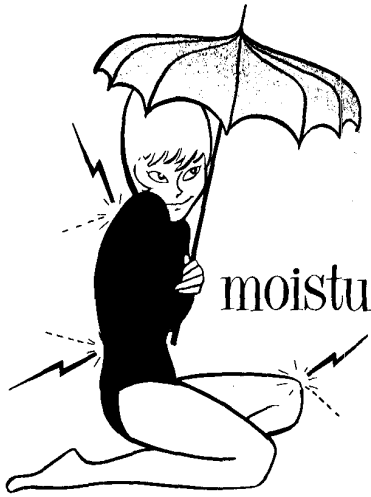


DESIGN DETAILS FOR

moisture protection

OF LIQUID INSULATION TRANSFORMERS

Oil-type and askarel type transformers share a common need: the necessity to be kept dry. The "breathing" of the air-space above the liquid insulation and condensation inside the shell from temperature changes represent potential sources of moisture contamination of the insulation.

As the manufacturer of askarel transformer fluids, Monsanto has an important interest in the satisfactory operation of askarel transformers. A well-designed (or maintained) askarel type transformer is most highly dependable and should give a minimum of 30 years of trouble-free* service. And, in addition — askarel transformers are fire safe, minimize insurance rates, require the least-expensive installation-site preparation, and can be placed close to electrical usage points, thus reducing costs of distribution systems.

Whether askarel transformers are used indoors or outdoors — the major maintenance checkpoint to assure virtually trouble-free operation is possible contamination of the inside of the shell by *moisture.* (This is true for oil-type, too!)

In already-installed transformers, there are a number of inexpensive devices available from the transformer manufacturers to minimize and control possible moisture entry. In purchasing new askarel (or oil) transformers, the following relatively minor "design features" will greatly minimize or eliminate possible moisture entry. These have worked dependably for many years and are considered the simplest, least costly and most practical. They can be specified to any transformer manufacturer when procuring new equipment.

*Transformer manufacturers report askarel type transformer failure rate over the past two decades is the lowest of any type; average less than one-half of one per cent. The last-issued report (1956-58) of Edison Electric Institute and member utilities shows a failure rate of only 0.13 units per hundred banks per year. Maintenance attention and breakdown can be virtually eliminated by following design suggestions to protect against moisture contamination.

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design tips

TO CONTROL MOISTURE ENTRY INTO ASKAREL (OR OIL) TRANSFORMERS

cover: Weld the entire transformer cover onto the body of the transformer — thus avoiding use of a gasket.

gasketing: Use the proper gasketing for removable hand-hole openings.

For maximum stability and fit, place the gasket in a recessed groove. Fine grain cork impregnated with nitrile rubber is suggested for gaskets. This type material is designated as NC757 by Armstrong Cork Co., Lancaster, Pa., and as M3150 by Wolverine Mfg. Co., Inkster, Mich. Suitable cement for this gasketing is dewaxed orange shellac, pigmented with iron oxide (available in pint size from Westinghouse, Sharon, Pa., Style No. 1150419).

Nitrile rubber is sometimes used to seal the hand-hole. Because it is slowly attacked by askarel, this gasket must be recessed to allow minimum contact.

Teflon, DuPont's Viton and most silicone "rubbers", while relatively expensive, warrant consideration for long term use requirements, at least for the smaller size gaskets.

fins: Weld all fin connections.

connections: Weld all major instrument or pipe connections. For incidental taps or nipples — **above** liquid — wrap with Teflon tape: **below** liquid, seal threads with askarel-resistant cement, such as Westinghouse 6707-3 (a shellac base with special rubber filler).

bushing connections: The most satisfactory bushings will be the type with rolled-on flanges with two ring seals rolled into a depression in the porcelain and sealed with silicone rubber rings held under compression. Metal-to-glass or metal-to-porcelain sealed bushings are also satisfactory.

Bushings on smaller sized transformers (around 100 KVA) can be sealed with cork-nitrile rubber composition.

nitrogen blanket: Blanket the space above the askarel with dry nitrogen. If the transformer has so many leaks that pressure will not hold — then bleed in a small amount of nitrogen steadily. Otherwise, "modernize" by welding.

Another approach to "designing out" moisture contamination: call for a "conservator" attachment so that the transformer shell is **completely filled** with the askarel. This eliminates the breathing of the air space. The liquid askarel level in the "conservator" is higher than the transformer cover; any water that would "seep" into the shell floats to the surface of the askarel in the conservator!

drying breathers: Transformers not hermetically sealed, and designed to allow breathing, should be fitted with a drying breather containing silica gel or anhydrous alumina.

A detailed description of this drying arrangement for mineral oil units is contained in the booklet "Activated Alumina Maintenance Program" (1955, Aluminum Company of America, Pittsburgh, Pa.). This approach is also suitable for askarel transformers.

To keep power factor as low as possible and resistivity as high as possible, hang a container of anhydrous alumina in the circulating system of the transformer (askarel as well as mineral oil units).

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