RELIABLE, COST-EFFECTIVE SOLUTIONS FOR SOUR ENVIRONMENTS
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:

### SOUR SERVICES

<table>
<thead>
<tr>
<th>STANDARD OFFER</th>
<th>CRITICAL SOUR SERVICES</th>
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<tbody>
<tr>
<td><strong>First generation of Sour Service grades from 80 up to 110ksi, such as VM110SS, provided with Quality Control as per NACE Method A at 1bar H2S, 2.7pH and at a higher applied stress or with a wider application domain than API grades.</strong></td>
<td><strong>Range of grades specially designed to be a cost-effective solution for mild sour environments validated by extensive quality control testing. They offer faster delivery, such as VM95S, and lower TCO such as VM110MS.</strong></td>
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<td><strong>COST EFFECTIVE</strong></td>
<td><strong>ENHANCED FRACTURE MECHANICS</strong></td>
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<td><strong>Range of grades specially designed to address fracture mechanics and well design requirements including IRP, Riser, proven NACE Method D and CTOD. Grades available from 80 to 125 ksi such as VM 95 IRP, VM 110 RSS and VM 125 SS-D.</strong></td>
<td><strong>State-of-the-art sour service materials with the most robust microstructure, thanks to enhanced chemistry and pipe processing. Grades available from 110ksi to 130ksi including next generation such as VM110XS.</strong></td>
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<th>SMYS (ksi)</th>
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<th>95</th>
<th>100</th>
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All our Sour Service grades proven by NACE Method A can also be provided with Quality Control as per NACE Method D.

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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 designs, offering collapse ratings up to 15% higher than High Collapse products.
A COMPREHENSIVE OFFER OF CARBON STEELS: COMPETITIVE SOLUTIONS FOR ALL APPLICATIONS.

CONVENTIONAL ONSHORE AND OFFSHORE

Advantages for sour environments

Your challenges
- Reduced cost ownership
- Fit for purpose material selection
- Long-term designs

Our solution
- VM CYXC: specifically designed for sour environments
- VM XS: tailored for sour environments (EP series per Canadian IRP standard)
- VM 110 XS: specifically designed for sour environments

For all applications: competitive solutions

CARBON STEELS:
OFFER OF A COMPREHENSIVE MATERIAL SELECTION

FOR ALL APPLICATIONS

COMPETITIVE SOLUTIONS

A one-stop-shop for the most demanding environments, reducing costs and extending the lifespan of the well.

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

Conventional environments affect a material’s performance and string integrity. Sour Service environments, with their presence of H₂S corrosion gases, tend 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 stress cases, which will define the minimum strength of materials in terms of internal and external components of the casing string.
- The specific environment, which is related to the minimum conditions such as temperature, pressure, presence of acid gases like H₂S and CO₂, hydrogen sulphide, well pressures, and environmental water compositions.

THE RIGHT MATERIAL FOR YOUR APPLICATION

- The materials need mechanical and corrosion properties for an enhanced well performance.
- The higher the mechanical properties of the material, the greater its susceptibility to hydrogen embrittlement and Sulfide Stress Cracking.
- The environment must offer a minimal resistance to corrosion or stress as the material performance mapping as per I3P process. It was selected for several applications, backed-up by thousands of NACE method S corrosion resistance for oil & gas fields.

MATERIAL SELECTION

- VM CYXC
- VM XS
- VM 110 XS

FOR MORE INFORMATION ON FIT-FOR-PURPOSE QUALIFICATION, CONTACT VALLOUREC.

HPHT/DEEP WATER

High mechanical requirements in sour environment

Your challenges
- Abrasive corrosion qualification
- High quality
- Temperature, pressure, chloride ions

Our solution
- Multitube alloy specification
- VM XS: best resistance to sour environments
- VM 110 XS: highest resistance to sour environments
- VM 130 XS: extreme resistance to sour environments

FOR MORE INFORMATION ON HPHT/DEEP WATER SOLUTIONS, CONTACT VALLOUREC.

PREDICATING SOUR ENVIRONMENTAL CONDITIONS

- The specific environment, which is related to the minimum conditions such as temperature, pressure, presence of acid gases like H₂S and CO₂, hydrogen sulphide, well pressures, and environmental water compositions.
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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 to optimization of reservoir management, reducing costs and ensuring well integrity in hostile environments.

AN END-TO-END SERVICE OFFERING

- Your challenges
- Operator conditions
- Sour environments

Our solution
- Technology and support
- Sour performance in your well
- Fit for purpose qualification matrix design and testing
- State-of-the-art testing techniques, to better represent your operating conditions and select the most cost-effective material
- Safety calculation and live data processing
- High Advanced Non Destructive Equipment and Test (HADNT) services
- Sour Service suit and equipment
- Supply Chain Management
- Standard Management - In halls and on board, in France, Germany, UK, USA, Canada, Mexico, Brazil and Indonesia.
- Extension VAM® License network: globally diversified expertise and access to our vast range of sour products.
- VAM® Field Service International: inspection and running services reduced downtime in real-time on operators.

BENEFITS OF CARBON SOUR SERVICE GRADES

- Best H₂S corrosion resistance
- Ouromol proprietary carbon steels offer the highest H₂S corrosion for API grade of 0.05 psi fields with increased temperatures and highest corrosion in sour environments

HIGHEST PROVEN PERFORMANCE

Decades of know-how and process control, backed up by thousands of NACE method A-3 test results.

COST EFFECTIVE

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

TRYED, TESTED AND VALIDATED

- The proprietary VM 110 INCHAMS grade has been qualified in fit-for-purpose conditions through and the arduous I3P test. It was selected for several HPHT/DEEP WATER projects in the Gulf of Mexico.
YOUR PARTNER, SETTING THE PACE FOR INNOVATION AND PERFORMANCE EVOLUTION

NEED MORE INFORMATION?
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