

TRAFOSEAL

ARS-ALTMANN



The vertical tank of the TRAFOSEAL II

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What is a TRAFOSEAL ?

The patented TRAFOSEAL conservator – main tank sealing principle represents a new art in the hermetization 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), which is created naturally in the TRAFOSEAL tank by the temperature differential between hot and cold oil**.

This thermal stratification layer acts as a very thin horizontal, virtually undestructible natural „membrane“ which separates the **hot oil** in the upper part of the TRAFOSEAL tank and the **cold oil** in 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.

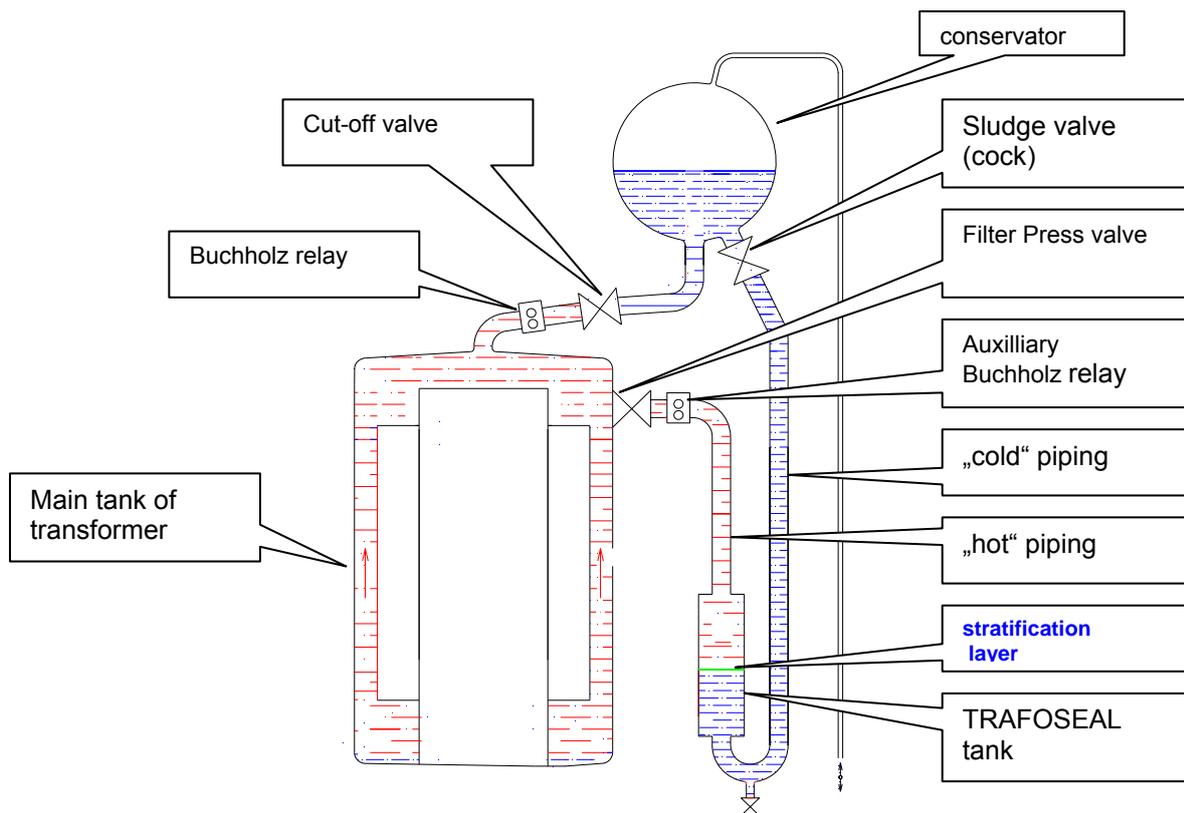


Fig.1 Schematic design of the TRAFOSEAL II for the retrofit (sealing) of the transformer.

Under normal operational conditions, the temperature of the oil in the transformer main tank varies, causing the oil to expand and contract accordingly. As the **temperature rises**, oil moves gradually from the main tank into upper part of the TRAFOSEAL tank, **the thermal stratification layer moves downward** and the cold oil from the bottom part of the TRAFOSEAL tank is displaced into the conservator. Then, as the transformer **temperature decreases**, the oil volume in the main tank decreases the cold oil from the conservator flows into bottom part of the TRAFOSEAL tank causing the **upward movement of stratification layer**.

