Contact Oerlikon today and tap into our production – boosting expertise in surface coatings tailored explicitly to oil & gas applications.

Higher level productivity

With innovative coatings engineered for exploration and production components, downtime can be significantly reduced.
Coated precision tools
- Improved milling and drilling for a wide range of difficult-to-cut materials.
- Maintains the hardness of tools at high operational temperatures.
- Reduces cutting stress due to low frictional coefficient.
- Enhances performance and reliability.

Centralisers & Augers
- Exploration and production cost savings can be achieved using our coatings that reduce friction and protection against wear.
- Coating on centralisers for drill strings decreases friction and wear preventing drilling downtime.

Couplings
- Component service life is increased by using our coatings that reduce friction and protection against wear.
- Increased service life reduces planned OPEX costs and ensures continued production.

Pumps
- At high loads and tight tolerances even hardened or nitride steel components suffer damage due to high friction or too high wear.
- Our coatings are designed to protect against seizure due to low friction delivering resistance against abrasive particles due to its extreme hardness.

Refrigeration & rotating equipment
- Providing coatings for gas turbines, steam turbines, boilers, steam vessels, external pipework, pipe clamping protection for erosion, corrosion and both high and low temperature environments, Oerlikon Metco has a solution.

Liquefied natural gas
- Coating the internal surfaces of pressure vessels, external connectors and pipes, Oerlikon Metco coatings are designed to withstand high pressure and temperature fluctuations.

Floating production storage & offloading
- Oerlikon Metco have a coating for all applications: coating of power generation components on gas & steam turbines, compressors, drill pipes, ship hulls, propellers, drive shafts and risers.

Subsea pumps and valves
- Erosion & corrosion resistant coatings on pump, compressor and e-motor casings.
- Bearing journal HVOF applications for extended running durations within pressurised environments.

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Tristel optical, friction and mechanical impacts take their toll. During service, components must withstand wear, corrosion and great loads while maintaining their light-weight and low-friction properties.

Oil and gas components have to meet very strict code of standards regarding environmental and safety requirements. With surface technologies such as physical vapor deposition (PVD), chemical vapor deposition (CVD), and Nitrizing, Oerlikon Balzers boosts the longevity of vital components. Our thinfilms and coatings cost-effectively enhance their durability and ruggedness. The result: physical properties that deliver a value proposition more cut reaching than just the sum of the substrate and coating whilst adhering to oil and gas standards.

High-end coating solutions and outstanding services provide reliability and long life for the oil & gas industry

Protected with Oerlikon Balzers BALINIT® coatings, surface properties are optimised to realise important advantages for oil and gas components. The service life of practically all components involved in drilling for oil and gas can be dramatically extended by applying high-end surface solutions that improve their resistance to abrasion, wear, corrosion, galling, and most other tribological phenomena. Cutting tools have to resist wear under serious conditions, from high cutting temperatures to heavy loads causing friction and difficulties in removing chips. Oerlikon Balzers supplies state-of-the-art BALINIT® coatings which fulfill those requirements – and are based on the environmentally friendly and future-oriented PVD and PACVD coating technologies.

Your benefits

- Bespoke engineered coating solutions
- More than 100 global service centres
- Supporting R&D capabilities
- Economies of scale reducing manufacturing and installation CAPEX costs
- Extend service life due to component reliability reducing OPEX cost
- Low coefficient of friction (~0.15), greater load tolerance, superior anti wear, corrosion and abrasive properties

