

# TRAFOSEAL

## ARS-ALTMANN



**The vertical tank of the TRAFOSEAL II**

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## What is a TRAFOSEAL?

Continuous ingress of the oxygen (O<sub>2</sub>) and moisture from the surrounding in the oil, together with the transformer's relatively high temperature, inevitably increases the oxidation aging of its insulants and decreases its reliability and life-expectation.

The patented TRAFOSEAL sealing principle represents a new art in the sealing of power oil-immersed transformers.

**TRAFOSEAL uses the transformer oil alone as a very effective sealing element.**

The cold – gas and water-contaminated oil in the conservator is separated from the hot (protected) oil in the main tank by **a thermal stratification layer(s) created naturally in the TRAFOSEAL tank via a temperature difference between hot and cold oil.**

**This layer acts as an indestructible natural „membrane,“ which separates the hot oil in the upper part of the TRAFOSEAL tank and the cold oil in the bottom part (see Fig. 1).**

This natural „membrane“ is extremely effective at stopping the mixing of cold (contaminated) oil from the conservator, with the hot (protected) oil from the main tank.

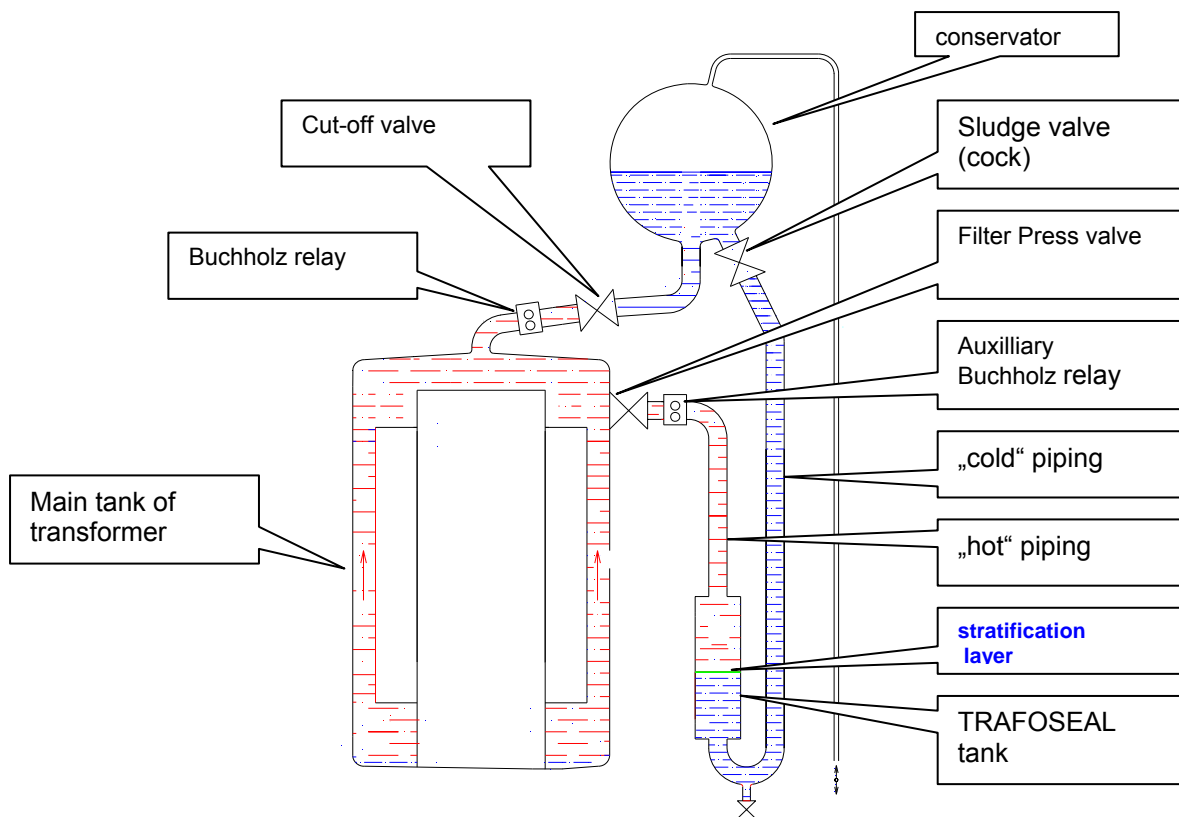


Fig.1 Schematic design of the TRAFOSEAL II for the retrofit (sealing) of the transformer.

Under normal operational conditions, the oil temperature in the Tx-main tank varies, causing the oil to expand and contract accordingly.

As the **temperature rises**, hot oil moves gradually from the main tank into the upper part of the TRAFOSEAL tank, **the thermal stratification layer moves downward**, and the cold oil from the bottom part of the TRAFOSEAL tank flows into the conservator.

Then, as the transformer **temperature decreases**, the oil volume in the Tx-main tank decreases, the cold oil from the conservator flows into the bottom part of the TRAFOSEAL tank, causing the stratification layer's upward movement.