Under normal operational 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 hermetization of a transformer are quite obvious especially if compared with present transformer hermetization methods:

- no mechanically moving parts and no „consumable“ items (as supply of N₂)
- no potential leaking / replacement of „hermetization“ element (as with Bag-In-Tank)

- no strong pressure changes in main tank due temperature variations (as with „flexible walls“ hermetization), 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/hermetization System is applicable to any type and size of power transformers.

Heavy 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 oil inventory of the main tank and sunsequently the intensity of a oxidation ageing of the cellulose (and oil) and significantly prolongs the service life of the transformer.

The TRAFOSEAL retrofit of a free breathing transformer is very easy. Generally, no substantial modification of the main tank or the conservator is necessary because two required connecting points are usually standard equipment of the main tank and conservator (Filter-Press Valve + sludge valve).

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

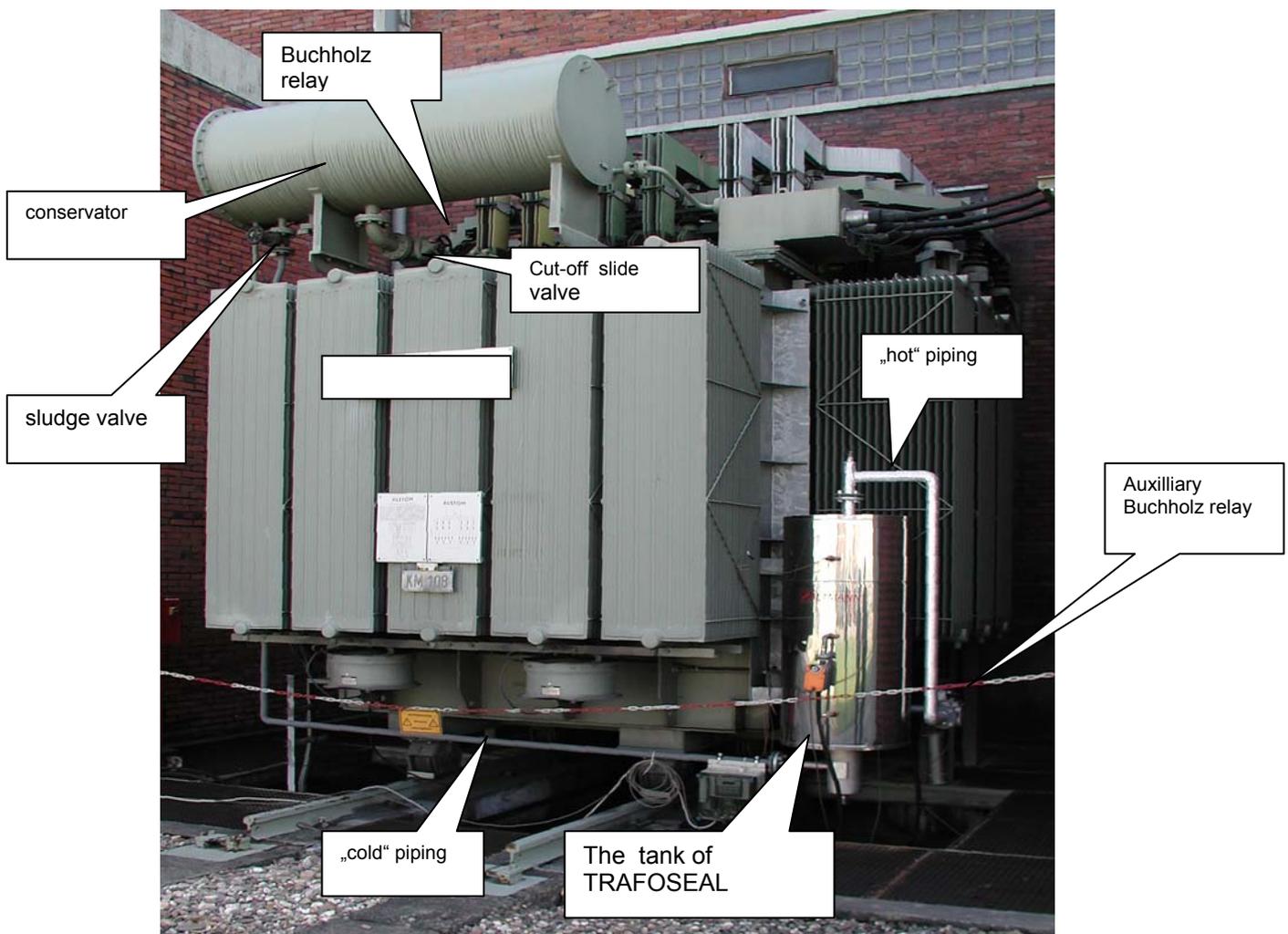


Fig. 2 The standard retrofit of the 17MVA furnace transformer using the vertical TRAFOSEAL tank

