

Pressure Compensated Sampler

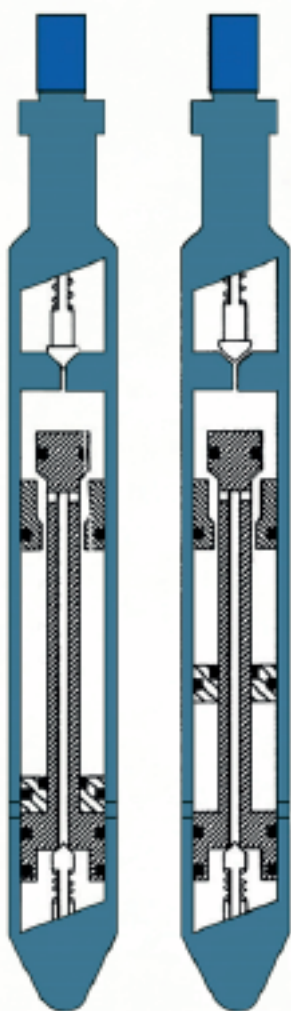


Fig 1
Running
position

Fig 2
Start
sampling

The single-phase sampling system is the most representative sampling technique available.

Operating principle

The operating principle of the single-phase bottom hole sampler is presented below. The bottom hole samplers are tested at downhole conditions before they are sent offshore/on-site.

Operating procedures

Running position (fig. 1).

Fluid entry to the sample chamber is prevented by the floating piston, which is held against the fixed piston across the sample entry ports by a pressurized charge fluid. When the tool is activated the charge fluid will bleed into the air chamber allowing the floating piston to be pushed up the central rod by well fluid entering through the sample ports. At the lower end of the fixed piston is a sleeve, which houses the power fluid valve. With the fixed piston in the running position the power fluid valve is closed (the power fluid is isolated from the sample chamber).

Tool fired, taking sample (fig. 2).

The mechanical timer is run with a preset delay time which opens the regulator valve. Before firing, the temperature effect on the charge fluid pressure keeps the floating piston hard against the fixed piston across the sample ports. Now that the regulator is open the charge fluid flows into the air chamber at a steady rate causing the pressure within the sample chamber to drop. When well pressure is reached, well fluid starts displacing the floating piston up the sample chamber. The pressure differential acting on the power fluid valve acts as a brake on the fixed piston when the tool is sampling, thereby preventing premature closure of the tool.

Sampling complete (fig. 3).

When 600 cc of fluid has been sampled, the floating piston has reached the closing piston at the top of the sample. The floating piston closes the isolation piston at the rod end and the rod is pulled up bringing the fixed piston seal into the sample chamber bore, thereby trapping the sample in the chamber. The fixed piston sleeve has now opened the power fluid valve allowing the nitrogen-energised power fluid to act between the isolation and floating pistons through the power fluid port in the hollow central rod. Power fluid pressure acting on the bottom of the fixed piston keeps the tool positively closed (pressure on the upper face of the piston is balanced by the same pressure on the closing piston).

Pressure compensation (fig. 4).

As the bottom hole tool is retrieved from the well, the temperature drops and the sample shrinks. In this case, however, the sample is maintained in a single-phase condition by use of increased, predetermined pressure from the nitrogen, acting via the power fluid.

- Positive displacement operation
- Mercury-free
- Pressure compensation (single-phase)
- No recombination necessary

