

HYDRATES

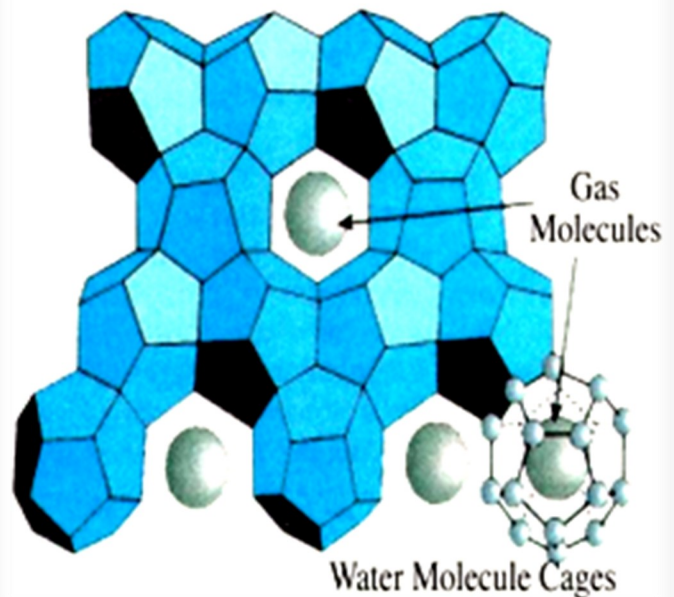


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Hydrates, also known as “ice that burns”, are ice-like structures formed when water cages a gas molecule which in most cases, is a hydrocarbon gas (C1-C4). Like most flow assurance issues, the more extreme the production environment, the more the likelihood that hydrates will form. Hydrates constitute over 70% of Flow Assurance issues in the Oil and Gas industry.

Hydrates occur in the Wellbore, Risers, Production Systems and Pipeline Systems.



Effects of Hydrates in Production Systems

- * Plugging of drill bits, subsea pipelines, chokes, valves, heat exchangers and instrumentation.
- * Loss of production to remove resulting plugs.
- * Pipeline damage due to hydrate plug missile.

These **four constituents** are necessary for hydrate formation: **presence of liquid water, gas molecules, high pressure and low temperature**. Without any one of them, hydrates will not form. In hydrate management, one or more of the four constituents are removed.

Hydrate management methods are summarised as:

- ◆ Temperature control: this involves;
 - * Passive Control (thermal or vacuum insulation of pipelines)
 - * Active Control (water or electrical heating of pipelines)
- ◆ Use of Inhibitor: there are two major classes of hydrate inhibitors:
 - * Thermodynamic inhibitors: they are applied in heavy doses and completely prevent hydrates from forming (examples are glycol and methanol)
 - * Low Dosage Hydrate Inhibitors (LDHI): they are expensive, used in low concentrations and do not totally stop hydrates from forming rather, they delay hydrate nucleation and growth (majorly Kinetic Hydrate Inhibitors (KHIs and Anti-agglomerants (AAs)).
- ◆ Dehydration: can be achieved by two major methods;
 - * Use of tri-ethylene glycols (absorption)
 - * Use of molecular sieves (adsorption)

In most production systems, more than one management method is applied at the same time to maximize production.

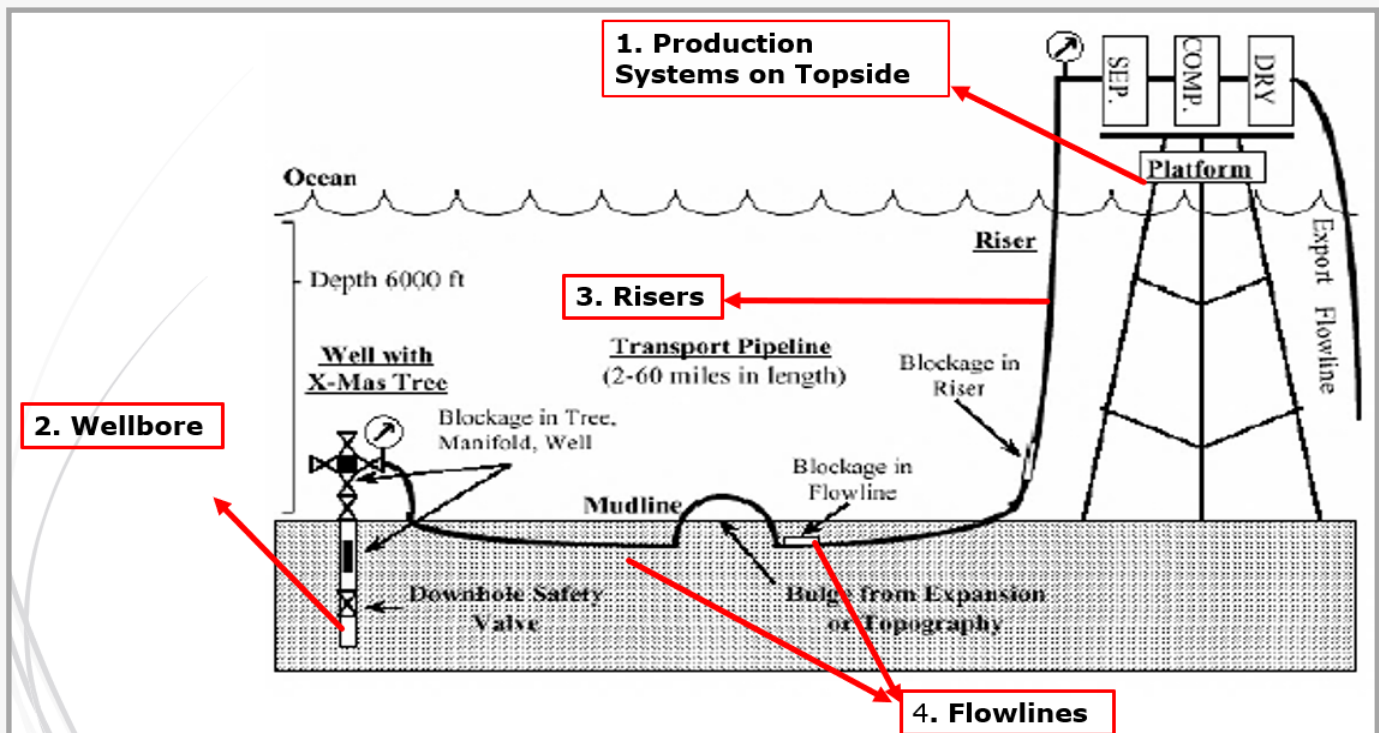


Fig 1. Hydrate Occurrence