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INTERNATIONAL ELECTROTECHNICAL COMMISSION

TECHNICAL COMMITTEE No. 10: LIQUID AND GASEOUS DIELECTRICS

SUB-COMMITTEE 10B: INSULATING LIQUIDS OTHER THAN HYDROCARBON OILS

Comments of the Italian National Committee on Document 10B(Secretariat)19: Guide for acceptance and maintenance of transformer askarel in equipment

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The Italian Committee finds the document generally acceptable but considers that an extensive revision is necessary in line with the following comments:

General

1) The document should only be intended to give guidance on the assessment of the condition of the fluid in askarel-filled transformers and on the means to be used to restore satisfactory properties. It is not intended to set rules for the acceptance of askarels supplied in new transformers.

   For this reason, the title and the text of various clauses require modification to remove this implication.

2) On account of the mixability of askarel with petroleum oils and the practical impossibility of removing such contaminants, it is recommended to emphasize the requirement that pumps, valves, piping and every equipment used in handling askarel should be thoroughly free of oil and greases. The adverse effect of petroleum oils on the fire resistance of askarel should also be mentioned.

3) It is suggested that a new clause should be added dealing with topping-up of askarel-filled transformers (mixability of different types of askarel, treatment of fluid before filling-in and so on).

Technical

Clause 1 - Introduction

In the 2nd paragraph, line 5, delete "and toxicological".

Clause 2 - Askarel general characteristics

The 2nd paragraph should be replaced by the text of Sub-clause 5.8 of Document 10B(Secretariat)21.

The two last sentences of the 4th paragraph on page 2 should be deleted. In fact the dielectric strength of any liquid dielectric of technical purity is not a basic property of the material but primarily depends upon its dryness and cleanliness.

Clause 3 - Evaluation of askarel received in new equipment

The wording of the 3rd paragraph is not consistent with the terms of reference of SC 10B. The following wording is proposed:

"Askarel contained in new equipment and exhibiting the following characteristics is considered satisfactory".

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Assigned value for breakdown voltage (IEC Publication 156) should be 50 kV minimum.

There are serious doubts as to whether the limiting value of loss tangent and the general statements in the penultimate paragraph can be accepted as they stand. A value of 0.10 at 25 °C is certainly indicative of contamination (see also the limits proposed in Document 10B(Secretariat)22) and possible effects on the serviceability of the fluid may be dependent on design and operational factors. A limiting value of 0.30 at 90 °C, 50 Hz is closer to our experience for voltage ratings of up to 20 kV and should tentatively be inserted. The limit should be further reduced as voltage rating increases.

Clause 4 - Classification of service aged askarels

It is considered that, in spite of the obvious difficulty to set limits applicable to all circumstances, some efforts should be made to develop basic principles on which to rely for the classification of a given askarel into one of the listed groups.

Clause 7 - Askarel tests and their significance

The following changes are considered to be necessary in the list of properties and test methods on page 5:

Item 1	: Delete ASTM D-2129.
Item 2	: Replace "electric strength" by "breakdown voltage".
Items 7 and 9	: Reference should be to IEC Publications 250 and 247.
Item 8	: Delete ASTM D-1807.
Items 10 and 11	: Reference should be to IEC Publication 296A (1971).
Item 14	: ASTM D-1808 is rather troublesome. Infrared spectroscopy affords easier and safer detection and determination of hydrocarbons in askarel.

With regard to test significance, the following amendments are suggested:

Electric strength: 6th line, delete "dissolved contaminants".

Inorganic chlorides: Replace "ionizable" by "inorganic".

Dissipation factor: Line 6, delete "moisture". The 3rd sentence should also be deleted.

Resistivity: The SI unit for resistivity is ohm.m.

Clause 8 - Testing procedures

In section B the following tests should be added to the list:

"8) Viscosity

9) Volume of oil".

Clause 9 - Reconditioning and reclaiming

The use of a filter-press is often troublesome because of fluid leakages and volatility of askarel at 60 °C. A sealed cartridge filter incorporating a 15 cm layer of finely-divided (0.06 to 0.10 mm) activated (20 h at 200 °C) alumina was found to be free of the above difficulties and effective in removing moisture, suspended particles and dissolved contaminants from contaminated askarels.

Clause 10 - Handling materials

The suitability of materials to be used in contact with askarels can be tested with the method described in Document 10B(Secretariat)22 and this should be mentioned.

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In the 3rd paragraph delete the reference to mineral oil.

Greater emphasis should be given to the last sentence of the clause, which should form a separate paragraph.

Clause 13 - Recommended handling procedures

The statement that no gloves should be used is in conflict with Sub-clause 7.3 of Document 10B(Secretariat)21.

The information given in the opening sentence of the 2nd paragraph would be improved by indicating the maximum permissible concentration of askarel vapours in ambient air (1 mg/m^3 per 8 h exposure).

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