TOOLBOX UTILISING THE MOST ADVANCED EQUIPMENT, TECHNIQUES AND TECHNOLOGY TO MEET AND EXCEED CLIENT EXPECTATIONS AND DELIVER RESULTS.

GLOBAL REACH WITH A WORLDWIDE TEAM READY TO DELIVER YOUR PROJECTS:
- UK.
- EGYPT.
- UAE.
- MALAYSIA.
- NIGERIA.

50+ STAFF

GENUINE COLLABORATION AND PARTNERSHIPS THAT SUPPORT, DRIVE AND LEAD THE DEVELOPMENT OF SERVICES TO CONQUER NEW AND INNOVATIVE SUBSEA FRONTIERS.

CHALLENGE THE CONVENTIONAL
Cortez Subsea forms part of a group of highly technical entities in the subsea energy sector. Together we can deliver the design and development of state-of-the-art technology and equipment and take this from the spark of an idea through planning to clever application and field operations.

- **30% of staff dedicated to innovation**
- **$2.5 million spent on innovation in 2018**

**PARTNERING FOR STRENGTH**
- PROJECT MANAGEMENT.
- PRECISE 3D MODELING AND MEASUREMENTS.
- STATE-OF-THE-ART INSPECTION DATA MANAGEMENT SOFTWARE.
- QUALIFIED INSPECTION ENGINEERS.
- THE MOST ADVANCED REMOTELY OPERATED VEHICLES (ROVs).
- IN-HOUSE R&D DEPARTMENTS.
- LATEST TECHNOLOGICAL INNOVATIONS TO SOLVE LIFE OF FIELD CHANGES.
- PATENTED TECHNOLOGY TO MAKE OPERATIONS SAFER, CHEAPER AND CLEANER.
- RISK-BASED ASSESSMENT.
- PRIORITISATION OF WORK ACCORDING TO RISK.
- PRELIMINARY ANALYSIS OF INSPECTION RESULTS.
- SCALABLE, TAILOR-MADE SOLUTIONS.
- ASSET REGISTRY.
- ANOMALY TRACKING.
- ACTION TRACKING.
- SUBSEA PIPELAY FOR FLEXIBLE, RIGID AND COILED LINE PIPE.
- THE MOST ADVANCED REMOTELY OPERATED VEHICLES (ROVs) FOR CONSTRUCTION, INSTALLATION AND DRILLING SUPPORT.
- SUBSEA TOOLING.
- ASSET ASSESSMENT, INTEGRITY AND DATA MANAGEMENT
- PIPELINE AND STRUCTURE INSPECTION
- INNOVATION HOUSE
- CONSTRUCTION AND INSTALLATION
ZAP-LOK™ PROVEN TECHNOLOGY

- More than 6300km or 8 million joints of Zap-Lok™ pipeline laid since 1992 with no failures. That’s further than from KL to Sydney.
- A 40 year history in the energy industry for thousands of miles of flow lines, gathering lines and aided-injection systems.
- Extensively proven in the USA, West Africa and Thailand.

OIL & GAS OPERATORS

TOTAL=6,374KM
QUICKER, CHEAPER, CLEANER, SAFER

You can lay 3.5 – 5km of pipeline per day resulting in less boat time and less crew.

Ease and speed of deployment means using Zap-Lok™ is up to 30 per cent cheaper than traditional methods.

A reduction on the reliance of vessels and man-power means we reduce our carbon footprint.

This alternative to welding takes advantage of semi-automation to result in a safer work environment, free from hot-work and radiography.

- Elastic strain and surface friction makes joints stronger than steel.
- An expanded end is forcefully inserted into a ‘pin’ end to provide an interference fit.
- Used on standard line-pipe up to 300m water-depth.
QUICKER, CHEAPER, CLEANER, SAFER

- Suitable for internal and external coatings and permits state-of-the-art corrosion control techniques.
- Coating application under factory controlled conditions and field joint coatings are not required.
- Lloyds Register approved for subsea application can be insured under a CAR and product policy.

