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THE ANNUAL COST OF CORROSION TO THE OIL AND GAS INDUSTRY IN THE UNITED STATES ALONE IS ESTIMATED AT $27 BILLION

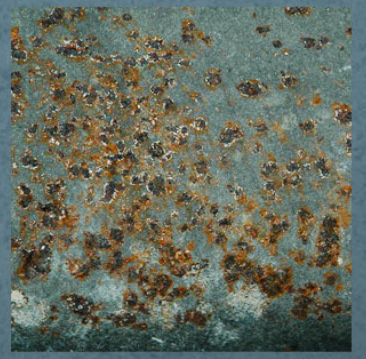
(ACCORDING TO NACE INTERNATIONAL)

Corrosion in the oil and gas industry is a multifaceted challenge of remarkable complexity. It emerges from various sources, including aggressive chemicals, extreme temperatures, and the corrosive nature of produced water. The intricacies of corrosion, starting with generalized pitting and localized corrosion, demand a comprehensive understanding and innovative solutions.

CORROSION MECHANISMS

Chemical Corrosion
Gradual deterioration or disintegration of a material, typically a metal, because of a chemical reactions with its environment.

Electrochemical Corrosion
Material breaks down due to chemical reactions on its surface, usually caused by exposure to water or other substances which involves the movement of electrons.

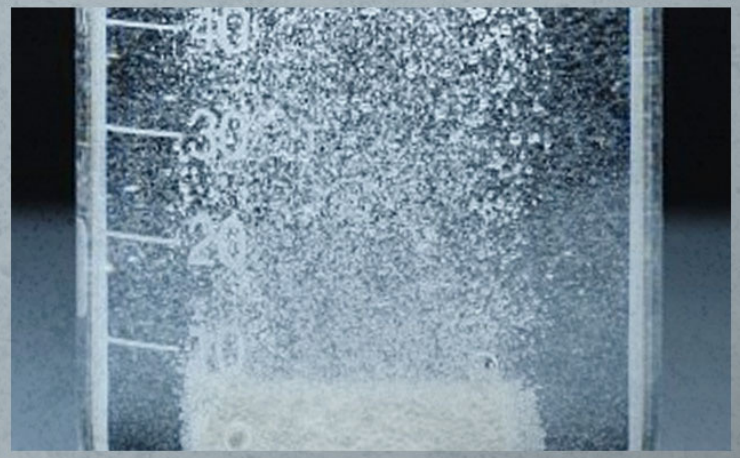


Localized Corrosion
Pitting, crevice corrosion, or other similar localized damage that occurs in small, isolated areas on the surface of a material, rather than uniformly across the entire surface.

PRODUCED WATER OFTEN CONTAINS NOTABLE QUANTITIES OF CHLORIDES, BIOCIDES, AND ACIDS. THESE COMPOUNDS POSE SIGNIFICANT CHALLENGES TO THE INTEGRITY AND LONGEVITY OF EQUIPMENT

CHLORIDES

BIOCIDES (DISSOLVED O_2)



