



## HydraCHEK™ Hydrate Inhibition Monitoring System

### The Problem

- Gas hydrates are a major challenge in oil and gas production systems
- Hydrate inhibitor injection rates typically remain fixed for long periods based on a pre-determined hydrate stability zone
- Currently there is no means of optimising injection rates in response to changes in production parameters
- This could result in over, or more importantly, under inhibited systems, leading to a hydrate blockage

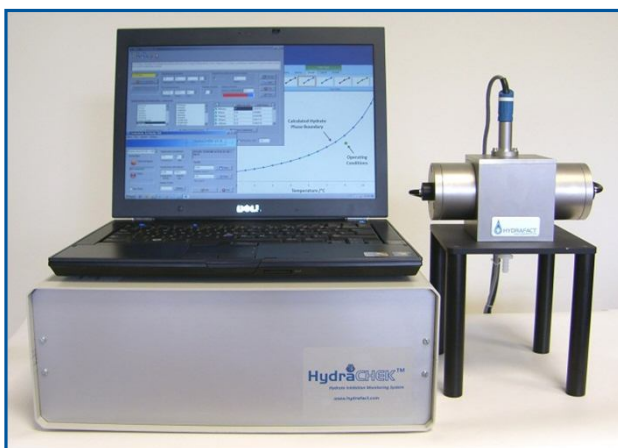
### The Solution

- Developed as part of an industry sponsored project in conjunction with Hydrafact
- HydraCHEK provides the actual concentration of hydrate inhibitors and salts through regular onsite downstream produced water analysis
- Combined with operating parameters, output data allows the operator to continuously monitor and optimise inhibitor injection rates
- Unique and highly innovative, HydraCHEK is revolutionising the way in which hydrate risks are managed



*Gas hydrate blockages cost millions of dollars in lost production every year*

Benefits of HydraCHEK
• Allows optimisation of hydrate inhibitor concentrations
• Works with all salts & inhibitors (MEG, methanol, KHIs, AAs...)
• Mitigates hydrate risks & reduces operating costs
• Rapid & highly accurate analysis
• Flexible – can be tailored to suit operator’s system
• User friendly – easy to operate
• Can monitor other chemical streams, e.g. umbilicals, gas dehydration & inhibitor regeneration units



*Laboratory HydraCHEK system*

*“The device (HydraCHEK) has been successfully applied in determining the amount of KHI in produced water from the Dolphin field in Qatar. The results shows that this new technique is very fast and reliable, optimising the KHI injection rate, improving the economy and reliability of hydrate inhibition strategy, and minimising the impact on the environment.”*

*Lavallie et al. (2009) International Petroleum Technology Conference, Doha, Qatar, 7-9 December. IPTC 13765.*

### Tried by JIP sponsors

TOTAL E&P, Petronas, Statoil & NIGC

### Recent Field Deployment

Dolphin Energy, Qatar

**HydraCHEK™ - add control to your flow assurance toolbox**

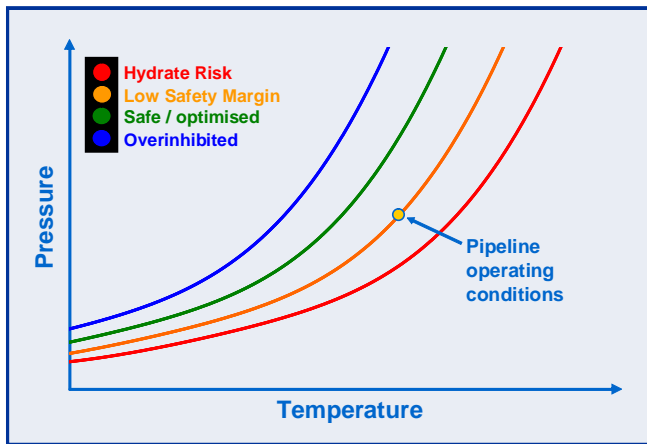
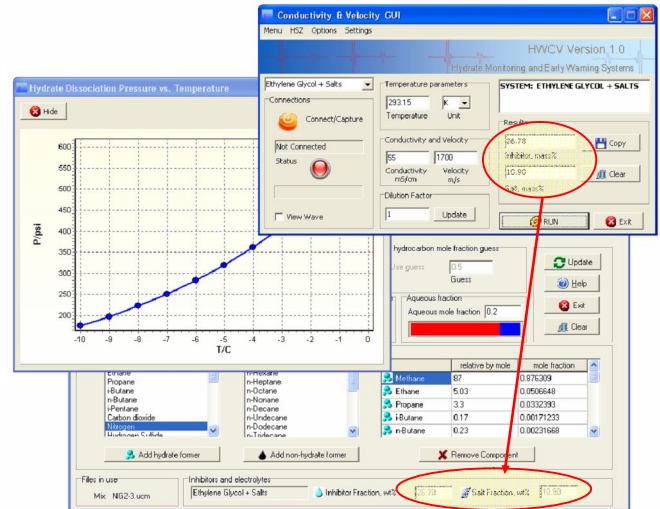


# HydraCHEK™ – Technical Summary

## Data Capture and Analyses

Output data from the HydraCHEK analyser is fed into a customised version of the industry recommended HYDRAFACT Equation of State (EoS) based gas hydrate thermodynamic model.

Combined with gas composition and system pressure/temperature data, the hydrate stability zone and safety margin are determined at the push of a button.



## Traffic Light System

HydraCHEK can be viewed as ‘traffic light’ system, keeping the operator constantly aware of the current hydrate safety margin relative to operating conditions.

Using this information, inhibitor injection rates can be continuously adjusted to avoid hydrate problems if under inhibited, or costly wastage if over inhibited.

## Rapid and Accurate Inhibitor Concentration Measurements

To determine aqueous salt and hydrate inhibitor concentrations by conventional methods requires a number of different, time consuming tests (e.g. GC, titration, gravimetric) and associated equipment. In contrast, HydraCHEK offers equal or better accuracy in one simple, rapid direct measurement.

Salt (wt%)	MEG + NaCl	MeOH + NaCl	KHI + NaCl	AA + NaCl
Actual Salt Concentration	3.50	2.50	4.50	1.50
Measured by HydraCHEK	3.51	2.60	4.47	1.51
Absolute Deviation	+0.01	+0.10	-0.03	+0.01
Inhibitor (wt%)*				
Actual Inhibitor Concentration	25.00	18.00	0.80	2.50
Measured by HydraCHEK	24.95	17.80	0.87	2.41
Absolute deviation	-0.05	-0.20	+0.07	-0.09

\*HydraCHEK can be used for a wide range of inhibitor concentrations (0-100%)