materials throughout the production process
- CMM inspection reports on machined components



Competitive advantages through innovation

Our quality management system is regularly inspected in audits in accordance with DIN EN ISO 9001 and its compliance ensured. Moreover, our products undergo ongoing controls in all phases of the production process.

Includes Quality management systems regularly checked and accredited to:

- ISO 9001
- ISO 13485
- ISO 14001
- AS9100
- FPAL Registered

At Röchling, our top priority is innovation. This allows us to present the market with product developments that provide our customers with competitive advantages.

We develop new products and manufacturing processes to fit the specific problem definitions of our customers in our excellently outfitted materials laboratory, and in close cooperation with suppliers, scientists and institutes.

We actively engage in serving the industries through our collaboration with numerous advisory boards and committees, and thus, help define the quality standards of the future.

Our internal labs allow us to continuously check the quality of our material as well as provide certification as per your requirements (e.g. 2.1, 2.2, 3.1 certificates according to EN 10204).





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