ACIDS

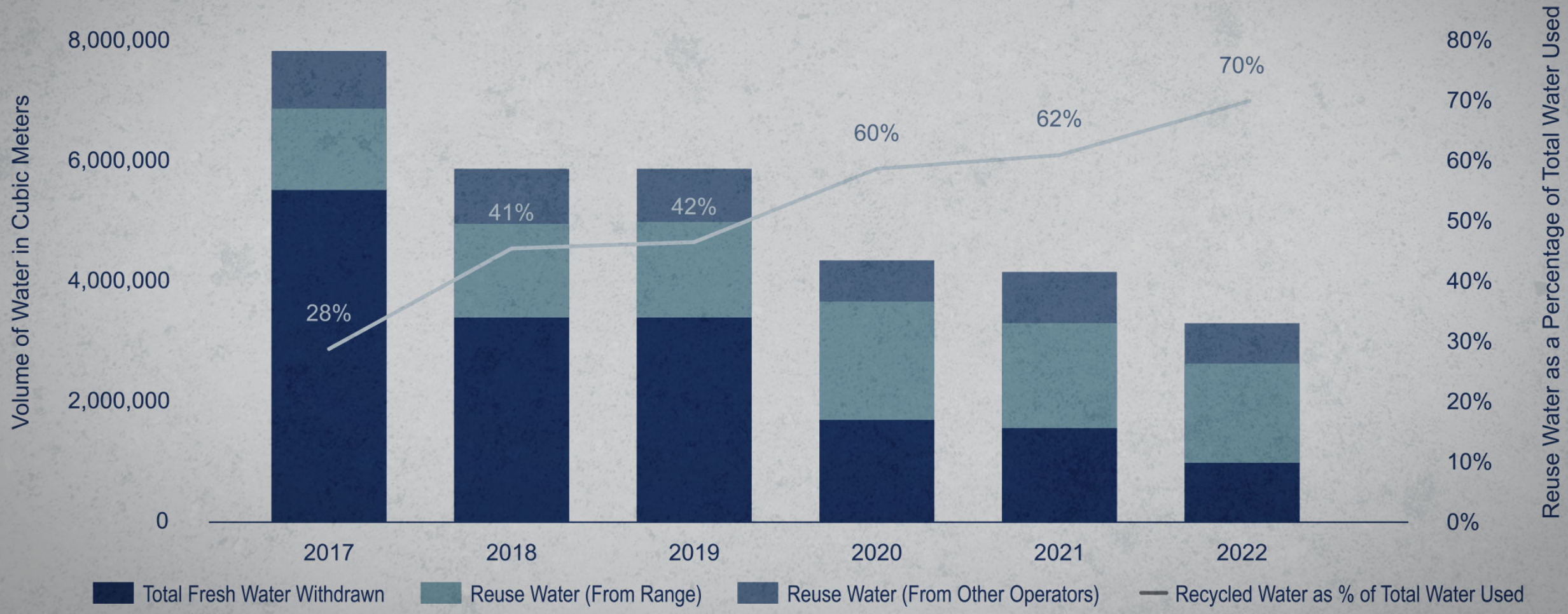
LOW ALLOY MATERIALS MOST COMMONLY USED FOR PRESSURE CONTROL EQUIPMENT INDUSTRYWIDE

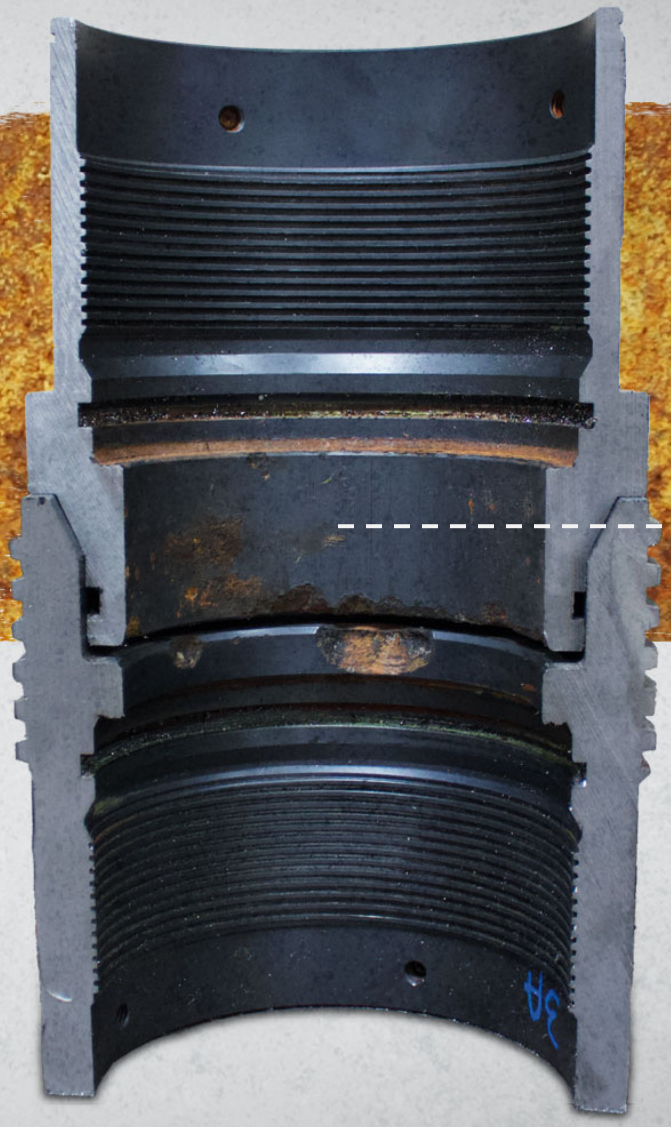
LOW ALLOY MATERIALS	L80	T95	P110	4130 4140 4145 (Tube)	4330V	4340	8630	F22
ALLOYING ELEMENTS	Chromium, Molybdenum, and Nickel	Chromium and Molybdenum	Chromium, Molybdenum, and Manganese	Chromium and Molybdenum	Chromium, Molybdenum, Nickel, and Vanadium	Chromium, Molybdenum, and Nickel	Chromium, Molybdenum, and Nickel	Chromium and Molybdenum
SERVICE (BASED ON HARDNESS)	H_2S or Standard	H_2S or Standard	Standard	H_2S or Standard	Standard	Standard	H_2S or Standard	H_2S or Standard

According to NACE MR0175/ISO 15156 requirements and recommendations for selection and qualification of materials for H_2S service in oil and natural gas production.