Oerlikon Balzers’ coating applications for oil & gas components

<table>
<thead>
<tr>
<th>COMPONENTS</th>
<th>BALINIT® C</th>
<th>BALINIT® DLC</th>
<th>BALINIT® DLC STAR</th>
<th>BALINIT® DYLYN</th>
<th>BALINIT® DYLYN PLUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coating material</td>
<td>WC7C</td>
<td>a-C:H</td>
<td>CN / a-C:H</td>
<td>a-C:H:Si</td>
<td>a-C:H:Si</td>
</tr>
<tr>
<td>Process technology</td>
<td>Sputter</td>
<td>PACVD</td>
<td>PACVD</td>
<td>PACVD</td>
<td>PACVD</td>
</tr>
<tr>
<td>Typical coating thickness [µm]</td>
<td>1 - 4</td>
<td>1 - 3</td>
<td>2 - 5</td>
<td>1 - 3</td>
<td>1 - 3</td>
</tr>
<tr>
<td>Friction against steel, dry running</td>
<td>0.1 - 0.2</td>
<td>0.1 - 0.3</td>
<td>0.1 - 0.2</td>
<td>0.1 - 0.2</td>
<td>0.05 - 0.1</td>
</tr>
<tr>
<td>Coating temperature [°C]</td>
<td>&lt; 250</td>
<td>&lt; 250</td>
<td>&lt; 250</td>
<td>180 - 220</td>
<td>180 - 220</td>
</tr>
<tr>
<td>Max. service temp. [°C]</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>350</td>
</tr>
<tr>
<td>Max. treatable dimensions (mm) D x L</td>
<td>250 x 1,000</td>
<td>250 x 1,000</td>
<td>250 x 1,000</td>
<td>330 x 900</td>
<td>330 x 900</td>
</tr>
<tr>
<td>Applications</td>
<td>The standard coating for sliding and rolling elements under poor lubrication conditions, counteracts seizure and galling</td>
<td>Harder than BALINIT® C and therefore used to withstand higher levels of abrasive wear and high sliding speeds</td>
<td>Tribological performance like DLC, but enhanced with a very ductile CrN base layer for additional loads</td>
<td>Silicon-enriched DLC coatings for lower friction, higher corrosion resistance and good release properties</td>
<td>Improved corrosion resistance, protects against abrasive wear and high stress resistance under dry running conditions</td>
</tr>
</tbody>
</table>

All given data are approximate values, they depend on application, environment and test conditions.

Oerlikon Balzers’ coating applications for precision tools machining oil & gas components

<table>
<thead>
<tr>
<th>TOOLS</th>
<th>DALINIT® ALNOVA</th>
<th>DALINIT® DIAMOND MICRO</th>
<th>DALINIT® DIAMOND NANO</th>
<th>DALINIT® HARD CARBON</th>
<th>DALINIT® PERTURA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coating material</td>
<td>ACO-based</td>
<td>C (sp3) micro-crystalline</td>
<td>C (sp3) nano-crystalline</td>
<td>Ta-C</td>
<td>AlTiN-based</td>
</tr>
<tr>
<td>Coating structure</td>
<td>multi-layer</td>
<td>mono-layer</td>
<td>mono-layer</td>
<td>nano-layers</td>
<td>nano-layers</td>
</tr>
<tr>
<td>Coating colour</td>
<td>light-grey</td>
<td>grey</td>
<td>grey</td>
<td>black-rainbow</td>
<td>aubergine-grey</td>
</tr>
<tr>
<td>Coating hardness H&lt;sub&gt;1&lt;/sub&gt; [GPa]</td>
<td>38 +/-3</td>
<td>80 – 100</td>
<td>80 – 100</td>
<td>40-50</td>
<td>35 +/-3</td>
</tr>
<tr>
<td>Max. service temp. [°C]</td>
<td>&gt; 1,100</td>
<td>600</td>
<td>600</td>
<td>500</td>
<td>1,000</td>
</tr>
<tr>
<td>Coating temperature [°C]</td>
<td>800 - 850</td>
<td>800 - 820</td>
<td>&lt; 150</td>
<td>Silicon-enriched DLC coatings for lower friction, higher corrosion resistance and good release properties</td>
<td>Improved corrosion resistance, protects against abrasive wear and high stress resistance under dry running conditions</td>
</tr>
<tr>
<td>Typical coating thickness [µm]</td>
<td>6, 8</td>
<td>6, 8, 12</td>
<td>1 – 2</td>
<td>Silicon-enriched DLC coatings for lower friction, higher corrosion resistance and good release properties</td>
<td>Improved corrosion resistance, protects against abrasive wear and high stress resistance under dry running conditions</td>
</tr>
<tr>
<td>Applications</td>
<td>Milling of Ti and Al alloys</td>
<td>Drilling and milling of graphite</td>
<td>Drilling and milling of CFRP and sandwich materials</td>
<td>Drilling and milling of Al &lt; 12 % content and non-ferrous metals</td>
<td>Drilling of challenging material</td>
</tr>
</tbody>
</table>

