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# The Recent Effective Hydrate Cleaning Happening in Field of Natural Gas in Gulf Region

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## Abstract:

Water and other liquids can cause problem production problems in natural gas field. These liquids can also be converted in to solids, non-stoichiometric compounds of small gas molecules and water. They are formed when the constituents come in contact to low temperature and high pressure. They are subset of compounds known as clathrates or inclusion compounds.A clathrate compound is one that contains a molecule of one substance in a structure made up of molecules of another substance.These compounds' physical properties are non-flowing crystalline solids that are denser than standard fluid hydrocarbons and extremely compressed gas molecules.Thus change in the temperature and pressure also releases an amount methane which can change or affect the global, atmospheric chemistry and this characteristic could explain about ma or sea floor instabilities resulting in submarine slides and slope failures.Therefore, these complexes of natural gas hydrates all have possible effects on human well-being and thus explain the increasing interest around the world.

*Keywords* **—Natural Gas, Cleaning, Hydration and Engineering.**

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## I. INTRODUCTION

Natural gas occurs in specific area due to natural activities like coal mining, gas well drilling, pipe line leaking, and also from landfills. Natural gas is colorless, odorless, tasteless and might be combustible.Natural gas is not harmful and causes no health issues in drinking water even at elevated levels. Natural gas hydrate cleaning is also known as methane clathrate is a solid clathrate compound (more precisely a clathrate hydrate), in which a large quantity of methane is contained within a crystal structure of water, creating a solid similar to ice.Originally thought to occur only in the outer regions of the Solar System where temperatures are low and water ice is natural, large deposits of methane clathrate were found in the earth's ocean floors under sediments. There are also some cases in Gulf region where the equipment's and bore wells are exploded due to the natural gas accumulation. Methane clathrates are common in the shallow marine geosphere, occurring in deep sedimentary structures and forming outcrops on the ocean floor. Methane hydrates are thought to be created by gas migration from deep along geological faults, followed by precipitation or crystallization, when the rising gas stream is in contact with cold sea water. Work on Antarctic Vostok and EPICA Dome C ice cores in 2008 showed that methane clathrates were also present in deep Antarctic ice cores and record a background of concentrations of atmospheric methane dating back to 800,000 years ago. The ice-core methane clathrate record is a key source of evidence for research into global warming, along with oxygen and carbon dioxide.

  

## II. METHODS OF NATURAL GAS HYDRATES CLEANING

### *A. Removal Through Brush*

The gas hydrate removal brush is designed to be used in conjunction with vortex reverse floe dredge or with vortex water pump only as the motive water source.

Water jets on four sides and front of hydrate cleaning brush utilizing high volume water about 62m3/hr and water pressure up to 80psi using tornado pump generate several turbulences to break up and disperse the hydrate build up with water pressure and flow.

Mechanical action of bidirectional rotary bush helps to break down hydrates further. Soft bristles prevent damage to delicate EFL and HFL assets.

### *B. Using Absorption Methods*

The liquid sorbents used for the purification of natural gas hydrate must have high water solubility, low cost and good corrosion resistance. They must also be chemically neutral towards the gas components and, if regeneration is used, they should be easily generated, be of low viscosity and so on. Diethyl glycol (DEG), triethylene glycol (TEG) and to lower extent, monoethylene glycol (MEG) satisfy most of these requirements.

### *C. Using Adsorption Methods*

Adsorption is also said as dehydration by solid media in which the natural gas hydrate cleaning is aimed at the depression of water dew point below the minimal below temperature that can be expected in the gas pipeline.

### *D. Using Membrane Method*

This system is used in pipes and process equipment to avoid hydrate formation, slug flow, corrosion, and erosion.

The goal of this project is to evaluate a new membrane process design for subsea natural gas dehydration to meet the requirements of pipeline transport. Modelling and simulation of processes will be conducted to determine the membrane dehydration cycle.The two membrane modules are modelled and tested before being implemented in the HYSYS simulation method for an assessment and optimisation of the overall process design. A feasibility analysis of the membrane dehydration process can be documented using a validated and optimized simulation model for the process.

No water would be present in downstream gas pipelines or plant equipment with subsea dehydration.

### *E. Super Sonic Separation*

This is one of the technology to remove one or several removal compounds in natural gas.By cooling the gas in a Laval nozzle, the process condensates the target components and separates the condensates from the dried gas through an integrated cyclonic gas / liquid separator. The separator uses only part of the field pressure as energy, and has technological and commercial advantages compared to traditional technologies that are widely used.

### *F. Joule Thomson Expansion*

Move natural gas into a heat exchanger to bring down the gas temperature. As the gas cools quickly, water vapor forms solid ice crystals and falls out of the natural gas. Remove the dehydrated natural gas from the low temperature separator and proceed as required for further processing.

### *G. Using Condensation and other methods*

This can clean the gas in a complex way but is usually used to clean the raw feed gas from the unwanted mass contaminants.

## III. COMPARISON OF NATURAL GAS HYDRATE CLEANING METHODS

This is to compare and sort out the best method for using in natural gas hydrate cleaning that are widely applied in industry:

- Absorption by Triethylene Glycol
- Adsorption on Solid Desiccants
- Condensation
- Super Sonic Separation
- Membrane Separation
- Brush
- Joule Thomson Expansion

  

A comparison is made according to their energy demand and suitably for use. The energy calculations are performed on a model where $10^5$ $Nm^3$/hr water saturated natural gas is processed at $30^0$ C. the pressure of the gas 7Mpa to 20Mpa. The required outlet water concentration in natural gas is equal to the temperature of dew point $100^0$C at a gas pressure of 7Mpa.

Therefore, the best method is absorption which said as natural gas hydrate cleaning by liquid media is commonly used in all over the world. Because its glycol concentration is almost high about (96% – 99%). Its only disadvantage is only it is difficult to reach the water dew point of the dehydrated gas.

## IV. SUMMARY

A detailed analysis of recent successful hydrate cleaning in the natural gas sector in the Gulf region.Various types of methods used till now are also detailed here and as well as the methods are compared and sorted out which is best. The review also shows that the past and the future natural hydrate gas cleaning happening in the gulf region and suggests the best effective method of natural gas hydrate cleaning.

## V. CONCLUSIONS

Natural gas hydrate was first occurred by a Russian scientist in 1960 exploring for gas in permafrost regions of northern Russia. After 1980 natural gas hydrate had been performed in continental slope sediments of the Middle America Trench offshore from Mexico and Guatemala and of the U.S SE coast in the Blake Ridge Since then the rate of discovery of evidence for gas hydrate has accelerated. It is known that the natural gas hydrates occur in sediments of continental and insular margins, both convergent and divergent, around the world. Most of the natural gas hydrate is composed mainly of methane and water and is in the structure of crystallographic form. The amount of methane in natural gas is enormous, but the estimates are speculative, with a present age of $10^{15}$ to $10^{17}m^3$, and a most likely value at the lower or intermediate part of this range. Determining the role that this methane plays in the global carbon cycle and perhaps will play in the global energy mix of the future is a major challenge.

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