# SOUR SERVICE GRADES





COVERING ALL SOUR SERVICE ENVIRONMENTS

LARGE OFFER

INTEGRATED SUPPLY, WITH CONNECTION EXPERTISE AND QUALIFICATION

MATERIAL SELECTION SUPPORT AND FIT-FOR-PURPOSE TESTING



## A COMPREHENSIVE PORTFOLIO **OF SOUR SERVICE GRADES**



Sour Service is one of the toughest challenges in hydrocarbon production. Whatever the level of difficulty, from conventional to high pressure and high temperature (HPHT), deepwater and unconventional wells, our extended portfolio has a tubular offer in high-strength sour service grades to meet the need in this high-stakes challenge. Available in the full range of outside diameters from 2 3/8" to 18 5/8" with wall thickness up to 2.5", our portfolio includes:



All Sour Service grades are offered combined with the High Collapse and eXtreme Collapse performances.



 High Collapse grades, are a cost-effective solution offering collapse ratings up to 50% higher than API, commonly used to ensure single external diameter and internal drift along the whole string, while reducing the weight of the string and costs.



 EXtreme Collapse grades, are a premium solution designed to cover the most challenging well loads and to offer an alternative to heavy and complex well desings, offering collapse ratings up to 15% higher than High Collapse products.

# A COMPREHENSIVE OFFER OF CARBON STEELS: COMPETITIVE SOLUTIONS FOR ALL APPLICATIONS

Sour Service resistance is becoming challenging with the increased exploitation of O&G fields in the presence of hydrogen sulphide ( $H_2S$ ) gas combined with increasing mechanical constraints.

When facing a reservoir with significant  $H_2S$  content, well equipment requires a specific metallurgy to resist Sulphide Stress Cracking (SSC). Every casing string, even when not expected to have contact with  $H_2S$ , must be Sour Service resistant as it is designed as a second barrier in case of tubular leak. In the case of unconventional wells, the risks are far greater due to contact between tubing and the reservoir fluids.

Vallourec has a long track record of developing and delivering the highest performance proprietary carbon Sour Service grades in the market as a competitive and highly effective response to sour environments, reducing costs and extending the lifespan of the well.

#### MATERIAL SELECTION



#### CONVENTIONAL ONSHORE AND OFFSHORE

All types of sour environments

#### Your challenges

- Reduce cost of ownership
- Fit-for-purpose material selection
- Large developments

#### **Our solution**

- VM S: cost effective and short lead time
- VM SS: adapted to severe sour environments
- VM 110 MS: cost effective in mild sour environment
- VM IRP: as per Canadian IRP standard
- VM 110 XS: adapted to extreme sour environment

#### HPHT/DEEP WATER

High mechanical requirements in sour environment

#### Your challenges

- Material normative qualification
- Well integrity
- Temperature, pressure & clearance

#### **Our solution**

- VM RSS for riser application
- VM SS-D: increased fracture mechanic performances
- VM 130 MS: highest SMYS (130ksi) in mild sour service environment
- VM 110 XS: for ultra critical services

# ADVANCED MATERIALS FOR HIGH PRESSURE AND SOUR ENVIRONMENT THROUGHOUT YOUR WELL LIFE

Corrosive environments affect a material's performance and string integrity. Sour Service environments, with their presence of H<sub>2</sub>S corrosive gases, lead to different corrosion risks that need to be assessed during the casing material selection process.

#### IN ORDER TO DETERMINE THE RIGHT MATERIAL FOR A GIVEN SOUR SERVICE ENVIRONMENT, THE FOLLOWING PARAMETERS ARE ANALYZED

#### **OPERATOR CHALLENGES**



• The expected stresses, including all load cases, which will define the required resistance in terms of internal and external pressures of the casing string.



• The specific environment, which is related to the well conditions such as temperature, presence of acid gases like H<sub>2</sub>S and CO<sub>2</sub> affecting the pH, well pressures and reservoir water composition.

#### THE RIGHT MATERIAL FOR YOUR APPLICATION



 The materials need mechanical and corrosion properties for an optimized well architecture. The higher the mechanical properties of a material, the greater its susceptibility to hydrogen embrittlement and Sulfide Stress Cracking.



 Many different parameters impact on a material's corrosion performance in sour environment such as temperature, pH level and H<sub>2</sub>S content among others. In addition, the fugacity, also known as "effective partial pressure ", allows to better estimate the severity of sour environment.



 Since materials performance mappings are not able to take all these parameters into consideration, Vallourec puts a team of experts at your disposal to support your Material Selection process.



• Our testing expertise allow us to evaluate our material performances in your well conditions, according to NACE standard test or following the latest, most state-of-the-art testing technique.

# PROVIDING VALUABLE SUPPORT IN OPTIMIZING YOUR OPERATIONS

Our team of experts is there to guide you at every stage of your project, from well design stage to decommissioning at end of well life, through eventual failure analysis during well production. Whatever your project, we have the solution to your challenges with an innovative range of proprietary grades and standard materials combined with a full range of services and assistance to mitigate risks and ensure well integrity in inhospitable environments.

### AN END-TO-END SERVICE OFFERING

- A one-stop, full-service provider from steelmaking to pipe running in your well
- Fit-for-purpose qualification matrix design and testing in our facilities in France and Brazil
- State of the art testing techniques, to better represent your operating conditions and select the most cost-effective material
- Fugacity calculation and in-situ pH simulation using dedicated softwares
- High Advanced Non Destructive Equipment and Heat Treatment facilities
- Pipe finishing including full-length mill threading
- Supply Chain Management
- Stock Management in nine facilities around the world, in France, Germany, UK, USA, Canada, Mexico, Brazil and Indonesia
- Extensive VAM<sup>®</sup> licensee network globally for field repairs and accessories
- VAM<sup>®</sup> Field Service International inspection and running services for reduced down-time and smoother operations

#### BENEFITS OF CARBON SOUR SERVICE GRADES



#### $\textbf{BEST}\,\textbf{H}_{2}\textbf{S}\,\textbf{CORROSION}\,\textbf{RESISTANCE}$

Our proprietary carbon steel grades offer the highest  $H_2S$  resistance for oil & gas fields with the lowest temperatures and highest constraints in sour environments.



#### HIGHEST PROVEN PERFORMANCE

Decades of know-how and process control backed-up by thousands of NACE method A & D test results.



#### **COST EFFECTIVE**

As an alternative to the more costly API C110 grade, our proprietary VM 110 MS grade generates cost savings for mild sour environments.

FOR MORE INFORMATION ON SECTIONAL PROPERTIES VISIT EXPERTISE.VALLOUREC.COM



## TRIED, TESTED AND VALIDATED

The proprietary VM 130 (HC)MS grade has been qualified in fit-for-purpose conditions and through the arduous I3P process. It was selected for several HPHT 20K projects in the Gulf of Mexico.



# POUR PARTNER, SETTING THE PACE FOR INNOVATION AND PERFORMANCE LOULTION Image: Construction of the set of the se

#### NEED MORE INFORMATION?

Information is available online on solutions.vallourec.com or by scanning the following QR code.





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