FRESH WATER AND PRODUCED WATER USE

Range Resources 2022-2023 Corporate Sustainability Report





ACCELERATED CORROSION FROM PRODUCED WATER ON LOW ALLOY STEEL

Low alloy steel, despite its advantages with mechanical properties, can be susceptible to corrosion in extreme conditions. Produced water, high pressure, and high temperatures may present challenges and accelerate corrosion.

According to API and ISO, low alloy steel is a type of steel that contains small amounts of alloying elements to enhance its properties.

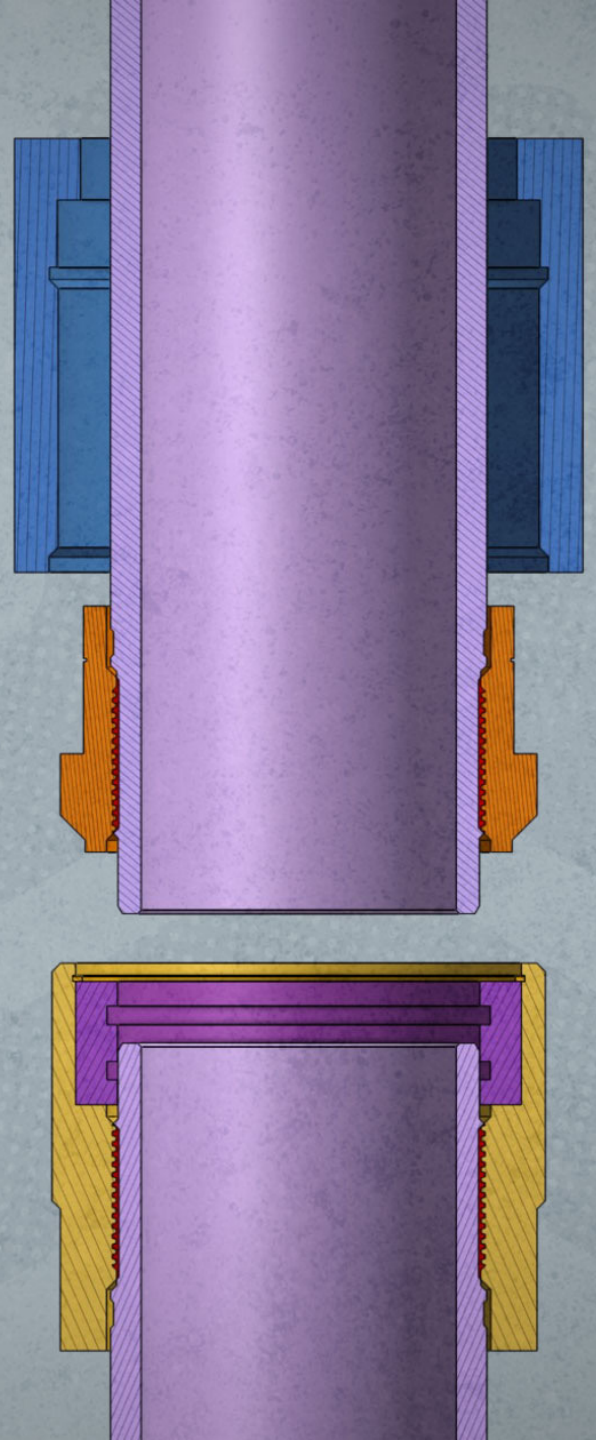
EQUIPMENT FROM OTHER MANUFACTURERS

CORROSION-FREE CONNECTION

CORROSION-FREE CONNECTION

MOST ADVANCED CORROSION PROTECTION EVER AVAILABLE FOR PRESSURE CONTROL EQUIPMENT

- Isolates bore fluids to only be in contact with corrosion-proof materials.
- Resistant to ALL dominant corrosive mechanisms.
- Reduces cost of operations with less maintenance and downtime.
- Developed through years of research, analysis and technological breakthroughs.
- Easily added to existing equipment.
- Patent pending technology

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