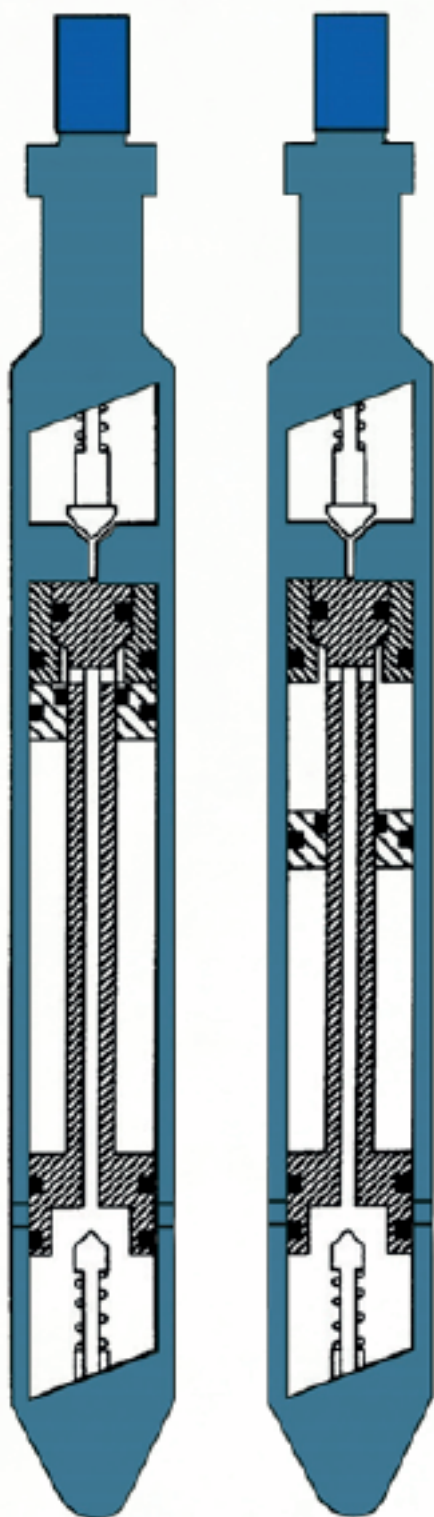
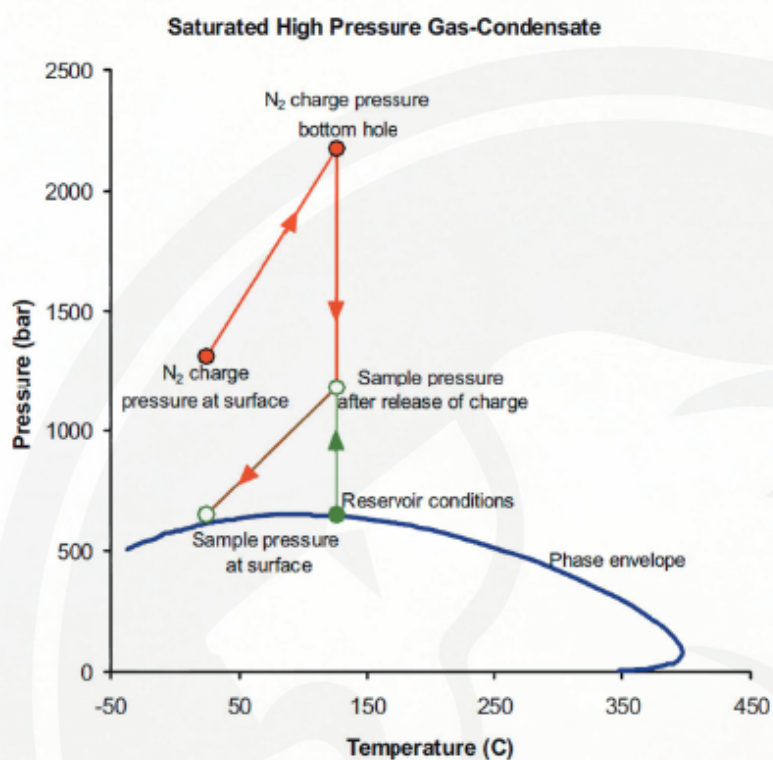


Fig 3
Complete
sampling

Fig 4
Pressure
compensation



Operational conditions

For fast and safe rig up we recommend the use of our wireline lifting clamp in conjunction with the Trinity Quick Coupling. The lifting clamp is hung on a tugger/crane and clamped round the fishing neck at the top sampler, which has one half of the quick coupling on top. The other half is on the bottom of the wireline running string. The other samplers are screwed onto the top sampler, one at a time and the complete sampling string is then stabbed into the lubricator. The lifting clamp arms are set down across the wireline BOP and the tugger slacked off to allow the wireline running string to be connected to the samplers with the quick coupling. The wireline unit then picks up the complete string and the lifting clamp is removed from the top sampler with the tugger. The lubricator union can now be assembled and pressure tested.

External equipment

The Standard Single Phase Sampler is equipped with a 15/16" Sucker Rod pin on the top and a 15/16" SR box on the bottom. Both standard threads for slick line tools. The tool can also be run on the bottom of an electric line string with the use of a cross over to Schlumberger, Baker Atlas and Halliburton are available. For Tandem firing, a special adapter with integrated knuckle joint can be used.

Expro Petrotech PCS sampling tool

The Pressure Compensated Sampler (PCS) is a single-phase reservoir sampling tool that compensates the sample volume shrinkage caused by the drop in temperature when the tool is pulled to the surface. The tool is a displacement type sampler, triggered either by mechanical timers (ranging from 3 to 24 hrs.), electrical wireline or a combination of the two systems. For surface controlled operation only the top PCS is triggered and the PCS tools mounted below are triggered by the closing action of the tool above. Lubricator length or cable rating (for deep wells) may limit the number of tools for this "Tandem Firing" system.

