Examine Gas Hydrate Formation

with the

Sapphire Rocking Cell RCS

Characteristics

- Test of AA and KHI at deepwater conditions
- Multi-phase flow testing
- Full view polished test cell for optimization of inhibitors
- Ball run-time measurement
- 4 designs - 2, 6, 8, 20 test cells max
- Stringent test conditions for improvement on product safety for deepwater application
- Sour gas testing

Gas hydrate challenge
Oil and gas production in colder regions and in the subsea deepwater necessitates further development of Low-Dosage Hydrate Inhibitors (LDHI) as Kinetical Hydrate Inhibitors (KHI) and, particularly, Anti-Agglomerants (AA). For research on Anti-Agglomerants, the transportation of dispersed gas hydrate in the fluid flow of a pipeline must be ensured. Lab tests must prove the efficiency and reliability of inhibitors in field conditions. As a specialty of LDHIs, for approval of gas hydrate inhibitors a detailed statistical check of effectiveness is required. Thus, the objective is to conduct the necessary amount of tests in the least amount of time.

Rocking cell measurement
The measuring principle of the lab instrument Sapphire Rocking Cell is based on the constant tilting (rocking) of tempe-rature-controlled, pressurized test cells (rocking cells). Tilting the cell causes a ball to roll back and forth through the entire length of the test cell, mixing the enclosed fluid-gas mixture. This ball movement induces strong shear forces and turbulence inside the test cell, simulating pipeline conditions.

A typical experiment can be divided into three phases: flowing conditions, shut-in and restart flowing conditions.
Measuring the cell pressure and performing examinations for a drop in pressure provides information about hydrate formation.
By measuring the ball run-time, changes in intrinsic viscosity can be monitored.

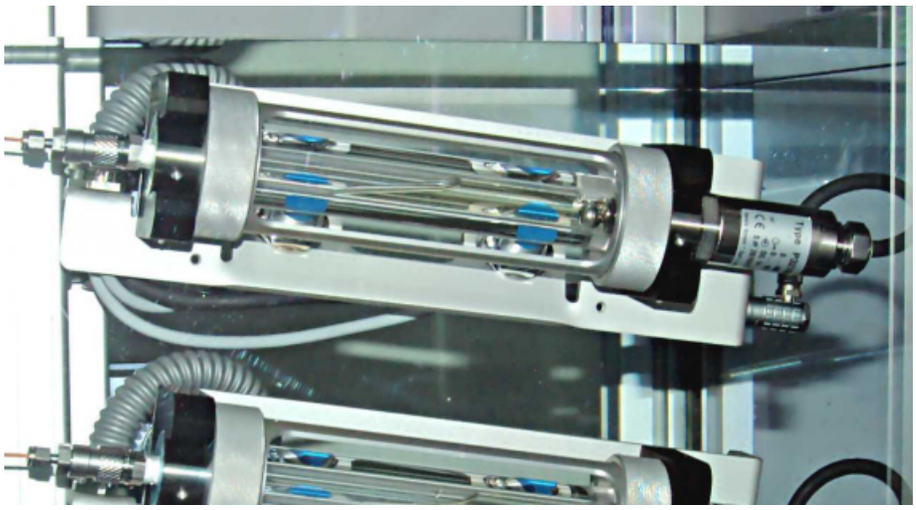
What PSL provides
The PSL Sapphire Rocking Cell conducts pressure, temperature and ball run-time measurements, all of which are visibly observable, and is specially designed for research on Anti-Agglomerants. Up to 20 cells can be used simultaneously, reducing test time with multiple measurements and providing statistical data within one test run.
The cells are pressure proof from 200 bar (2,900 psi) up to 350 bar (5,000 psi) and can be used separately at a constant volume or simultaneously at constant pressure. The temperature ranges from +60 °C (140 °F) to -10 °C (14 °F) respectively -20 °C (-4 °F). Thus a wide range of field conditions can be simulated, starting from cool temperature onshore transport up to deepwater applications.

With the ball run time measurement, the pumpability of the dispersed gas hydrate can be tested and referenced to intrinsic viscosity changes in the multiphase slurry.
The sapphire test cells are completely transparent. The entire sample chamber is visible for close observation of the sample behavior and the structure of the composed gas hydrates. In addition, the tests can be recorded by a video camera, making it possible to observe whether hydrates are gathering or compacting on less turbulent areas, i.e. the end of the cells. The interaction of LDHIs and other additional substances such as corrosion inhibitors (CI), asphaltene inhibitors (AI), wax inhibitors (WI) or scale inhibitors (SI) are accessible by experimental data. Free water or oil phases are detectable.
Upon request, the cell caps can be produced in high-grade stainless steel or Hastelloy® / Titanium to provide sour gas compatibility.

Your benefit
With the Sapphire Rocking Cell you will save considerable development and measuring time, e.g. over 75 % in comparison to a five cell batch autoclave testing. Your project costs are also reduced accordingly.
Testing of Anti-Agglomerants with the Sapphire Rocking Cell will deliver useful statistical results. The cell meets the stringent conditions for evaluating inhibitors for deep-water applications. Anti-Agglomerants can be optimized and adjusted to your application and actual operating conditions, which allows a significant increase in product safety. The view into the test cell provides more information on how your inhibitor is working or why it failed.

Designed to your requirements
The Sapphire Rocking Cell is available in four designs. The Rocking Cell RCS2 with up to two test cells or the RCS6 with up to six test cells are models for small spacing, e.g. to be placed in a fume hood. The Rocking Cell RCS8 and RCS20 are stand-alone rig installations with up to 8 or 20 test cells.

We can also adapt the Sapphire Rocking Cell to your specific requirements.



Detail: Mounted sapphire test cell in cooling liquid

Specifications:

Test cell:	RCS2 / RCS6 / RCS8 / RCS20: up to 2 / 6 / 8 / 20 sapphire glass cells
Volume:	20 cm³ (fluid + gas)
Rocking rate / angle:	1 ... 20 min^{-1} / 1 ... 45°
Pressure range:	up to 200 bar (2,900 psi)
Temperature range:	-10 ... +60 °C (+14 ... +140 °F), depending on thermostat
Data recording:	variable between 1 and 30 sec
Voltage input:	115 V~, 230 V~, 400 V~ 50/60 Hz
Power consumption:	max. 7 kW (without thermostat)
Weight:	RCS6 / RCS20: approx. 230 kg / 380 kg without thermostat
Dimensions (WxDxH):	RCS6 / RCS20: 110 x 36 x 90 cm / 200 x 80 x 220 cm without thermostat

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