All coating, mastik, overspray in the **Bell I.D.** must be removed. Bell End Bevel will be coated with FBE or suitable epoxy.
# ZAP-LOK™ MECHANICAL CONNECTOR

## Zap-Lok™ Capability Summary

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diameter Range</strong></td>
<td>2” to 16” NB</td>
</tr>
<tr>
<td><strong>Design Compliance</strong></td>
<td>ASME B31.4 and B31.8. &lt;br&gt; PD8010 code of practise for pipelines part 2 subsea pipelines &lt;br&gt; DNV OS F101 submarine pipeline systems &lt;br&gt; ISO 21329 Petroleum and natural gas industries -- pipeline transportation systems -- test procedures for mechanical connectors &lt;br&gt; ISO 13679:2002 Petroleum and natural gas industries -- Procedures for testing casing and tubing connections &lt;br&gt; NACE mr0175</td>
</tr>
<tr>
<td><strong>Material Capability</strong></td>
<td>API 5L specification pipe &lt;br&gt; ASME/ANSI B36.10M, schedule 10 to 80/XS WT &lt;br&gt; Grade B to X65 &lt;br&gt; ERW, HFI or SMLS</td>
</tr>
<tr>
<td><strong>Pressure Rating</strong></td>
<td>As per line pipe material specification &lt;br&gt; Joint does not de-rate the pipe</td>
</tr>
<tr>
<td><strong>Offshore Installation Rate</strong></td>
<td>Vessel and environmental dependent typical jointing speed is 5min per standard pipe length with equates to over 5km per 24hrs.</td>
</tr>
<tr>
<td><strong>Coating Compatibility</strong></td>
<td>Internally coated FBE &lt;br&gt; Externally coated FBE, 3LPP, 3LPE, 5LPP, CWC</td>
</tr>
<tr>
<td><strong>General</strong></td>
<td>Crevice corrosion is not an issue for the joint. &lt;br&gt; No special requirements for either CP or pigging &lt;br&gt; For cyclic loading the Zap-Lok™ connection can be considered to be equivalent to a DNV class C2 weld in seawater</td>
</tr>
</tbody>
</table>
ZAP-LOK™ MECHANICAL CONNECTOR

The test data has been obtained on a variety of API 5L line pipe specimens ranging from 2” to 16” NB, schedule 40-80 wall thickness and grade B to X65 carbon steel, ERW and SMLS.

<table>
<thead>
<tr>
<th>Test</th>
<th>Average Result</th>
<th>Compliance</th>
</tr>
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<tbody>
<tr>
<td>Axial Tension</td>
<td>70% UTS</td>
<td>ASME B31.4 / B31.8, ISO 21329 (app. Level 4)</td>
</tr>
<tr>
<td>Axial Compression</td>
<td>&gt; 95% UTS</td>
<td>ASME B31.4 / B31.8, ISO 21329 (app. Level 4)</td>
</tr>
<tr>
<td>Internal Pressure</td>
<td>&gt; 95% UTS</td>
<td>ASME B31.4 / B31.8, ISO 21329 (app. Level 4)</td>
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<tr>
<td>Bending</td>
<td>&gt; 95% UTS</td>
<td>ASME B31.4 / B31.8, ISO 21329 (app. Level 4)</td>
</tr>
<tr>
<td>Fatigue – in air</td>
<td>DnV D Class weld curve</td>
<td>BS 7608 F2 / DNV C1, ISO 21329 (app. Level 4)</td>
</tr>
<tr>
<td>Fatigue –in water</td>
<td>DnV C2 Class weld curve</td>
<td>BS 7608 F2 / DNV C1, ISO 21329 (app. Level 4)</td>
</tr>
<tr>
<td>Stress Corrosion Cracking</td>
<td>No reduction in strength</td>
<td>NACE MR0175 / NACE TM0177 – Method A</td>
</tr>
<tr>
<td>Crevice Corrosion</td>
<td>No reduction in strength</td>
<td>1 month exposure at 130°F and 500psi in brine with 1,000ppm acetic acid, 30% CO₂, 70%N₂</td>
</tr>
<tr>
<td>Electrical Resistivity</td>
<td>±1μΩ / connection</td>
<td>N.B. 10A, 25mV FSD</td>
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ZAP-LOK™ MECHANICAL CONNECTOR

