

## Vallourec Open Innovation Platform Make Vallourec pipes “augmented”

### Specific environment conditions per application

The challenge is applicable to the following Vallourec pipe applications:

- OCTG tubing and casing in Oil & Gas well
- Offshore and onshore line-pipe
- Tube and pipe in industry applications

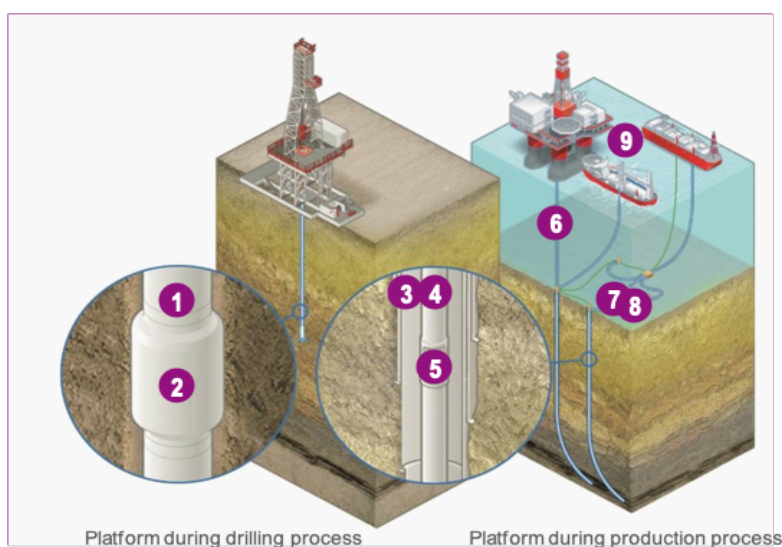
The proposed solution must withstand the specific environment conditions of the application and operational aspects that it shall be in contact with both before during and after installation.

The specific environment conditions of Oil & Gas wells and line-pipes that the proposed solutions must withstand are given hereafter.

It is to be noted that the information given remain generic. Contact Vallourec team for more detailed and specific information.

### Conditions the proposed solutions must withstand

- OCTG tubing and casing in Oil & gas well (below 3, 4,5):



Pressure, temperature, corrosion conditions:

TYPE OF WELL	PRESSURE (Bottom Hole Pressure)		TEMPERATURE (Bottom Hole Temperature)		H2 corrosion	CO2 corrosion
	PSI	MPA	Deg C	Deg F		
Non-HPHT	< 10 000	< 68.9	< 150	< 302	pH <sub>2</sub> S > 0.05 psi defines a Sour Service well. pH <sub>2</sub> S = [concentration] x BHP. For a 15.000 psi well, an H <sub>2</sub> S content as low as 4 ppm provides a sour environment	pCO <sub>2</sub> < 2 psi (0.15 Bar) requires specific material such as 13CR, 22 - 28 CR for pipes.
HPHT	>10 000	>68.9	>150	>302		
Extreme	>15 000	>103.4	>180	>356		
Ultra HPHT	>17 500	>120.6	>200	>392		

Pipes dimension range:

- Outside Diameter (OD): 3 ½ - 16 inches (89 - 406mm)
- Wall Thickness (WT): 0,25 - 1 inches (6,5 - 25.4 mm)

ATEX:

All solutions must be ATEX certified for Oil and gas conditions.

- **Offshore line-pipe - Riser, Flowline, welding solutions (above 6, 7, 8, 9):**

Pressure, temperature, corrosion conditions:

DEPTH	TEMPERATURE	EXTERNAL PRESSURE	INTERNAL PRESSURE	H2 corrosion
< 500m : Shallow	Typical range between 40° C and 150° C	Pressure of Water Depth	Broad range. For classical applications : 100-450 bars Pressure can be higher but that would be for complex applications such as HP/HT	pH <sub>2</sub> S > 0.05 psi defines a Sour Service environment. pH is usually below 7.
>500m : Deep water. Vallourec products typical region is Deep water down to 2500m				
>= 1500m : Ultra Deep				

Typical pipe dimensions:

- Outside Diameter (OD): 6 - 16 inches (150 - 406 mm)
- Wall Thickness (WT): 0,4 - 1,0 inches (11 - 25mm)

- **Onshore line-pipe (not represented above)**

Pressure and temperature are the ones of onshore environment.

Typical pipe dimensions:

- Outside Diameter (OD): 6 - 16 inches (150 - 406 mm)
- Wall Thickness (WT): 0,35 - 0,75 inches (9 - 19mm)