



Vacuum Insulated Tubing

Flow Assurance by Dramatically Reduced Heat Flow

Many production problems are caused by the transfer of heat from produced reservoir fluids into surrounding formations and casing annuli. These problems include paraffin (wax) deposition, hydrate plugging and annular pressure buildup in the outer casing strings. Vacuum insulated tubing (VIT) can successfully solve or prevent these problems in deepwater as well as improve the efficiency of steam flooding operations and help prevent environmental damage to permafrost zones in areas like Alaska.

Key Features

- VIT is constructed using two concentric tubing strings of different diameters, with the annulus between them sealed by welding. The thin layer of air between the tubulars is evacuated with a vacuum pump, thus creating an insulated jacket.
- VIT prevents various production problems by reducing the outward migration of heat from the produced formation fluids. With VIT, fluid temperature loss is approximately 10°F (5.6°C) over 5,000 linear ft (1524 meters), compared to a loss of 80°F (44°C) or more over the same length of conventional tubing.
- By reducing the outward migration of heat, VIT ensures:
 - Delivery of steam to the reservoir injection point at higher temperatures than would otherwise be possible, thereby providing more heat transfer into the producing formation.
 - Mitigation of Annular Pressure Buildup (APB) by reducing heat transfer from the production flow to the fluids in the casing annuli. VIT is typically run from the mud line to below the deepest unstable shallow formation for optimal results in this regard.
 - The temperature of produced fluids doesn't fall below the wax deposition (cloud point) temperature of paraffin or "wax".
 - Prevention of methane gas hydrates crystalizing due to too low temperatures thereby avoiding plugging of the flow line or production string during a well shut-down or a cold start-up.



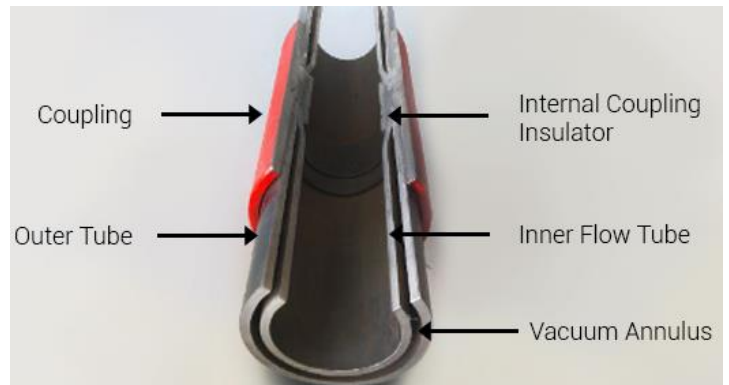


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Benefits

- Deployment of VIT in steam assisted operations reduces steam consumption with more efficient lifting costs and reduced loads on the steam generation systems thereby making wells more energy, time and cost efficient. Since less steam is needed, the quantity of water is also reduced with overall reduction in not only operational costs, but also reduced impact to the environment whilst increasing operational safety.
- VIT enhance deepwater production through alleviating problems created by production flow heat migrating due to the contrast in temperature between warm produced formation fluids and colder shallow formations. Foremost among these problems are:
 - Annular Pressure Buildup (APB): This occurs when fluids trapped between strings of casing thermally expand due to radiant heat from produced formation fluids. Because muds are composed of incompressible fluids, the thermal expansion of the trapped fluids can cause quite high annular pressures, creating the potential for rupture or collapse of casing strings or failure of casing hanger seals. In wells with surface access to the casing annuli, this problem is normally treated by bleeding off the pressure at the surface. However, most deepwater completions do not have this capability with the problem compounded with typically higher production rates and cold shallow formations. VIT mitigates APB by reducing heat transfer from the production flow to the fluids in the casing annuli.
 - Paraffin or “wax” deposition and build up is prevented by using VIT therefore avoiding or reducing costly intervention activities which usually consists of shutting down production and using mechanical or chemical means to remove buildup. The costs of these services, lost production and potential hazards due to these interventions, can therefore be avoided.
 - Methane gas hydrates: VIT’s heat retention capability can greatly improve cold start-up/warm-up times and minimize hydrate risks by reducing the likelihood of crystallized hydrate formation which can plug the flow line or production string during well shut-down or a cold start-up.
- Environmental concerns are addressed with VIT preventing heat transfer from warm formation fluids to the surrounding permafrost in oil fields like Alaska’s North Slope. In addition to preventing environmental damage, potential structural failure of wells due to subsidence of the melted formations is also addressed.
- Heavy Oil Flow: VIT allows produced fluids to flow at higher temperatures, thereby maintaining lower viscosity and increasing flow and enhancing profitability.



Inventory

- 5 1/2" 17# L80 C/W 4 1/2" 12.75# 12CR85 INTERNAL LINER RTS-8
- 4 1/2" 11.6# L80 C/W 3 1/2" 9.2# 13CR85 INTERNAL LINER RTS-8
- *Extensive Crossover and Sub package available*