



### Three competencies – three brands

In our efforts to afford our customers the best possible support and promote development in line with specific targets, we have built our core competences within Joint Welding, Repair & Maintenance Welding and Soldering & Brazing. This way we offer our customers the largest and most comprehensive product portfolio of filler materials within our three brands:

- Böhler Welding
- UTP Maintenance
- Fontargen Brazing

### Welding Solutions for demanding industries

We focus on industries with high technological standards and deliver products tailored to industry-

specific requirements. In the development and optimization of filler materials, we collaborate closely with customers, manufacturers, and research institutes.

Whether destined for use in challenging scenarios or in standard applications – our high quality filler materials are ideally suited for all applications in the following industry sectors:

- Oil and Gas
- Pipeline
- Chemical
- Power Generation
- Transportation & Automotive
- Maintenance & Repair
- Brazing Industries

# Onshore Pipelines

We are one of the pioneering suppliers of arc welding consumables and are dedicated to sophisticated applications in the pipeline onshore segment.



Steadily increasing deadline constraints and the reduction of overall project costs in onshore pipelines have led the segment more towards semi- and fully automated welding processes with solid-, flux- and metal-cored wires in order to increase productivity compared to manual arc welding. voestalpine Böhler Welding has monitored this trend over the last years and has developed highly effective technologies and consumables in collaboration with key equipment suppliers to meet the highest technical requirements in cases where climatic conditions prevail such as in the desert or the arctic. In order to reduce wall thicknesses and to increase operational pressures, higher tensile strength pipes produced from thermomechanically (TM) treated steel plates, e.g., X80, are currently being used in onshore pipeline projects.

voestalpine Böhler Welding offers a full range of consumables for welding of low and high strength, stainless, duplex and super duplex, and corrosion-resistant alloy (CRA) pipes meeting highest project requirements in transportation- and distribution pipeline projects.

This includes solid-, flux- metal- and self-shielded flux-cored wires for semi- and fully-mechanized welding processes, submerged wire and flux combinations for double joining as well as gas tungsten arc wires and rod that offer outstanding welding performance and mechanical properties. State-of-the-art manual arc welding electrodes are manufactured either in the form of cellulosic coating systems, or as basic, low-hydrogen systems with vertical up or vertical down operability.



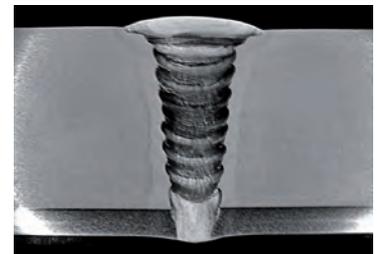
### Climatic conditions

Climatic conditions may vary from desert temperatures of +50°C/122°F to arctic subzero temperatures of -40°C/-40°F. Our weld metals are designed to meet the high impact and tensile requirements even under these severe conditions.



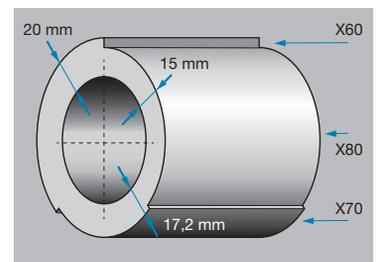
### Corrosion conditions

As the media inside the pipelines are becoming more aggressive, stainless steel and corrosion-resistant alloy (CRA) pipes are gaining in importance. Chemical composition of the appropriate consumables needs to be well-balanced in order to meet corrosion requirements.



### Wall thickness

Even with changing pipe material towards higher tensile strength, e.g., X60–X80, significant wall thickness reductions under the same operational conditions can be achieved. From the very early stages of base metal developments we are working closely together with plate/pipe manufacturers in order to provide state-of-the-art welding consumables along with approved welding technologies (wall thickness reduction comparison X60–X70–X80 under same conditions).



