

HIGH COLLAPSE & EXTREME COLLAPSE GRADES



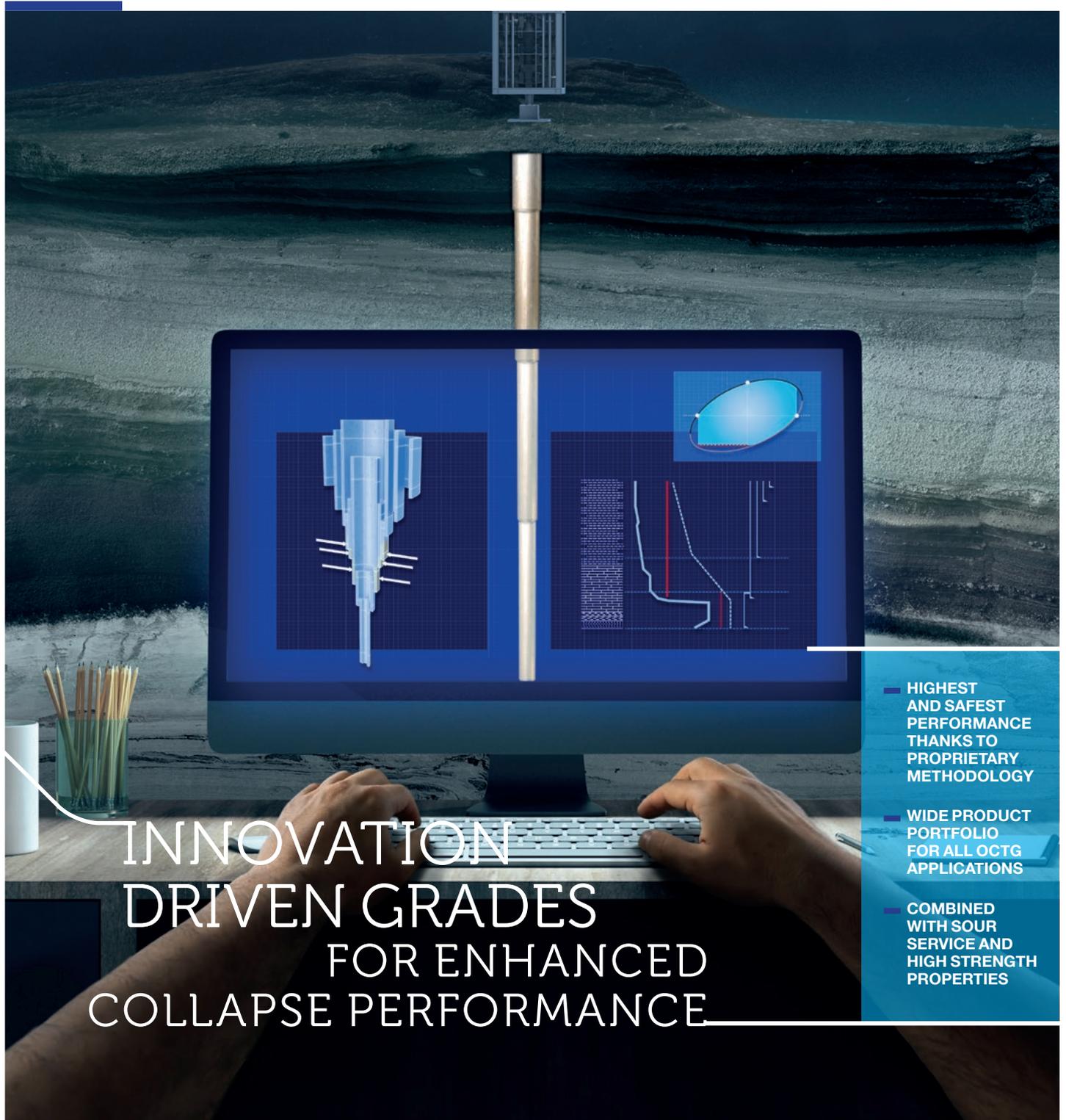
EXTENSIVE OFFER



SAFEST AND MOST RELIABLE PRODUCTS



COST EFFECTIVE



INNOVATION
DRIVEN GRADES
FOR ENHANCED
COLLAPSE PERFORMANCE

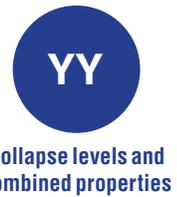
HIGHEST AND SAFEST PERFORMANCE THANKS TO PROPRIETARY METHODOLOGY

WIDE PRODUCT PORTFOLIO FOR ALL OCTG APPLICATIONS

COMBINED WITH SOUR SERVICE AND HIGH STRENGTH PROPERTIES

A COMPREHENSIVE PORTFOLIO

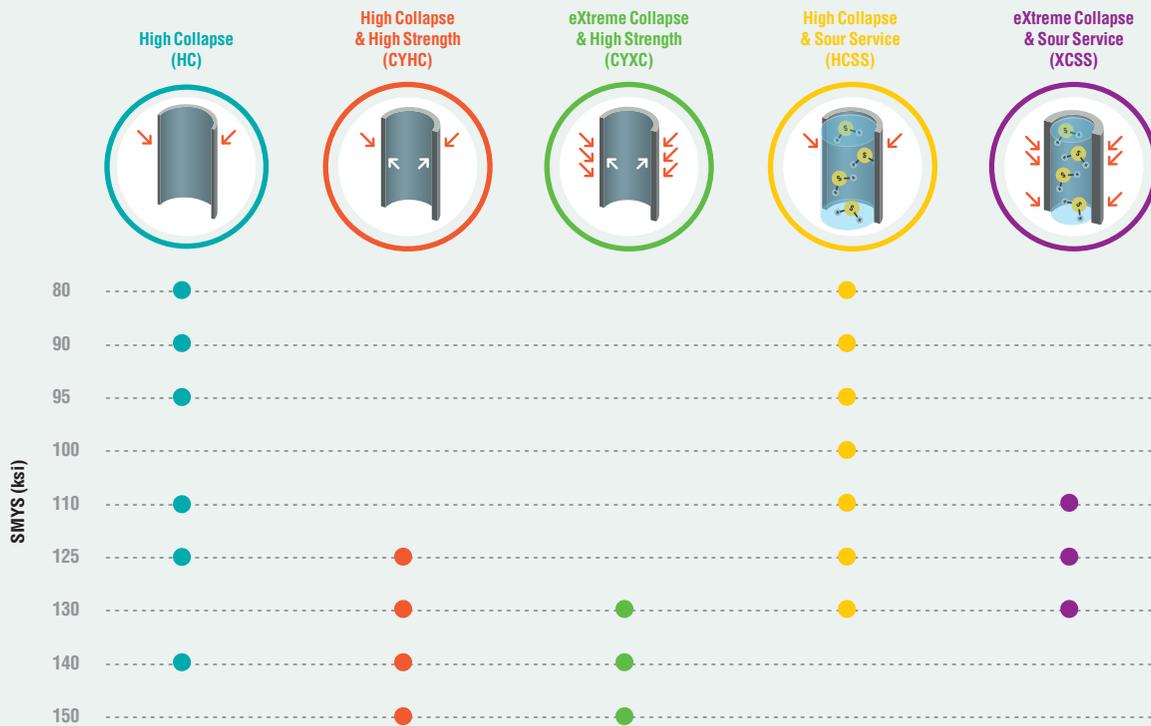
HIGH STRENGTH SOLUTIONS:



Vallourec provides a series of High Collapse and High Strength proprietary grades for oil and gas wells where high external and internal pressures are anticipated, and higher collapse and burst resistances than API values are needed. This offer is available in the full range of outside diameters from 4 1/2" to 26", including special drift diameters and odd-ball sizes upon customer request.

- **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.
- **High Strength grades** combine High Collapse or eXtreme Collapse properties with high burst resistance.
- **All sour service grades**, are also offered with High Collapse and eXtreme Collapse properties.

