

SCALES



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Scales are inorganic mineral components of water. Hence, **the key concept in scaling is solubility**. Solids may precipitate as they (ions) have low solubility in water and deposit from the brine once the solubility limit or capacity has been reached.

These inorganic compounds referred to as “Scales” are ionic species that are found in oil and gas fields. They lead to increasing challenges such as scale deposition in the reservoir, wellhead, flowlines, topside production etc.

Solid precipitates may either stay in suspension in

the water or form an adherent on the pipe wall. Both are undesirable as they may cause problems like plugging, corrosion and microbiological activity. Oilfield scales are generally inorganic salts such as carbonates and sulfates of the metals’ calcium, strontium and barium or may be the complex salts of iron such as sulfides, hydrous oxides and carbonates. Often, calcium carbonate scaling occurs with a pressure drop and a **very important property of calcium carbonate is that its solubility decreases with increasing temperature**, which is the condition of most pipeline systems. As a consequence, thermal monitoring is critical.

The solubility of scales is affected by various conditions, such as:

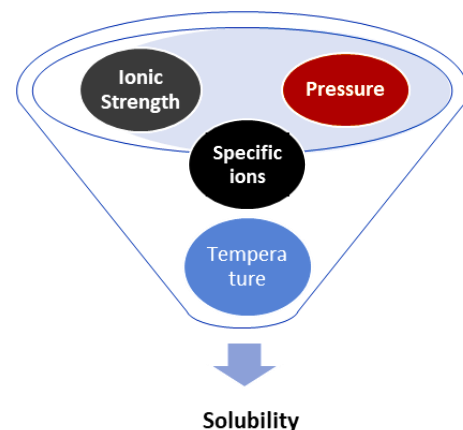


Table 1: Factors contributing to various scales formation

Deposit	Most Important Factors Affecting Solubility							
	Partial CO2 Pressure	pH	Total Pressure	Temperature	Total Salinity	Corrosion	H2S	Oxygen
Calcium Carbonate	✓	✓		✓	✓			
Calcium Sulphate			✓	✓	✓			
Barium Sulphate			✓	✓	✓			
Iron Carbonate	✓	✓		✓	✓	✓		
Iron Oxide		✓				✓		✓

Procedures to consider in the remediation and prevention include:

- ◆ Consider the symptoms first to determine whether scale problems exist or not.
- ◆ Perform standard water analyses.
- ◆ Use a model to identify scale formation potentials.

Scales can be managed in several ways:

- ◆ Pre-treatment to remove dissolved and suspended solids.
- ◆ Using Scale Inhibitors such as Inorganic Polyphosphates, Organic Phosphates Esters, Organic Phosphonates etc. to prevent deposition.

Note that there are factors to consider in inhibitor selection:

- ◆ Type of scale
- ◆ Severity of Scale
- ◆ Temperature
- ◆ pH
- ◆ Chemical Compatibility
- ◆ Cost