### Base materials

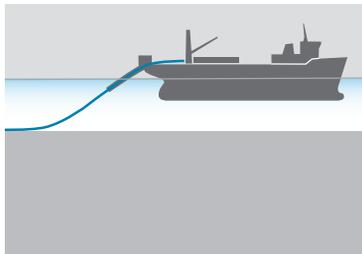
- Low-strength pipe steels API 5L/EN 10208 grade A-X60/L210-L415MB
- High-strength pipe steels API 5L/EN10208 grade X65-X100/L455MB-L690MB
- Stainless steels grade 316L, 317L, 22Cr, 25Cr
- Nickel base: alloy 625
- CRA clad pipes alloy 316L, 625 and 825

# Offshore Pipelines

Global demand for oil and gas continues to increase while historic supplies are being depleted. This is driving the upstream segment to increase exploration activities and develop extraction techniques applicable to hostile offshore environments such as the deep sea and the arctic.

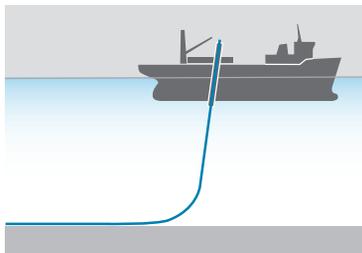
More than ever before, voestalpine Böhler Welding continues to be committed to the development of new technologies and delivers technical and cost-effective solutions to our clients in their increasingly challenging projects and operations. Many of our most effective technologies were developed in collaboration with key equipment suppliers who play an important role in the emergence of effective new concepts and

technological solutions. Our consumables are designed to meet highest application requirements for the construction of offshore pipelines applying either S-lay, J-lay or Reel-lay technology. This includes solid-, flux- and metal-cored wires for mechanized welding, submerged wire and flux combinations for double joining, gas tungsten arc wires and rods as well as electrodes for manual arc welding.



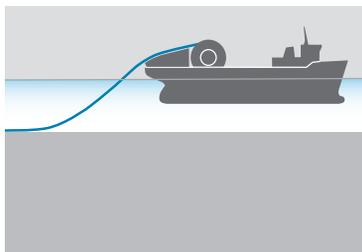
## S-Lay Pipe Installation

When performing S-lay pipeline installations, pipe is eased off the stern of the vessel as the boat moves forward. The pipe curves downward from the stern through the water until it reaches the "touchdown point," or its final destination on the seafloor. As more pipes are welded in the line and eased off the boat, the pipe forms the shape of an "S" in the water. S-lays can be performed in waters up to 1,981 meter (6,500 feet) depths, and as many as 6 kilometers (4 miles) a day of pipe can be installed in this manner.



## J-Lay Pipeline Installation

Overcoming some of the obstacles of S-lay installations, J-lay pipeline installations place less stress on the pipeline by inserting the pipeline in an almost vertical position. Here, pipe is lifted via a tall tower on the boat, and inserted into the sea. Unlike the double curvature obtained in S-lay, the pipe only curves once in J-lay installations, taking on the shape of a "J" under the water. The reduced stress on the pipe allows J-lays to work in deeper water depths. Additionally, the J-lay pipeline can withstand more motion and underwater currents than pipe being installed in the S-lay fashion.