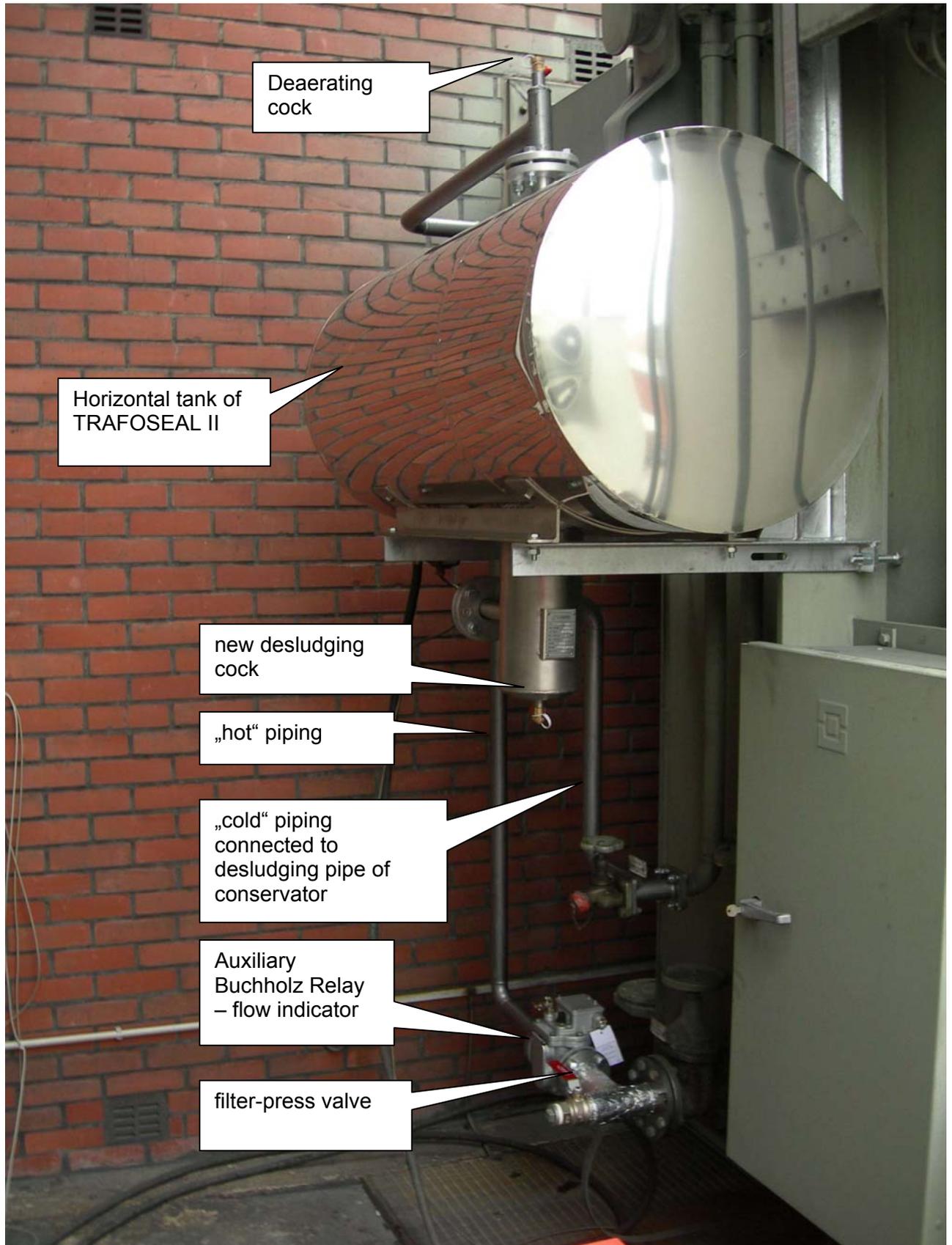


Fig.3 The horizontal version of the TRAFOSEAL II - the retrofit of the 63MVA transformer.