All given data are approximate values, they depend on application, environment and test conditions.
Oerlikon Metco has over 80 years of market experience and more than 45 years of partnership with the oil and gas industry. Oerlikon Metco’s materials, coating equipment and services, specialised machining services and components for rotating and fixed components significantly increase efficient and longevity of the components to meet the next planned outage. Specifically designed materials and coatings protect the base material of critical parts from oxidation, erosion and corrosion.

**Market leader in many industries**

<table>
<thead>
<tr>
<th>SURFACE MECHANISM</th>
<th>AVIATION</th>
<th>POWER</th>
<th>AUTOMOTIVE</th>
<th>OIL &amp; GAS</th>
<th>INDUSTRIAL &amp; SPECIALITY*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wear</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Friction</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Corrosion</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Thermal Protection</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Clearance Control</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Oxidation</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Electromical conductivity</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-Skid</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Dimensional Restriction</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

* Agriculture, PPP, Metals Processing, Heavy Machinery, Construction, Tooling, Mining, New Energies, Medical, Electronics

- **Oil Production**
  Our services and coatings ensure reliable compressor, turbine and pump operations. Coatings designed to prevent Corrosion Under Insulation (CUI) protect pipeworks in oil refineries and ensure safe operation.

- **Subsea**
  To help protect surfaces in subsea environments, we have developed long-lasting coatings that excel at wear prevention on critical components while resisting the corrosive effects of saltwater environments.

- **Liquefied Natural Gas**
  Our sacrificial coatings offer long-lasting protection to storage tanks, transfer pipelines and tanker hulls and equipment, increasing their service life, reliability and safety.

- **FPSO**
  Floating production, storage, and offloading (FPSO) is very demanding. Our coatings provide reliable protection in applications like riser tensioners, hulls, pumps, drill platforms and drill strings. We can also provide anti-skid coatings for decks and stairways.

- **Exploration & Drilling**
  Oil and gas equipment is exposed to extreme demands. Our surface solutions like plasma transferred arc welding, high-velocity oxy-fuel spray, laser cladding materials, and tungsten carbides multiply component service life. In demanding environments, you can rely on our products and services.

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- **Carbon Capture and Storage**
  Pumps, valves and piping are protected with surface technology to maintain the operating efficiency of carbon capture and storage systems.

**Coating Systems**

- **Thermal Spray**
  Single- and multi-process systems with standard and customised handling designed for every budget and need.
  - Atmospheric Plasma Spray: APS
  - Controlled Atmosphere Plasma Spray: VPS, LPFP, LVPS, LPFP-Hybrid
  - High-Velocity Oxygen Fuel Spray: HVOF-GF, HVOF-LF
  - Electric Arc Wire Spray
  - Combustion Wire and Powder Spray

- **Laser Cladding (LC)**
  LC Systems with customised robotic handling for process head and work piece movement.

**Customer Services**

- Thermal spray and laser cladding coating services
- Coating Solutions Centres for Coating Development
- Additive Manufacturing printing for materials testing and test article production
- Technical and Field Services
- Customer training
- Spare parts

**Build-to-print services**

- 1-stop-shop for your hot and cold section turbine engine components
- Production cell concepts delivering a high level of delivery performance
- Automation in place to maximise efficiency
- Cross-functional work approach with customers for new parts introduction
More than 100 global service centres
Regionally aligned to oil & gas supply chain geographies

Higher level productivity
With innovative coatings engineered for exploration and production components, downtime can be significantly reduced

Contact Oerlikon today and tap into our production – boosting expertise in surface coatings tailored explicitly to oil & gas applications

You can find a full listing of our locations at: www.oerlikon.com/balzers www.oerlikon.com/metco