Technical Advantages of Leutert Downhole Sampling System

The Sampler

Before the positive displacement technology was introduced, bottom hole samples were obtained using flow through type samplers such as the Leutert PNL. The main reason why flow through type samplers are not in use nowadays is that they required mercury for sample transfer. Mercury as incompressible metal proved ideal for sample transfer into the shipping bottle, at that time. The benefit of the flow through sampler was and still is, its length. As it utilizes only a single chamber its overall length was limited to 7 feet. The flow through sampler had another advantage: only 13 seals were required in total.

When the first positive displacement sampler was introduced into the market in the late 1980th, it was almost twice as long (12.7 feet).

Positive displacement samplers require a second chamber. The displacement or priming fluid will be transferred into the secondary chamber during sample intake. The displacement fluid must not be discharged into the well in order to avoid contamination.

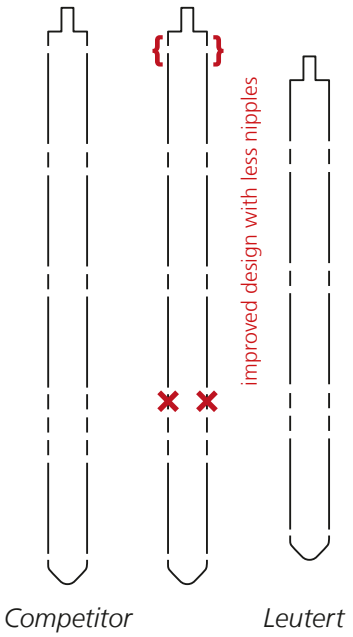
The PDS technology was originally developed in the North Sea. On offshore platforms the length of down hole tools proved quite irrelevant. Many onshore service companies however had difficulties handling the tool owing to its length. Since Leutert began manufacturing their own positive displacement sampler, the reduction of the tool's length has always been the primary objective.

In the early 1990th modified versions of the positive displacement samplers were developed. These samplers were known as single phase samplers. Single phase samplers require a third chamber for pressure compensation. This chamber contains compressed N_2 which maintains the sample in monophasic condition. Besides its extensive length of more than 16.6 feet, these samplers are equipped with more than 50 O-rings and almost as many back-up rings. Redressing such samplers is time consuming and costly.

The only way to reduce seals is by reducing the number of chambers or nipples. As described above the number of chambers can not be reduced. However, Leutert has reduced the number of nipples in their single phase sampler which is called One Phase Sampler (OPS).

The reduction of length is critical as samplers are seldom run singly. Most customers run two samplers in tandem or even three at the same time.

- The Leutert PDS^{short} has a total length of only 11.4 feet. It is the shortest sampler of its kind.
- The Leutert OPS sampler has fewer nipples than the competitors' product. Thus, the sampler has fewer possible leak passes than the competitors' products.
- Shorter redress time due to reduction of O-rings and back-up rings up to 25% in comparison to competitors´ tools.
- Short length and fewer components make it easier to operate the Leutert sampler.



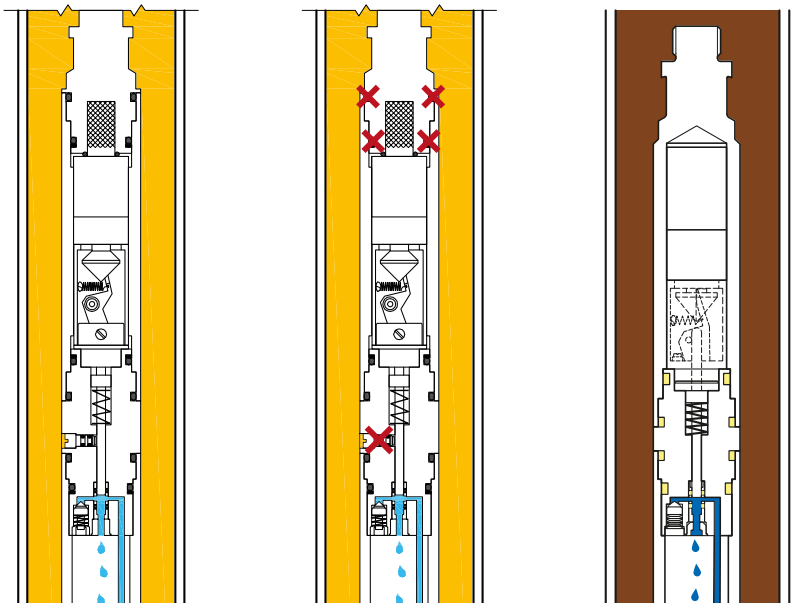
The Trigger

During the last years Leutert has observed that many customers had difficulties to handle the delicate trigger of the bottom hole sampler. Therefore Leutert has combined the former trigger mechanism and the clock.