OVERVIEW OF VALLOUREC PROPRIETARY OFFER



DUAL PERFORMANCE BASKETS (DPB):

A combination of High Collapse and eXtreme Collapse, the innovative DPB represents a solution to extremely challenging collapse loads at a reasonable cost, allowing operators to cope with the most challenging localized well loads, placing XC and HC grades in a smart design: 50% of the order is delivered with a higher, eXtreme Collapse rating, the other 50% with the standard High Collapse rating.



Find our products' performances on our Connection Data Sheet website
VAMSERVICES.COM

HIGH COLLAPSE: TAKING THE PRESSURE OFF THE MOST DEMANDING APPLICATIONS.

High Collapse pressure, the term given to external pressure beyond standards, is typical of critical wells due to depth, formation loads or temperature.

API standard products offer a limited collapse rating, many times inadequate to operator's drilling operations.

For many decades, Vallourec has developed process controls and collapse models, backed up by thousands of test results, in order to deliver high collapse ratings for best-in-class performances in a variety of environments, while reducing the total weight of the string.

APPLICATIONS AND OPERATIONS EXPOSED TO COLLAPSE

- **External pressure loads** during drilling operations (e.g. partial or full evacuation) and production phase (e.g. APB)
- **Deep wells**, where there is usually no direct access to bleed off the pressure increase in annulus
- **Extended reach drilling, deepwater or HPHT wells** that are subject to level of loads not found in simple vertical wells
- **Salt dome wells** where shear stress can lead to very high local loads

CHALLENGES & SPECIFIC REQUIREMENTS

CONVENTIONAL OFFSHORE/ ONSHORE

Your challenges

- Moderate pressure and temperature levels
- Simple architecture and standardized products

Our solutions

Most suitable grades: High Collapse

HP-HT

Your challenges

- High external pressure combined with high temperature derating factors
- Heavy and non-standard well design

Our solutions

Most suitable grades: High Collapse, eXtreme Collapse and High Strength

DEEP WATER

Your challenges

- High internal and external pressure and temperature, often combined with corrosive environments
- Complex architecture, with tight clearances

Our solutions

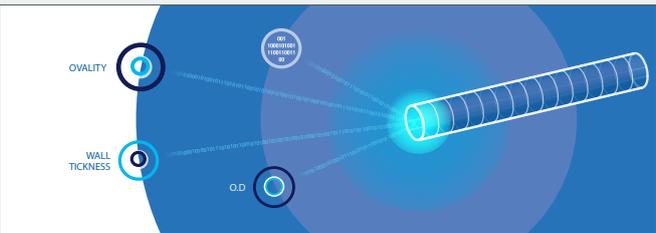
Most suitable grades: High Collapse and eXtreme Collapse in combination with Sour Service or High Strength properties

INNOVATION THAT BRINGS RESULTS

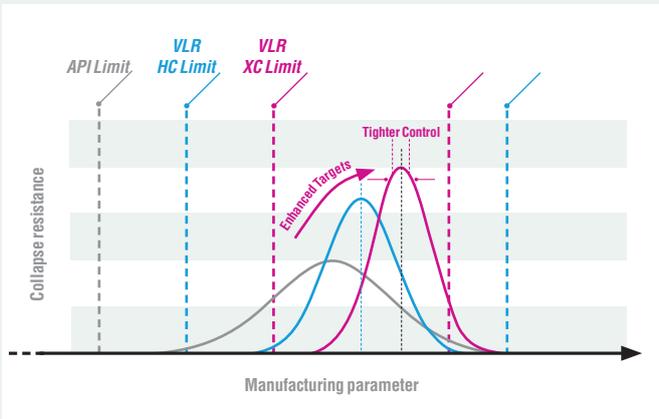
OUR COLLAPSE METHODOLOGY FOR SUPERIOR RESISTANCE

With several decades of expertise, our High Collapse offer is based on strict process controls of both geometrical and mechanical properties that have an impact on the pipe's collapse performance:

- Yield strength
- Wall thickness
- Ovality
- Eccentricity
- Residual stress



During product design phase, acceptable target ranges are set for these parameters based on the Vallourec Collapse Proprietary model, and then controlled during production: the tighter such control becomes, the higher the outcome collapse rating.



