Sour Service Products

Proprietary Grades Meeting Your H₂S Challenges
Operational Challenges

The physical phenomenon associated with Sour Service environments and affecting steel based products under applied or residual stress is known as H₂S embrittlement or more specifically as Sulfide Stress Cracking (SSC). H₂S in combination with water and low pH will release free hydrogen, which can be absorbed through the steel’s surface. At this point, hydrogen particles diffuse further into the steel matrix and interact with the steel itself, which becomes brittle. The key factors leading to SSC are elevated H₂S content, low temperatures, low pH, and the high stress state of material (tensile stress). When these factors are combined, a crack can initiate in the material and propagate causing catastrophic failure, even when stresses are substantially inferior to the yield limit of the material.

Specially designed drill pipe and BHA grades are essential to guaranteeing the necessary H₂S resistance within the steel and to ensure the safety of those working in such harsh environments.

The Solution: Specific Drill String Components Providing Higher Performance and Safety Margins

Vallourec’s Sour Service proprietary grades are renowned for their performance. Our extensive research, development facilities, and our internationally recognized expertise combine to produce outstanding critical service material. We are able to guarantee the superior performance of our material in the toughest sour environments around the world.

Due to the astringency of sour environments, particular attention needs to be paid when selecting and characterizing adapted Sour Service steel grades. Controlling critical manufacturing parameters is also a requirement to ensure superior product performance. Steel microstructure, chemical composition, cleanliness, and heat treatment process controls are essential or high sulfide stress cracking resistance. Such proprietary grades largely exceed the resistance of API grades to SSC, and are being manufactured according to several industry standards such as NACE TM0177 and IRP 1.8.

We offer three levels of resistance to Sour Service environments:

- **MS level:** Mild Sour
- **S level:** Intermediate Sour
- **SS level:** Severe Sour – the SS level is fully compliant with IRP 1.8 requirements

Our grades have been successfully used in various parts of the world for decades. In addition to our standard offer, we have developed several innovative grades for specific applications including deep or extended-reach drilling in highly sour fields.
Performance Comparison

Sour Service drill pipe provides superior resistance to H₂S as compared to standard grade drill pipe. Our standard offer is based on grades with 95 to 105 ksi Specified Minimum Yield Strength, with an improved resistance to H₂S including severe sour environments. Our SS level is fully compliant with the latest edition of the Canadian IRP Volume 1 standard. An increasing number of reservoirs explored or developed are associated with complex well profiles, the use of high strength drill pipe is essential to achieving drilling objectives. Because higher strength is generally detrimental to Sulfide Stress Cracking, we have developed the high strength Sour Service grades VM-120 DP MS and VM-120 DP S.

Due to the increasing demand for gas worldwide, some highly sour oil and gas reservoirs are being explored with H₂S content beyond what could have been imagined a decade ago. In order to explore, appraise and develop these new fields, new highly engineered drill string solutions are needed to increase safety margins related to Sulfide Stress Cracking (SSC) failure risks, especially in the upset and the weld zones. Thanks to years of research and development, Vallourec has proudly developed its first Sour Service product with enhanced SSC resistance in the upset and weld zones. Qualified with rigorous NACE testings; these two grades named VM-95 DP SS+ and VM-105 DP SS+ fully comply with IRP 1.8, and exhibit enhanced SSC resistance in the weld and pipe body upset areas.

Our Sour Service HWDP is compliant with API specifications and is more resistant to H₂S than standard grade HWDP.

Sour Service Hydroclean® DP and Hydroclean® HWDP are also available. Both are well adapted to mild sour environments, where materials are exposed to low levels of H₂S corrosion.

Vallourec can maximize safety margins in H₂S environments with Sour Service drill collars, pup joints and accessories using ERS 425™ material.