## Reel-Lay Pipe Installation

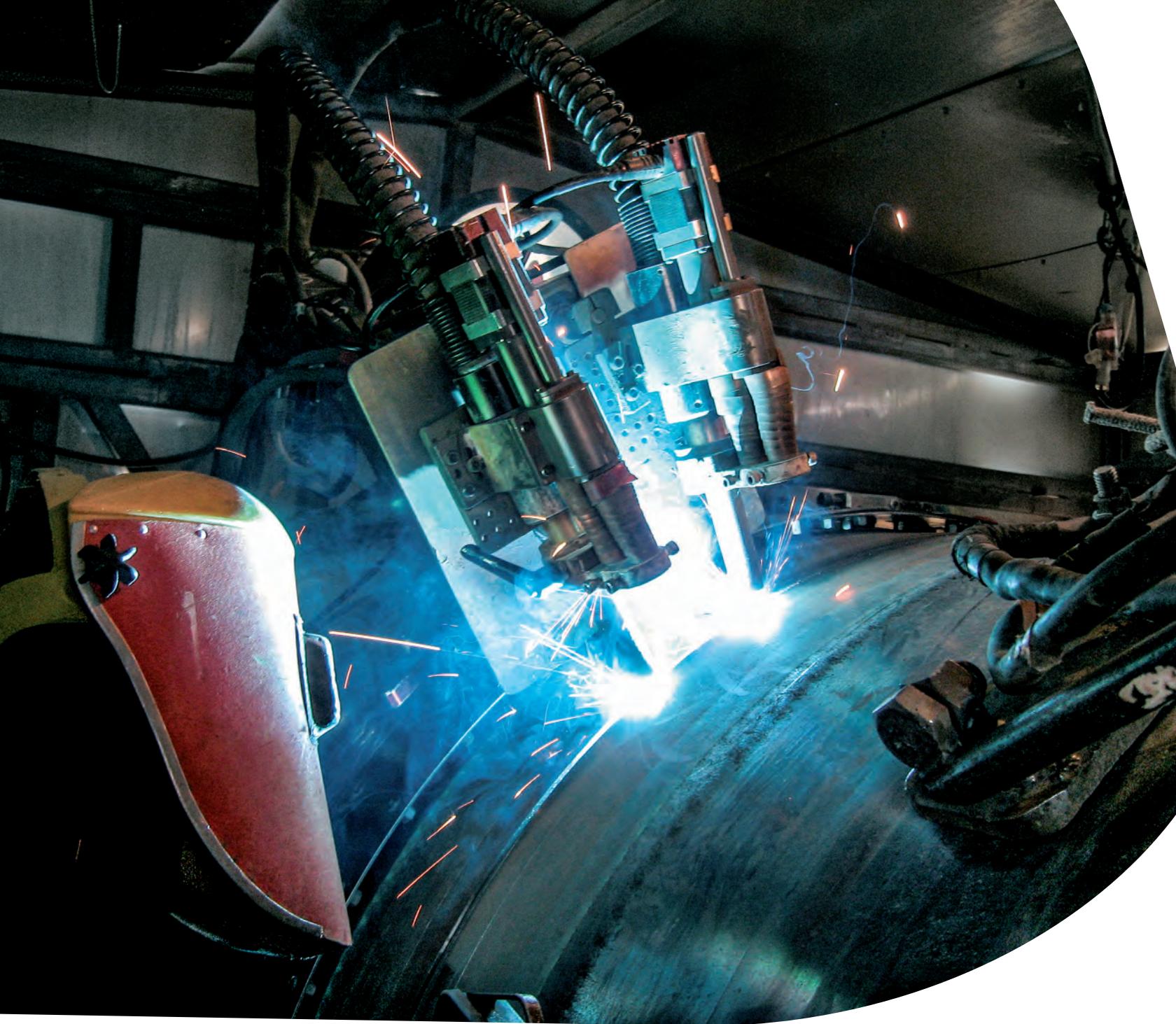
On the other hand, reel barges contain a vertical or horizontal reel that the pipe is wrapped around. Reel barges are able to install both smaller diameter pipe and flexible pipe. Horizontal reel barges perform S-lay installations; while vertical reel barges can perform both S-lay and J-lay pipeline installations. When using reel barges, the welding together of pipe sections is done onshore, reducing installation costs. Reeled pipe is lifted from the dock to the vessel, and the pipe is simply rolled out as installation is performed. Once the entire pipe on the reel has been installed, the vessel either returns to shore for another, or some reel barges are outfitted with cranes that can lift a new reel from a transport vessel and return the spent reel. This saves both time and money.