CONNECTION MAKE-UP STRESSES

Stresses during mandrel insertion

Stresses following pin insertion.
ZAP-LOK™ PIPELINE INSTALLATION

Zap-Lok™ connected pipelines have been installed from a number of offshore barges and vessels using traditional anchor lay spread and dynamically positioned vessels. Since the first offshore pipeline was installed in 1982 by Shell Oil in the Gulf of Mexico the range and complexity of the installation vessel has only been dictated by the total pipeline length and water depth for installation. Using the “S-Lay” method for pipelay Zap-Lok™ pipelines can be installed in water depth of up to 300mtr.
ZAP-LOK™ PIPELINE INSTALLATION

OFFSHORE INSTALLATION VESSELS USED TO INSTALL ZAP-LOK™ PIPELINES

1996 Gabon – Perenco’s use the DP 2 DSV Seaway Harrier

2008 Gabon – Perenco use a DP1 supply vessel Argo 1

2010 Gabon / Cameroon – Perenco’s use the DP 2 vessel Gulmar Condor

2011 Thailand – Chevron use the DP3 Pipelay barge Lewak Champion

2008 Gabon – Maurel & Prom use Stemat barge

2014 Gabon – Perenco use DP2 vessel Bourbon Peridot for pipelay
EVEN BETTER TOGETHER

- The Cortez designed and patented MPS® allows Zap-Lok™ and other mechanical connected pipe to be laid from a standard DP 2 vessel.

- The modular nature of the MPS® is adjustable in width and length to cater for available deck space and the amount of product to be laid for a particular project.

- The steel modular framework provides in-built strength and load bearing capability and simplifies the tie down onto the host vessel.

- Reduces field development costs and combined with mechanical connectors offers cost savings of up to 40% for subsea pipeline installation.

- Provides flexibility so you can dictate your own schedule.

- MPS® is a mobile equipment spread allowing simple and effective transportation and installation.

- Installation onto a range of DP vessels with min 800m² deck.

- Up to 5km lay rate in 24hrs.

- 150m water depth.

- Stinger range 6” to 16” pipe.

- Tensioner range up to 50Te.
### Budgetary Analysis of Total Cost of Zap-Lok™ Installed Pipeline (USD m)

#### Total Budgetary Cost

<table>
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<tr>
<th>USD (m)</th>
<th>1km</th>
<th>5km</th>
<th>10km</th>
<th>15km</th>
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<th>25km</th>
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<tr>
<td>6 Inch</td>
<td>5.9</td>
<td>6.3</td>
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<td>7.4</td>
<td>7.8</td>
<td>8.5</td>
<td>12.2</td>
</tr>
<tr>
<td>8 Inch</td>
<td>6.0</td>
<td>6.5</td>
<td>7.0</td>
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<td>9.0</td>
<td>10.0</td>
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DELIVERING OUR PROMISE

WE ADVANCE TECHNOLOGY
In-depth knowledge coupled with the latest developments in the sector allows us to support our clients to conquer new and innovative subsea frontiers.

WE MAXIMISE VALUE
Building team synergy and collaboration with our customers and partners means smarter solutions which lead to more sustainable and efficient ways to deliver our business.

WE OPTIMISE COSTS
Our technology toolkit gives our clients access to some of the most cost-effective products, equipment, services and expertise in subsea pipelay and inspection globally.

WE EXCEED EXPECTATIONS
Advanced techniques mean we deliver excellence in health and safety for our clients, employees and business stakeholders.
For more information on Cortez Subsea’s services, please get in touch with your nearest office or visit:
cortezsubsea.com