Under normal operating conditions, the stratification layer(s) moves up and down in the TRAFOSEAL tank only, totally preventing any mixing of the hot oil from the main tank and the cold (contaminated) oil from the conservator.

The advantages of the new kind of oil/oil sealing of a transformer are quite noticeable, especially if compared with current transformer sealing methods:

- ⇒ no mechanically moving parts and no „consumable“ items (as the supply of N<sub>2</sub> )
- ⇒ no potential leaking/replacement of „sealing“ element ( as with Bag-In-Tank)
- ⇒ no substantial pressure changes in the main tank due to temperature variations (as with „flexible walls“ sealing, no corresponding Buchholz Relay alarms induced by the release of gases from oversaturated oil
- ⇒ monitoring of proper function is not necessary

## Application

The TRAFOSEAL conservator – main tank sealing System applies to any type and size of power transformers.

Heavily loaded transformers are currently free-breathing and, therefore, perfect candidates for this simple, elegant, and cost-effective sealing method, with considerable life extension effect.

The substantial reduction of oxygen entry from the conservator into the main tank gradually decreases the oxygen level in the main tank's oil inventory and, subsequently, the intensity of an oxidation aging of the cellulose (and oil) prolongs the service life of the transformer.

The TRAFOSEAL retrofit of a free-breathing transformer, in contrast to standard sealing methods, is straightforward. Generally, no substantial modification of the main tank or the conservator is necessary: two required connecting points are usually standard equipment of the main tank and conservator (Filter-Press Valve + sludge valve).