#### Base materials

- Low-strength pipe steels API 5L / EN 10208 grade A-X60/L210-L415MB
- High-strength pipe steels API 5L / EN 10208 grade X65-X70/L450MB-L485MB
- Stainless steels grade 316L, 317L, 13Cr, 22Cr, 25Cr
- Nickel base: alloy 625
- CRA clad pipes alloy 316L, 625 and 825



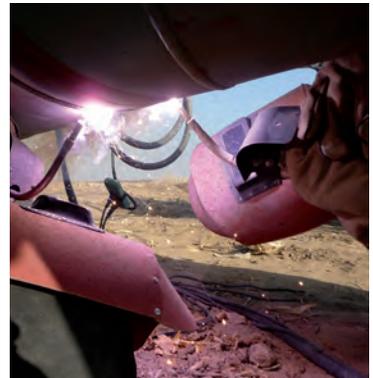
GMAW



SMAW



FCAW gas shielded



FCAW self shielded

# Welding Processes

voestalpine Böhler Welding offers a full range of consumables for all relevant welding processes.

Steadily increasing deadline constraints and the reduction of overall project costs in pipelines leads the segment more towards semi-and fully automated welding processes with solid (GMAW)-, flux (FCAW)- and metal (MCAW)-cored wires in order to increase productivity compared to manual arc welding. However, up to now the conventional shielded metal arc process (SMAW) with coated stick electrodes using either cellulosic or basic low hydrogen systems suitable for vertical up and down positions is applied where terrain, project length, climatic conditions or human resources don't permit automated welding. SMAW is also widely used for tie-ins and repair welding.

Meanwhile welding with self-shielded flux-cored wires (SS FCAW) is very well established in many regions in the world. The process is easy to handle, offers excellent toughness properties, doesn't require shielding gas and provides higher deposition rates compared to SMAW. Submerged arc welding (SAW) is mainly used offshore for double or triple joining in order to increase productivity further. Gas tungsten arc welding (GTAW) can be applied either manually with rods or fully mechanized with wires. The produced weld metals are of highest quality but efficiency is the lowest amongst all the other processes.



GTAW



GMAW



SAW

# References



Contractor: Subsea 7  
 Project name: Svalin  
 Base material: 13% CR

Consumables: Thermanit 22/09-LH (EN ISO: G 22 9 3 N L, AWS: ER2209)  
 Thermanit 25/09CuT-LH (EN ISO: G 25 9 4 N L, AWS: ER2594)



Contractor: Bonatti  
 Project name: Südschiene  
 Base material: L485 MB

Consumables: BÖHLER FOX CEL (EN ISO: E38 3 C 21, AWS: E6010)  
 BÖHLER FOX CEL 80-P (EN ISO: E 46 3 1Ni C 25, AWS: E8010-P1)



Contractor: REKAYASA INDUSTRI  
 Project name: Subsea Pipeline & ORF West Java  
 Base material: DNV 450

Consumables: BÖHLER SG 3-P (EN ISO: G 46 5 M G3Si1, AWS: ER70S-G)  
 BÖHLER TI 70 PIPE-FD (EN ISO: T 55 4 Mn1Ni P M 1 H5, AWS: E91T1-GM)  
 Filler/Capping: BÖHLER EML 5 (EN ISO: W 46 5 W2Si, AWS: ER70S-3)  
 BÖHLER FOX EV 65 (EN ISO: E 55 6 1 NiMo B 42 H5, AWS: E8018-G)

## This is a short list of some of our partners:

CRC Evans	Saipem	Punj Lloyd	Argus	Max Streicher
Dodsal	Nacap	Technip	CPP	Stroygazconsulting
CNPC	Bonatti	Sicim	Denys	Techint
Allseas	Spiecapac	HABAU/PPS	Visser & Smit Hanab	Tekfen
Serimax	Subsea7	L & T	McConnell Dowell	
Stroytransgaz	A.Hak	Südrohrbau	CCC	