

## Materials for underwater drills in oil and gas sector



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## Why development in this sector is important?

- The oceans surrounding the United States hold tremendous oil and natural gas potential
- Nearly 85 percent of the waters from the Atlantic, the Pacific, and the eastern Gulf of Mexico are off-limits to exploration and drilling
- Government studies estimate that these areas hold at least 19 billion barrels of oil.
- Offshore oil production has reduced the natural oil seepage, especially in areas with active offshore oil seeps, such as California's Santa Barbara coast.

## Common problems faced during deep drilling in oil and gas sector.

- Acid-bearing fluids eat into the tubing through which they flow.
- Substances such as Sulfur and  $H_2S$  present in the crude oil induce corrosion in pipelines
- Temperatures higher than 1,100 degrees Fahrenheit in oil processing plants can make steel brittle
- Mercury present in natural gas, reacts with other metals in the plant's equipment, causing brittle failure

## Conventional materials used to solve these problems are:

- Steel
- Copper
- Nickel
- Titanium
- Chromium
- Molybdenum

## STEEL

- Most important metal used in every part of the oil and gas sector
- An alloy of iron with up to 2 percent carbon
- Increases the strength of the material and its corrosion resistance
- Also contains trace quantities of other metals such as nickel or chromium

## COPPER

- Copper and its alloys have excellent electrical and thermal conductivity and cryogenic properties
- Copper alloys are used in valves, stems, seals and heat transfer applications
- Bronze along with traces of nickel and aluminium is used in wellheads and blowout prevention valves
- Copper salts are used in gas processing plants to absorb mercury.

## NICKEL

- Steel with 9 percent nickel content is tough at extremely high and very low temperatures
- It is used in heat exchangers, which remove heat from oil and gas at about 392 degrees F and cool it to 70 degrees F
- Steel and nickel alloys are used extensively in gas processing plants because of their high strength and corrosion resistance

## TITANIUM

- Titanium addition to steel alloys increases the material's strength, density and corrosion resistance
- High-strength titanium alloys used in compressor parts are more durable compared with other steel alloys
- Used in heat exchanger tubing in liquefied natural gas plants and in the linings of the pressurized vessels in LNG tankers

## CHROMIUM

- One of the first metals to be used in strengthening steel alloys
- Low carbon steel containing 12 to 14 percent chromium is highly resistant to CO<sub>2</sub>, H<sub>2</sub>S and the high temperatures
- Chromium compounds such as chromium lignosulfonate used in oil industry drilling fluids as deflocculants

## MOLYBDENUM

- High-performance steel used for gas pipeline construction contains between 2 percent and 4 percent molybdenum
- Increases the strength and corrosion resistance of steel alloys
- Also used as a catalyst in oil refinery processes

Thank You