



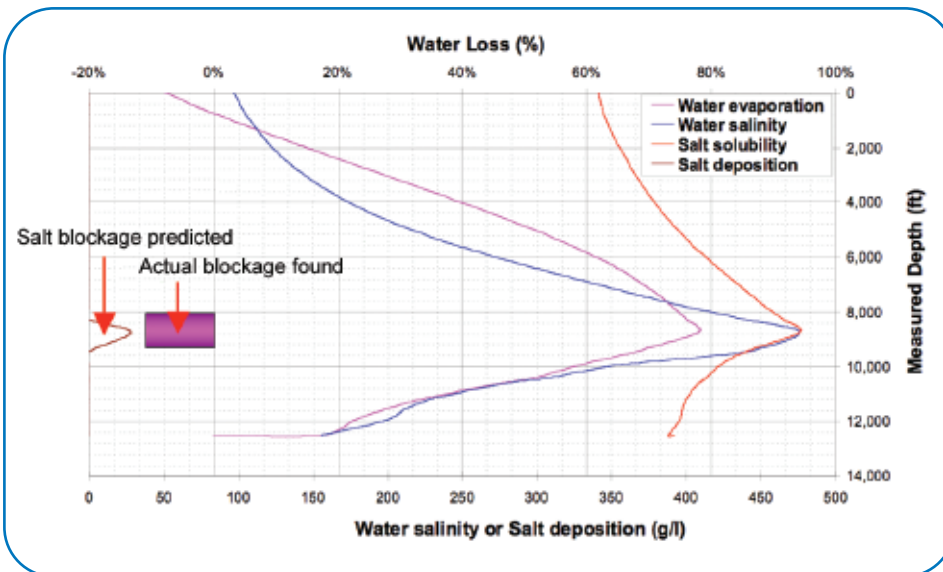
A Baker Hughes Company

Production Chemistry

Introduction

An ongoing focus on production chemistry and flow assurance is key to the success of all producing assets; in particular, in sub-sea developments where produced fluids are exposed to an extreme range of conditions, and mitigation treatments can be very expensive. It is also important in mature developments where multiple fields at different development stages may be tied back to a single processing facility.

The Baker RDS Production Chemistry Team enables clients to optimise their production and injection system potentials and their well and surface facilities uptimes, whilst minimising operating expenditure (Opex) associated with production chemical usage and any health, safety and environmental (HS&E) impact.



Calculated vs. Actual water salinity and salt deposition

Independent Perspective

RDS can provide production chemistry support services from a completely independent perspective because we do not have any chemical sales driver. Therefore, there is no incentive to introduce additional chemicals, or generally to maximise revenue to a chemicals supplier. RDS recommendations are made solely on the basis of technical and cost effective criteria to identify the best and most appropriate mitigation approaches or products from the market.



Gas Hydrates from a subsea flowline

Our expertise includes:

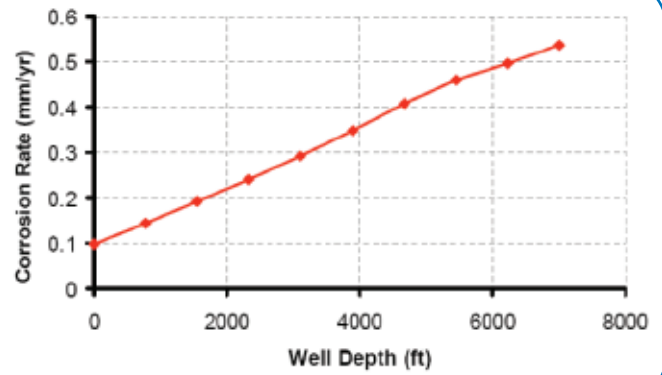
- > All aspects of well design
- > Completion design
- > Well test design
- > Drilling, completion & well testing supervision
- > Drilling & completions project management
- > Well interventions
- > Well examination
- > Extended reach well design
- > HPHT well design
- > Deepwater drilling
- > Hydraulic workover operations
- > Well control strategies
- > Underbalanced drilling
- > Multi-lateral well planning
- > Coal-bed methane operations
- > Smart completion equipment