Clock and clock coupling may now be screwed on to the sampler in one step. Setting of any screw is not required anymore.

Neglect of releasing this setting screw caused several misruns with the sampling tool in the past. This failure will not occur with the new design.

OLD: *NEW:*



The Transfer Bench

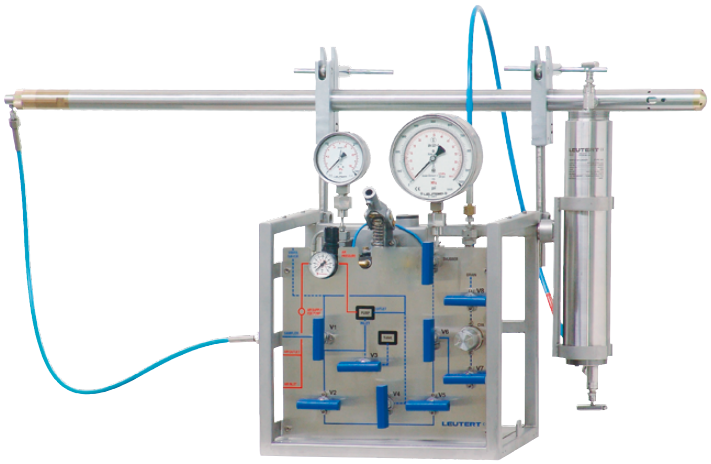
The reservoir sample requires to be transferred into a certified shipping cylinder in the field for dispatch to the PVT lab. The transfer unit needs to be compact and light for ease of transportation and rig-up.

The competitors so-called „MICRO Field Transfer Bench", which is big, heavy and needs two persons for carrying has its compactness only in name.

Instead of inappropriate naming, Leutert reduced the dimensions and weight of their transfer bench effectively.

Leutert has also reduced the number of valves within the system. This does not effect the functionality of the bench, but makes the operation easier.

- The Leutert field transfer bench is smaller in dimensions and 5 kg lighter than the competitors' product.
- Smaller and lighter equipment is easier to handle and reduces freight costs.
- Less valves for easier operation.



The Operating Tools

To prepare the flow through sampler only two open ended spanners were needed. To operate the positive displacement or one phase sampler a lot more tools are required. The risk of having too many tools is that you´ll never find the right one when needed. Especially, in the field orderliness and completeness will help saving time and money.

- Leutert has reduced the number of necessary operating tools by 10%.
- Leutert has designed a proper toolbox in which every tool got its own place.

German Engineering

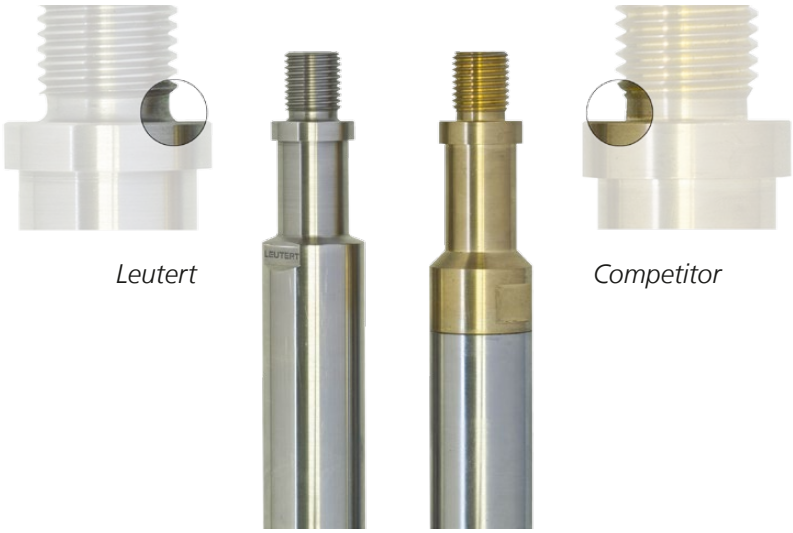
- Leutert smoothens all transitions and fillets to avoid fatigue stress cracking that might result in a loss in hole.

