Sour Service Products

Better suited to your drilling conditions

Grant Prideco's field proven materials provide unmatched product performance, now packaged in the most comprehensive grade offering.

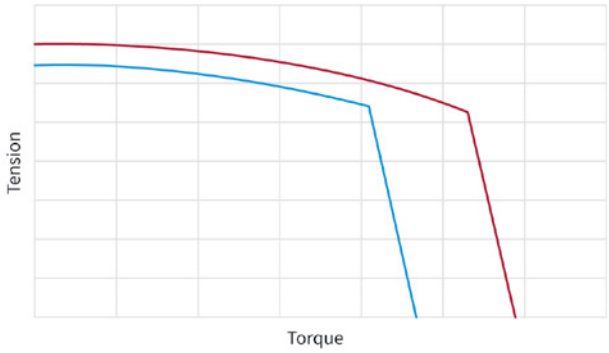
Complex drilling techniques are used to achieve extended reach and deep wells in sour environments, exposing drill string components to increased levels of stress.

Sulfide stress cracking (SSC) can lead to quite catastrophic failures that can happen without any prior indication, and often at loads well below the pipe's rating. Sour service failures have been recorded in numerous locations around the world when using general purpose pipe grades, justifying the use of specialty grades when developing fields with acid gas bearing formations.

Drillers need drill stem products with maximum mechanical performance and enhanced SSC resistance to deliver today's complex sour wells. As these conditions are exclusive, a risk assessment decision should be done to weigh the need for performance and the resistance to SSC.

We have developed a range of products to help you drill safely and efficiently in harsh, sour conditions that maximize performance in every region of the NACE environmental severity diagram. This way, you can select the right product more easily.

To create a possible alignment between the drilling engineer's needs and the availability of material on rigs, or with rental companies, we offer 6 engineered **H2Shield™** grades for drill pipe and 3 for heavy weight drill pipe (HWDP). These are the most balanced and cost-effective selection available to date.



In this 5 ½ in. 24.7 ppf drill pipe example one can see that the H2Shield™ 135 MS provides 8% more tension than the 125 KSI pipe and that the Delta™ 544 connection delivers 26% more torque in this new design

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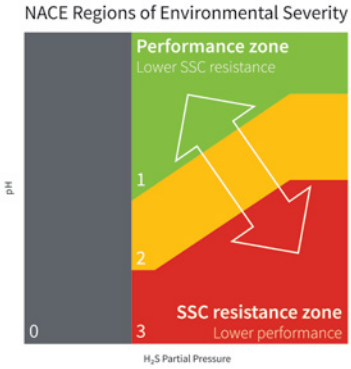
Grant Prideco™ Sour Service Products

New Materials, New Solutions

Due to limited sour service specifications, the industry has established mechanical and chemistry recommendations through guidelines in MR0175 and Industry Recommended practices (IRP) provided respectively by National Association of Corrosion Engineers (NACE) and Canada's Drilling and Completion Committee (DACC). Grant Prideco has extensive experience in manufacturing drill pipe and accessories for sour service applications, and we were the first manufacturer to meet stringent IRP requirements.

Grant Prideco's new product philosophy maximizes the product strength in every region of the NACE environmental severity diagram, offering as much performance as the driller needs to safely deliver his project. The grades are tested or prequalified to a combination of NACE MR0175 and IRP 1 section 1.8 standard. The prequalification shortens lead time and helps lower the cost of the product.



Engineered Grades

Our new engineered **H2Shield™** grades maximize torque and tension in each of the three regions of the NACE MR0175-2015 environmental severity diagram.

Region 1 and 2 grades are prequalified at plant level to ensure delivery of a product that will provide the right SSC resistance, with shortest lead time and cost. This way, we guarantee the best and most economic option.

For region 3 products, SSC resistance is so important that tests must be performed, and every order will be processed with NACE method A, solution A testing of the pipe and tool joints.

We have simplified our offering to provide industry players a chance to be aligned. To satisfy the needs of drilling engineers, we intend to place the correct grade of sour service pipe on rigs or with rental companies. Reducing combinations of grades will give pipe owners a greater chance of carrying the right grade.

IRP and Other Industry Grades

SS grades of the IRP 1.8 are now integrated in our range of H2Shield™ products for region 3.

We can also supply products built to other industry specifications, including the new API specification 5DP, TH Hill TS1 and Fearnley Procter NS1.

Customized Grades

CYX™ is a family of grades that allows end users to customize their drill pipe by adjusting a number of parameters. This is particularly suited to operators who understand the balance between the need for strength and SCC resistance, and have completed a risk assessment to define the fit for purpose product. This really works best for long term development projects in well-known fields.

We allow multiple meaningful variations on the pipe strength (from 105 to 125 ksi) and tool joints (from 110 to 130 ksi), with options of prequalified or NACE tested components.

Heavyweight Grade

H2Shield™ HWDP grades are available for standard and spiral products, designed with tubes that are stronger in tension than the drill pipe and with tool joints of similar strength to maximize the MUT of connections. These HWDP are offered in 3 grades that match the drill pipe environmental severity regions of the NACE diagram.

XD™ 90 is our legacy sour service HWDP grade that offers higher tensile capacity but with reduced connection performance being a region 3 product.

Diagram region	Product	Grade name	Tube SMYS (ksi)	Tool joint SMYS (ksi)	SSC resistance validation
1	Drill pipe	H2Shield™ 105 MS	105	120 or 130[1]	Prequalified at region 1 border
1	Drill pipe	H2Shield™ 135 MS	135	120 or 130[1]	Prequalified at region 1 border
1	HWDP	H2Shield™ 55 MS	55	120 or 130[1]	Prequalified at region 1 border
1	HWDP	H2Shield™ 90 MS	90	120 or 130[1]	Prequalified at region 1 border
2	Drill pipe	H2Shield™ 120 S	120	120	Prequalified at region 2 border
2	Drill pipe	H2Shield™ 125 S	125	120	Prequalified at region 2 border
2	HWDP	H2Shield™ 55 S	55	120	Prequalified at region 2 border
2	HWDP	H2Shield™ 90 S	90	120	Prequalified at region 2 border
3	Drill pipe	H2Shield™ 95 SS[2]	95	110	Order testing to NACE Method A, Solution A (85% pipe/65% TJ)
3	Drill pipe	H2Shield™ 105 SS[2]	105	110	Order testing to NACE Method A, Solution A (85% pipe/65% TJ)
3	HWDP	H2Shield™ 55 SS	55	110	Order testing to NACE Method A, Solution A (85% pipe/65% TJ)
3	HWDP	H2Shield™ 90 SS	90	110	Order testing to NACE Method A, Solution A (85% pipe/65% TJ)

[1] Strength is driven by the connection technology selection *[2] This grade is compliant with IRP specification*

The above table presents Grant Prideco's H2Shield Sour Service grades.