We are uniquely placed to help you:

- > Select optimum well designs
- > Select optimum equipment
- > Improve drilling & completion performance
- > Project manage drilling & completion operations
- > Comply with local government regulations
- > Integrate well planning with subsurface expertise

Results from Helicor Ver 2000.1, a Helix Well Technology Product

Parameters		Carbon Steel	Water Properties	
Material	Type	Carbon Steel	Na+ (mg/l)	23120
Gas properties	CO2 in gas (mol %)	0.3	K+ (mg/l)	186
	H2S in gas (mol %)	0	Mg++ (mg/l)	555
	Gas SG (frac)	0.85	Si+++ (mg/l)	462
Oil properties	Paraffin #	2392	Ca++ (mg/l)	110
	Oil SG (frac)	1	Cl- (mg/l)	41000
Conditions	Oil rate (mbbl/d)	10000	CO3- (mg/l)	0
	Water rate (skbbl/d)	1000	SO4- (mg/l)	10
	Gas rate (mmmscf/d)	9.5	Ca++ (mg/l)	1850
	Depth (ft)	Min: 1, Max: 7000	Rate (mg/l)	1
	Pressure (psia)	600, 3094	OH- (mg/l)	0
	Temperature (deg F)	105, 165	Alkalinity (as HCO3-)	230
	Corrosion allowance (in)	0	Acetates	0
	Inhibitor efficiency (%)	0	TDS	87532
	Glycol (wt%)	0	Density (g/cc)	1



Helicor corrosion prediction

Operational Production Chemistry Management and Support

The RDS Production Chemistry Team is a group of industry-respected professionals with an unrivalled breadth of experience from working with a range of major oil operators. This provides a unique understanding of all aspects of Production Chemistry Management and the ability to get the best out of the complex networks and organisational interfaces involved in modern operations. The Team offers a flexible access to expertise on a full or part-time basis in order to meet client needs.

Detailed Design

The Team has a long track record providing production chemistry evaluation and recommendations for concept development and then detailed front end engineering design for new development projects (e.g. platforms, surface processing facilities, wells, and sub-sea tie-backs). This enables efficient handling of all production chemistry and flow assurance issues (scale, separation, corrosion, materials, hydrates, wax, asphaltene, etc) at an early stage of design.

Problem Solving Studies

Production chemistry problem solving and review studies are a key activity for the Team. The combination of a thorough theoretical understanding of the chemistry issues aligned with practical operational awareness and experience, enables a proper focus on the most sensible and feasible solutions.

The Team has access to both industry-leading commercial software and proprietary RDS software covering: hydrocarbon and water pressure-volume-temperature (PVT) phase modelling, scale, corrosion, wax, asphaltenes, and hydrate prediction. This enables a valuable ability to model the fluid physical properties which are the key input to production chemistry.

The RDS organisation enables rapid and productive interfaces with Production Technology and Reservoir Appraisal disciplines (e.g. well design, well modelling, reservoir engineering, geomechanics) when required. This provides a deeper, more flexible, and more continuous capability than is possible from an individual consultant.

HealthChecks, Audits, and Expert Adviser

RDS HealthCheck provides an in-depth review of current production chemistry risks. The process should be carried out regularly as conditions change and as new data emerges. The outcome is a snapshot view of which risks are being appropriately managed and which may need new mitigation strategies.

We also carry out audits of production chemistry operations, chemical suppliers, analytical laboratories; and provide expert production chemistry technical advice in workshops, reviews, risk assessments, strategy meetings etc.

Chemical Selection Management

Our understanding of chemical product development, testing, supply chain, and field deployment means we are ideally placed to design and manage independent chemical selection studies, taking appropriate account of environmental requirements.

Proprietary Tools and Approaches

We have developed a number of novel proprietary tools and workflows for our evaluation work including: downhole corrosion model (Virtual Calliper), halite salt deposition, reservoir souring.