Verification of the TRAFOSEAL function

Verification of the function of the TRAFOSEAL was performed on a 17 MVA furnace transformer with an aprox. constant load.

Automatic on-line chromatography (DGA) device TGM (Gatron) analyzed the oil in the transformer main tank twice per day.

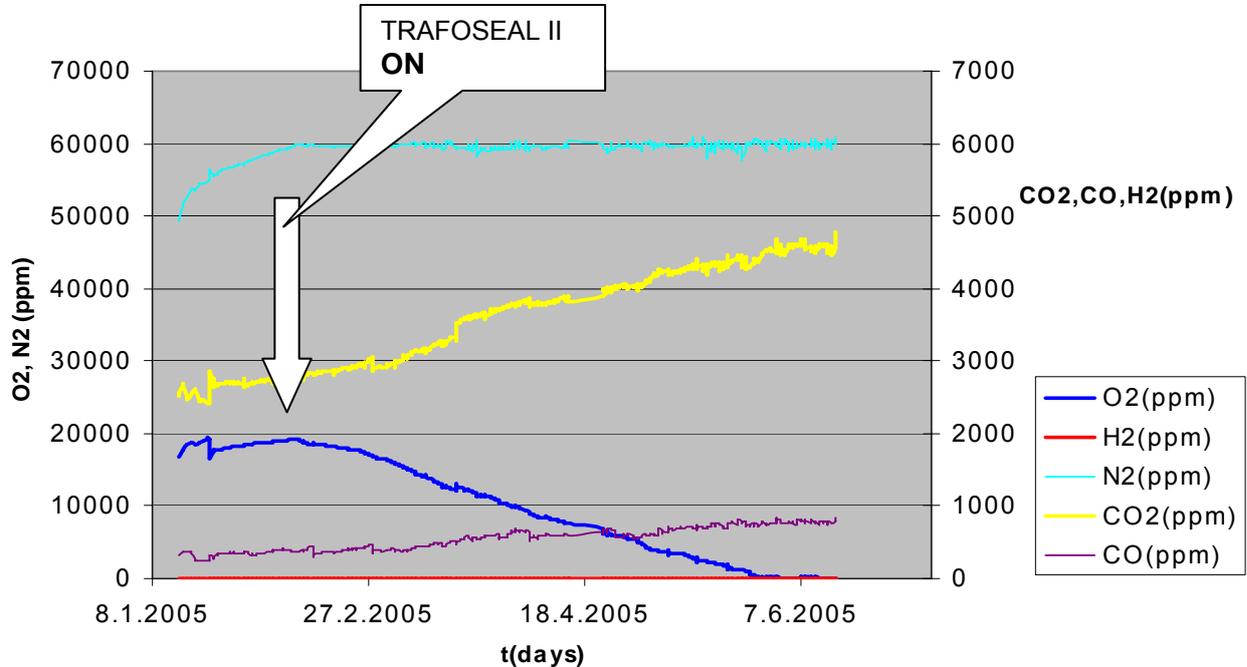


Fig.4. Dynamic of dissolved gases in oil of the main tank before / after switching the TRAFOSEAL ON.

After switching the TRAFOSEAL ON, the inflow of air gases (O₂,N₂) into the main tank and simultaneously, the outflow of ageing products (CO, CO₂, H₂) from the main tank, is effectively stopped and consequently:

- the N₂-level which previously slightly increased, is now approx. constant. The N₂ is an inert gas and therefore an ideal marker of the intensity of the transportation process between the main tank and the conservator. The conclusion - the free oil throughflow between the main tank and conservator is very low or non-existent now.
- the oxygen is steadily consumed by oxydation processes in the transformer then, due present very low entry of the O₂ from the conservator, the O₂-level in the oil of the main tank continuously decreases until non-measurable level is reached (O₂→0).
- CO₂- and CO-levels continue to increase untill the oxygen is completely depleted, then due no or very low production, both levels remain relatively constant.

The interpretation of the data is clear and simple:

TRAFOSEAL stopped oxidation ageing of the transformer

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

For the better understanding and a deeper insight in the function of a TRAFOSEAL II See – www.ars-altmann.com /Product Range/ TRAFOSEAL/Technical Specification – Dynamic Animation.

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

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