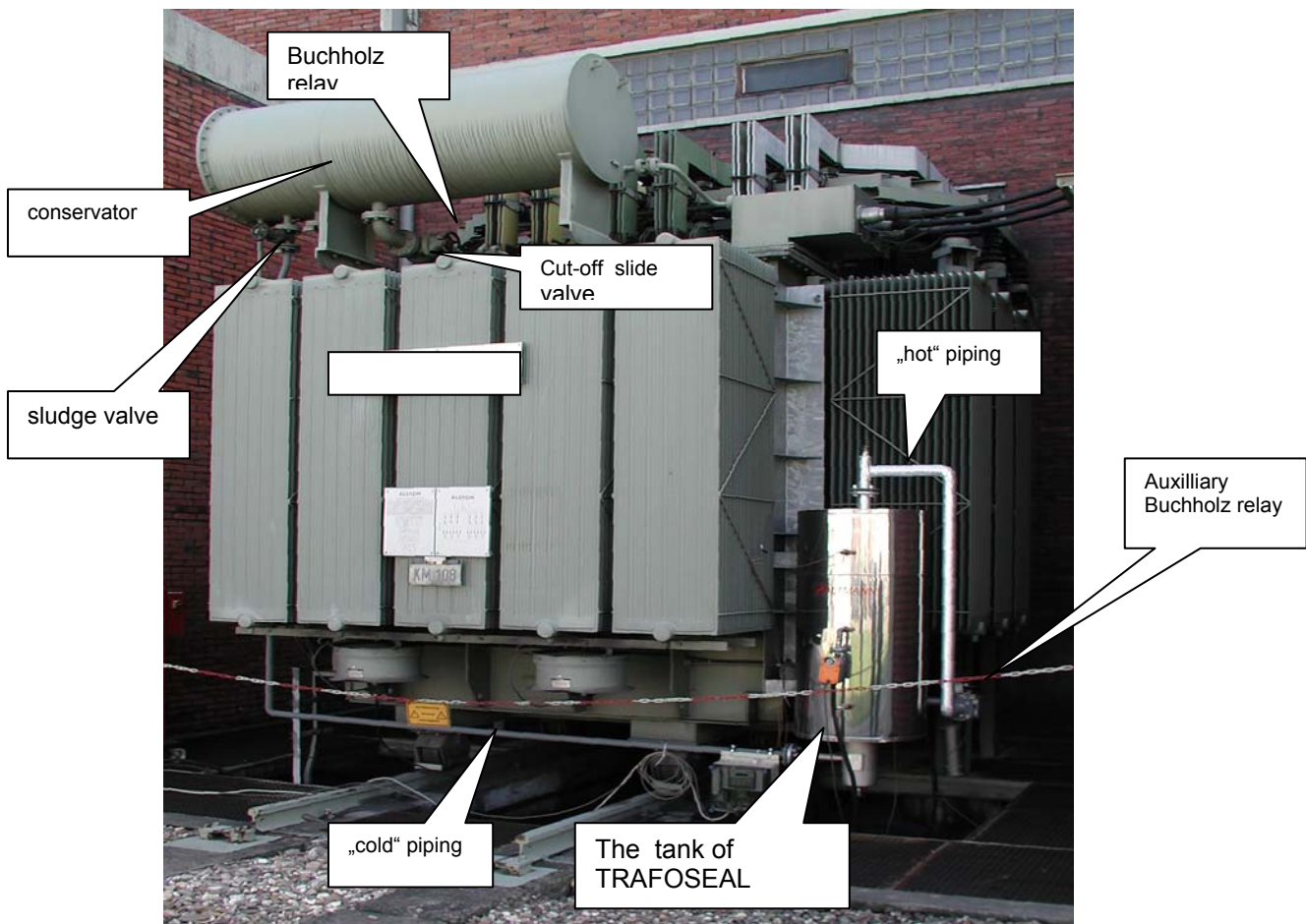


Fig. 2 shows the pipework, the installation usually takes less than one to two days with two engineers, depending on the size of the transformer. Fig. 2 shows the pipework, the installation

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## Verification of the TRAFOSEAL function

The test of TRAFOSEAL sealing effectivity at 17 MVA furnace transformer (with an approx., constant load) shows Fig. 3.

The online DGA TGM (Gatron) analyzed the oil in the Tx main tank twice per day.