High Collapse grades are obtained by pushing the design parameters beyond standard API control. Additionally, eXtreme Collapse ratings are obtained by pushing the control of the production parameters beyond the targets defined for standard High Collapse grades.

FROM HIGH COLLAPSE TO EXTREME COLLAPSE, COST-EFFECTIVE BUNDLING

In addition to the standard High Collapse offer, Vallourec developed the eXtreme Collapse offer as a cost-effective solution to your most demanding well requirements by developing a new methodology to take advantage of the intrinsic variability existing in production.

Thanks to best-in-class data collection and processing techniques, this method allows for accurate and reliable prediction of individual pipe collapse performance.

By sorting the produced lot into pipes with the highest collapse performance and pipes with regular pipe performance, Vallourec is able to deliver eXtreme Collapse grades at a reasonable cost.

Basket options :

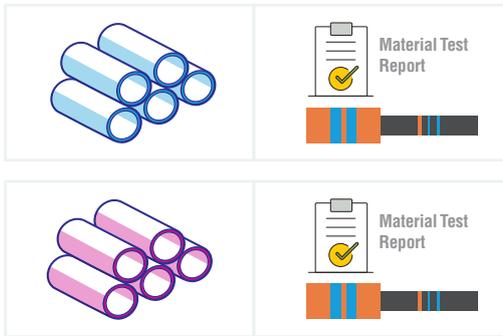
- Regular basket (HC only)
- Premium basket (XC only)
- Dual performance basket (a mix of both HC and XC)

DUAL PERFORMANCE BASKET (DPB) METHODOLOGY

During quality control, Vallourec applies a unique methodology based on individual pipe analysis. Every pipe produced has 100% of its surface inspected from outer diameter to wall thickness, and **the collapse resistance of each pipe is calculated**. This is possible thanks to advanced data collection and processing techniques, including individual pipe dimensional characterization, advanced pipe traceability and big-data computational capability.

This state-of-the art technology allows the development of the Dual Performance Basket offer:

it consists of identifying and segregating the most performing pipes of a production lot by means of accurate dimensional pipe data and Individual pipe performance prediction:



-The most performing pipes are sorted into the Premium Basket and assigned a higher, eXtreme Collapse rating.

-The remaining pipes are part of the Regular Basket, and assigned the standard High Collapse rating.

Each basket is delivered to the operator with its own mill certificate and test report, grade name and specific color code.

PARTNERING WITH YOU TO GET IT RIGHT

SELECTING THE RIGHT RESISTANCE FOR YOUR APPLICATION

WHEN API IS NOT ENOUGH

API products offer a limited collapse rating, very often inadequate for drilling operations. High Collapse products offer enhanced performances while reducing string weight, allowing for a safer and simpler operation.

SUPERIOR PERFORMANCE WITH HC AND XC

Superior performance with HC and XC: Vallourec's High Collapse grades provide +50% collapse rating vs API, and eXtreme Collapse (XC) +15% more than HC, covering the needs of the most challenging wells.

SUPPORT AND SERVICES

Vallourec offers support during well design and material and connection selection processes, partnering with you to find the most effective solution.

CONNECTION QUALIFICATION

All Vallourec proprietary High Collapse and High Strength grades are supplied with VAM® connections, fully validated against API RP 5C5:2017 / ISO 13679:2019 up to the pipe's collapse resistance, therefore providing a final product with fully demonstrated external pressure resistance.

PROVEN TRACK RECORD IN THE FIELD

VALLOUREC MEETS HIGH COLLAPSE CHALLENGE IN MAJOR PROJECT IN GULF OF MEXICO

The construction of ultra-deep, HP/HT wells, has become a steady trend in the North America oil and gas industry. Vallourec was able to demonstrate its capacity to respond to these technical challenges with efficiency and reliability by supplying Dual Performance Baskets, allowing the operator to maintain the internal drift and external clearance all along the casing string, while reducing the weight of the string and gaining simplicity in logistics and running.