In materials science, fatigue is the progressive and localized structural damage that occurs when a material is subjected to cyclic loading.

If the loads are above a certain threshold, microscopic cracks will begin to form at the stress concentrators such as the surface, persistent slip bands (PSBs), and grain interfaces. Eventually a crack will reach a critical size, and the structure will suddenly fracture.

The shape of the structure will significantly affect the fatigue life; sharp corners will lead to elevated local stresses where fatigue cracks can initiate. Smooth transitions or fillets are therefore important to increase the fatigue strength of the structure.

Leutert smoothens all transitions and fillets to avoid fatigue stress cracking that might result in a loss in hole.



Standardized Sample Cylinder Dimensions

As fluid sample cylinders are part of a system, standardized dimensions simplify the adaptation to supplementary equipment such as cylinder stands, heaters and transfer benches, without the need for modification. Due to sophisticated design of the Leutert monophasic sample cylinders the overall weight and outer dimensions are identical to those of the standard Leutert Piston Type Cylinder, without compromising the volume.

Damaging external valves during handling and transportation was and still is the main safety issue of pressurized cylinders. Leutert is proud to announce that our engineers have been able to eliminate the use of external valves and in the process made our cylinders safer than those of our competitors.

As pioneers of sample cylinder design and construction, we focus on manufacturing cylinders complying with the highest international safety standards. The usage of NACE approved stainless steel is another example of making safer sample cylinders. Cylinders made of Titanium are popular due to their low weight, however Titanium is not NACE approved. Leutert's unique cylinder design combines the low weight of titanium cylinders and usage of NACE approved stainless steel.

Leutert Type OPC

Type 5 / Type 600

Features for Specialists

- Only Leutert supplies all the tools really needed to operate the PDS/OPS sampler.

If you are familiar with the operation of positive displacement or single phase samplers you know that there are several items which can make handling unnecessarily complicated. Leutert is continuously improving their products.

Leutert added a piston rod clamp to its standard tool kit.

Leutert has modified the filler funnel. By adding a lid to the funnel, a vaccum may be drawn within the sample chamber. This vacuum will draw the displacement fluid into the sample chamber. From now on nobody has to stick their fingers deep into the synthetic oil to remove the air from the sample chamber. Chamber filling time has been significantly reduced!

The piston sub assembly has removable pads on both sides which makes it easier to change O-rings and back-up rings. Redress time has been significantly reduced!

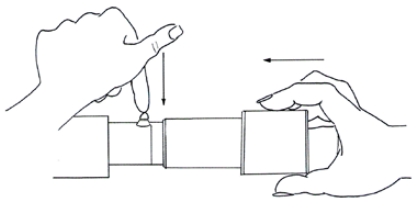
Leutert uses higher quality peek back-up rings within the piston sub assy instead of Teflon back-up rings. This material is stronger and therefore less deformation occurs.

No additional flow regulator prime port nipple is required. The Leutert PDS prime port nipple can be used with the OPS without modification.

Leutert has modified the air hose. The air gun allows the operator to clean the bench at any time.

OLD:

Slide the posi-lock holder over the needle valve body until it hits the posi-lock pin. Depress the pin and push the holder forward to cover the pin.

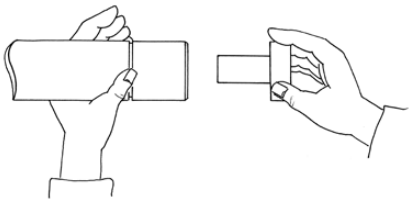


Turn the needle valve body until the hole for the posi-lock pin is uppermost and in line with the slot and hole in the sample chamber.

Guide the posi-lock holder into the sample chamber and continue to push forward as far as possible.

NOTICE:
A gap will remain between the sample chamber and the wider end of the posi-lock depressive tool. This gap serves to prevent injuries.

Insert push rod & setting tool. Push slowly forward until the shoulder hits the end of the posi-lock holder.



NOTICE:
If resistance is met during this operation the posi-lock pin might not be in line with its groove in the sample chamber. The solution is to turn the posi-lock holder slightly to the left or right until the push rod & setting tool can be pushed forward easily.

The front of the needle valve body has to be in line with the front end of the sample chamber.

NEW:

Return the complete rod assembly to the sample chamber as shown below.

- Leutert has replaced the posi-lock pin with a guide pin. That makes the operation significantly simpler.