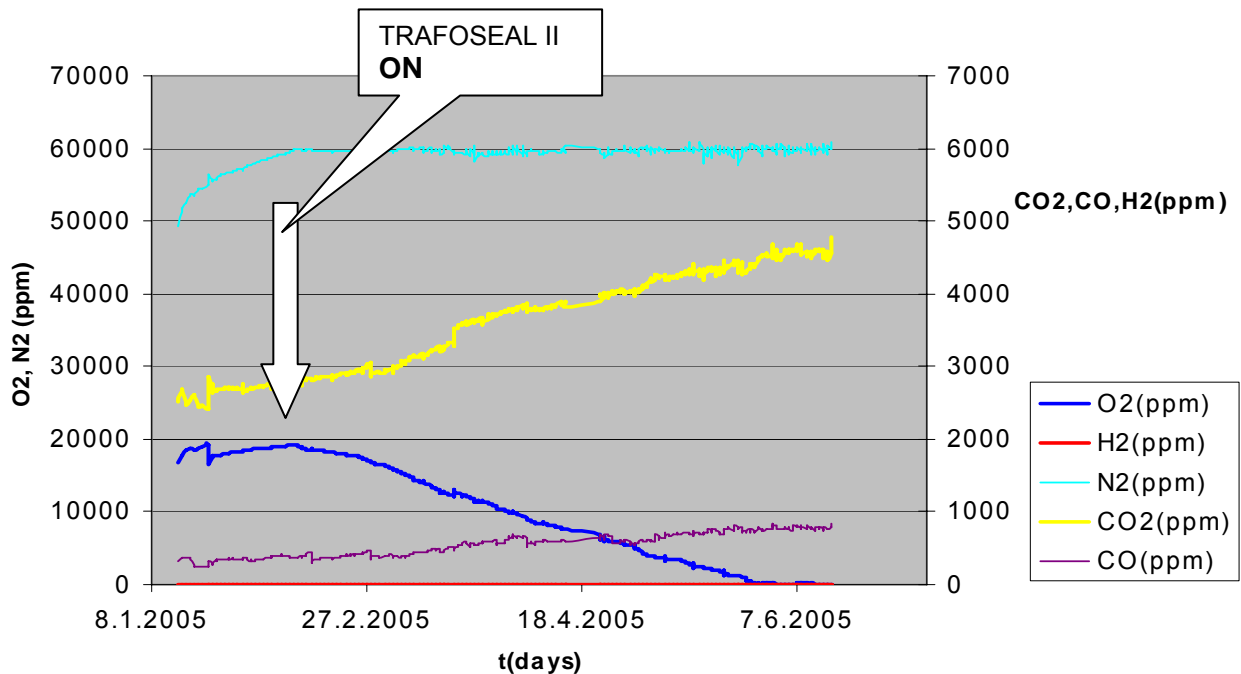


Fig.3. Dynamic of dissolved gases in oil of the main tank before/after switching the TRAFOSEAL ON.

After switching the TRAFOSEAL ON, the oil freely flows between the main tank, TRAFOSEAL tank, and conservator, but the inflow of air gases (O<sub>2</sub>, N<sub>2</sub>) into the main tank and simultaneously, the outflow of aging products (CO, CO<sub>2</sub>, H<sub>2</sub>) from the main tank, is effectively stopped and consequently:

- ⇒ the N<sub>2</sub>-level, which previously slightly increased, is now approx. constant. The N<sub>2</sub>, as an inert gas, represents an ideal marker of the intensity of the gas transportation process between the main tank and the conservator. The conclusion: the gas transport between the main tank and conservator is very low or non-existent now.
- ⇒ because oxidation processes inside a transformer steadily consume the oxygen then, due a very low entry of the O<sub>2</sub> from the conservator, the O<sub>2</sub>-level in the main tank continuously decreases until the non-measurable level is reached (O<sub>2</sub>→0).
- ⇒ CO<sub>2</sub>- and CO-levels increase until the oxygen depletion, then (due to no or very low production), both levels remain constant.

The interpretation of the data is clear and straightforward:

### TRAFOSEAL stopped oxidation aging of the transformer

Moreover, the TRAFOSEAL is constructed of permanent materials and requires no maintenance, no supervision, no moving parts, and will outlive the transformer.

To better understand the function of a TRAFOSEAL II See – [www.ars-altmann.com](http://www.ars-altmann.com) /Product Range/ TRAFOSEAL/Technical Specification – Dynamic Animation.

The intellectual property corresponding to a TRAFOSEAL sealing method of power transformers cover patents e.g. US 7,122,075, CZ 292 922, or CZ 289 115.