BENEFITS OF HIGH COLLAPSE GRADES



EXTENSIVE OFFER

Our product portfolio covers all your needs, from standard wells to the most challenging projects, including in sour environments or in combination with burst loads.



SAFEST AND MOST RELIABLE PRODUCTS

Decades of know-how and unique quality control backed-up by thousands of test results for the highest and safest ratings on the market.



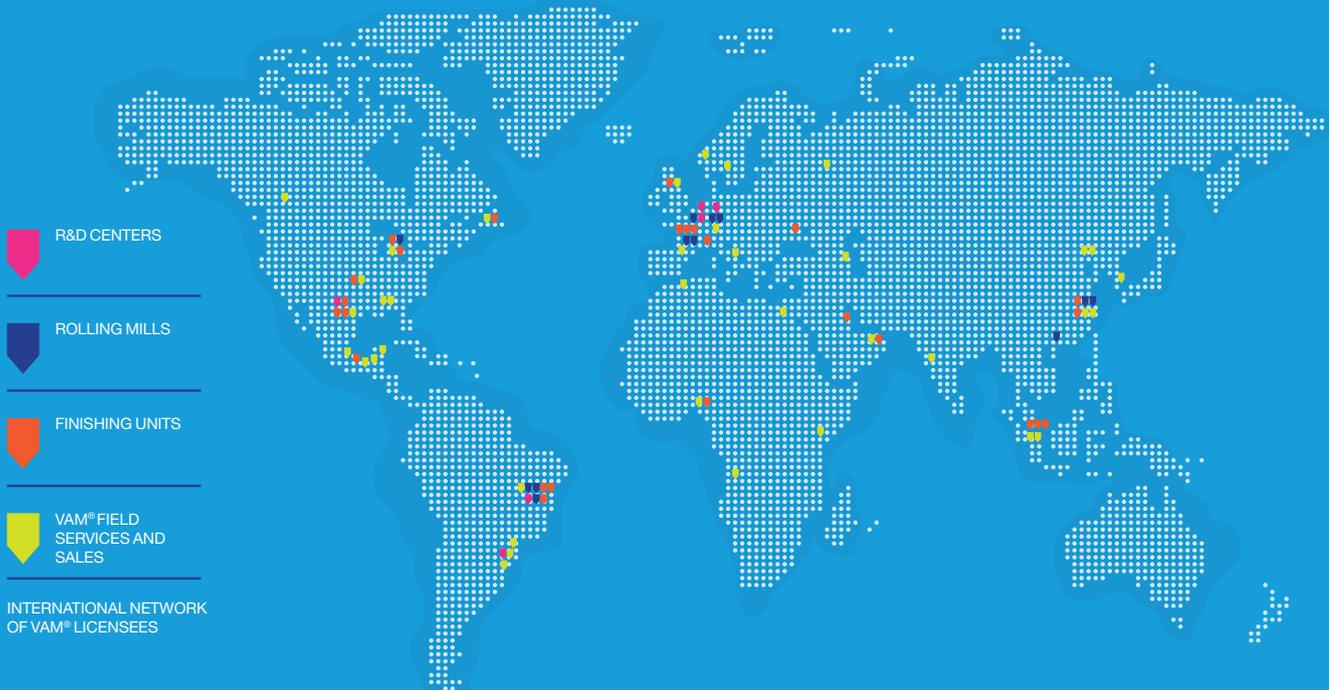
COST EFFECTIVE

Reduce the weight of your string and the total cost thanks to High Collapse and High Strength grades.

For more information on sectional properties visit
[EXPERTISE.VALLOUREC.COM](https://www.vallourec.com/expertise)



YOUR PARTNER, SETTING THE PACE FOR INNOVATION AND PERFORMANCE EVOLUTION



NEED MORE INFORMATION?

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



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