Non-reactive materials

The materials selected for the PCS Tools meet the requirements in the NACE MR 0175 / ISO 15156 standard, and are suitable for heavy sour service. The materials have excellent chemical resistance and will withstand very hostile

environments. The PCS sample chamber is especially designed for trace element analysis of hydrogen sulphide, mercaptans, carbon dioxide, pH, chlorides and mercury etc. (Under development)

Features:

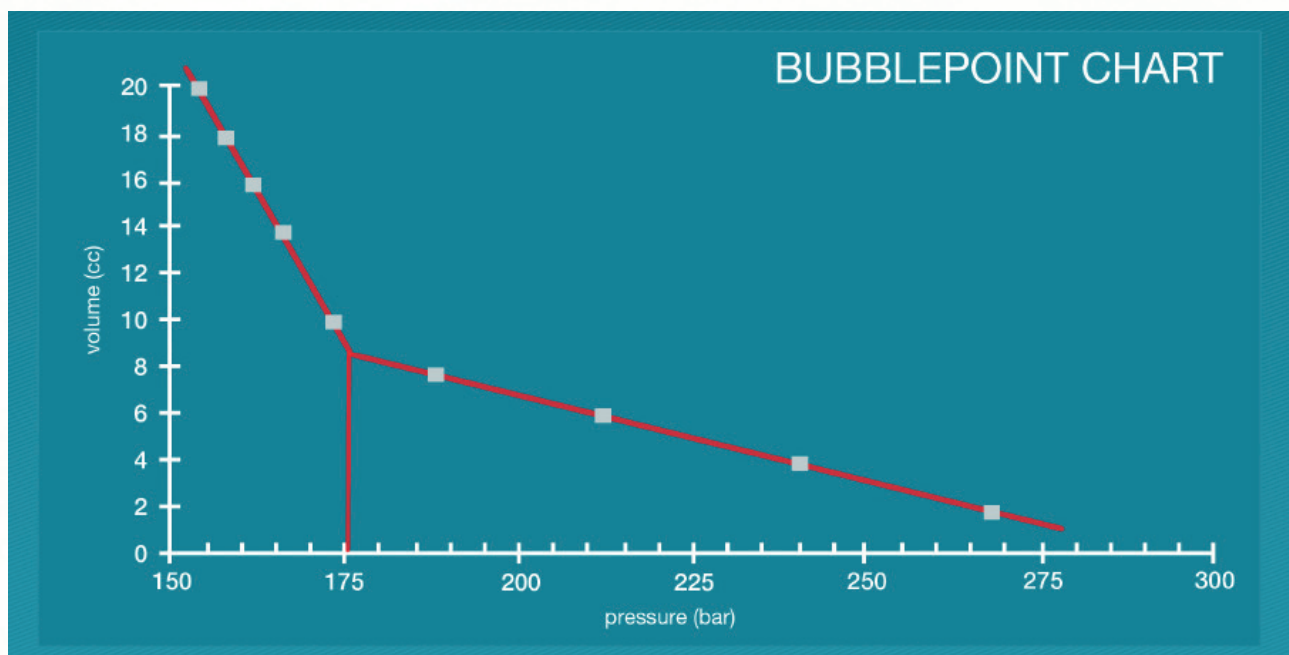
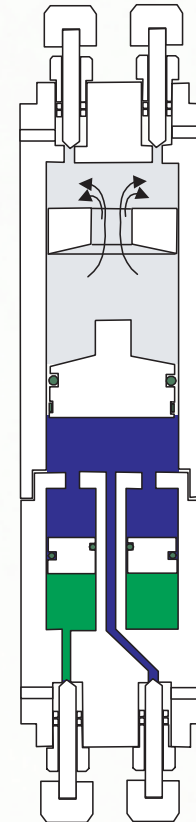
| | |
|---------------------------|---|
| Type: | Pressure Compensated Sampler (PCS) |
| Principle: | Displacement |
| Chamber: | Balanced between pistons, plus compensating fluid closing assistance. |
| Sample Vol.: | 560 cm ³ |
| Max. working pressure: | 1380 bar / 20000 psi |
| Max. working temperature: | 204 °C / 400 °F |
| Length: | 4.20 m / 13.8 ft |
| Diameter: | 44.5 mm/ 1-3/4" |
| Weight: | 38 kg / 84 lbs. |
| Materials UNS: | INCONEL N06625, N07725 |

All materials according to NACE MR0175 / ISO 15156

The unique single phase sample bottle for oil and formation water preservation and transportation

By using the single phase sampling method the sample is retrieved at surface in single phase state and does not require lengthy recombination before transfer. Transfer to single-phase bottle keeps the sampled oil or formation water in a virgin condition all the way to the laboratory.

For oil samples this is of vital importance in order to keep wax and asphaltenes dissolved in the oil. For formation water analysis, it is of special importance to prevent formation of scale or particles in the sample. This is especially important when examining for possible scaling by using the prediction program MultiScale™ (separate info sheet).



Using single-phase sampling and single-phase bottles, makes the determination of the bubble point more accurate by the easily identified bubble point curve.