



Pyranol® Insulating Liquid

INTRODUCTION

Pyranol insulating liquid is an askarel which has been compounded to General Electric Company specifications and contains polychlorinated biphenyls (PCB's). **Care should be taken to prevent any entry of this material into the environment through spills, leakage, use, disposal, vaporization or otherwise.**

Materials that are unaffected by Pyranol have been selected for use in constructing Pyranol transformers and no substitutes should be made for these materials without the approval of the General Electric Company.

These instructions contain certain excerpts from NEMA Publication No. TR-P6-1973 and/or ANSI standards C107.1 concerning techniques for handling and disposing of askarels and askarel-contaminated materials. For further information on this subject the user is referred to the latest revisions of these publications.

SAFETY PRECAUTIONS

Based on a long period of safe industrial usage, it is generally thought that exposure to Pyranol is relatively harmless to humans. However, it is still recommended that exposure be held to a minimum.

VAPORS

Breathing of concentrated vapors in poorly ventilated areas or of fumes from heated Pyranol should be avoided. High concentrations of vapors can cause irritation of the eyes, nose, throat and upper respiratory tract.

CAUTION - Hydrogen chloride gas is formed when Pyranol is decomposed by an electrical arc. Although a scavenger is added to chemically neutralize any of this gas dissolved in the liquid, some free gas may be present. This gas is an irritant and the inhalation of large quantities can be dangerous and harmful to personnel. The

presence of hydrogen chloride gas even in small quantities is readily detectable by its strong odor and irritant action on the nasal membranes. Should anyone be exposed to a quantity of this gas, immediately escort him to fresh air.

If exposure to high concentrations of Pyranol or its arced products is necessary under emergency conditions, an approved gas mask of the organic canister-type or self-contained breathing apparatus must be worn. Such exposure should be under the surveillance of other personnel capable of rescue in case of accident. If the odor of Pyranol or its arced products is detected by the person wearing protective equipment, he should immediately go into fresh air. All gas masks, respirators and replacement parts should have Bureau of Mines approval and be maintained on a regular schedule in accordance with the manufacturer's recommendation.

LIQUID

Unlike mineral insulating oil, there is no fire hazard in handling Pyranol. A limited solvent action (similar to that for paint thinner) on the fats and oils of the skin with prolonged contact may lead to drying and chapping of the skin. As with insulating oil, some people are allergic to Pyranol and continued exposure may result in skin irritation. Both the liquid and vapor are moderately irritating to eye tissue.

Operating procedures should require avoidance of contact with Pyranol. The use of porous gloves which can absorb and retain Pyranol is to be avoided. Resistant gloves and aprons of the neoprene, polyethylene, viton type should be used if contact is unavoidable. In case of spillage on the clothing, the clothing should be removed as soon as practical, the skin washed and the clothing laundered.

Medicinal washes or mild detergents followed by the application of cold cream will reduce the irritation resulting when Pyranol comes in contact with an open cut or abrasion.

Safety glasses with side shields or a face shield should be worn when handling Pyranol. Eyes which have been exposed to the liquid should be irrigated immediately with large quantities of running water for 15 minutes and then examined by a physician if the irritation persists. (A drop of castor oil has been found to reduce irritation.)

Persons developing a skin irritation or respiratory tract irritation while working with Pyranol should be placed under supervision of a physician.

Ingestion or swallowing of Pyranol is not generally regarded as a problem of the industry. Should accidental ingestion occur, a physician should be consulted. Hands should be washed with warm water and soap before eating, drinking, smoking or using toilet facilities.

RECEIVING, HANDLING AND STORING

RECEIVING

Immediately upon receipt of a Pyranol-filled transformer or shipping drums containing Pyranol an examination should be made for leaks. If leakage is evident either at this time or at any time thereafter, the cause should be corrected and the spillage soaked up with absorbent materials such as sawdust or fuller's earth, followed by a clean-up of the affected area with rags soaked with kerosene or other approved solvent such as perchloroethylene or trichloroethylene. All materials used should be collected for proper disposition as described under "Disposal".

HANDLING

On those infrequent occasions when the Pyranol is removed for shipment, the transformer will be shipped gas filled and is to be liquid filled at installation. (Refer to separate installation instructions for filling procedures.) If the transformer is located outdoors, adequate precautions must be taken to insure that no dirt or moisture enters

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

the Pyranol during the filling operation. Before opening a container of Pyranol allow it to stand until the liquid is at least as warm as the surrounding air.

Before placing the Pyranol in the transformer take a sample from each container and make dielectric test as outlined under "Sampling" and "Testing". If the tests are unsatisfactory, restore the dielectric strength before placing the Pyranol in the transformer. When transferring from containers to the transformer it is recommended that the liquid be passed through a filter press to remove any undetected moisture or sediment which may be present.

Pyranol must be handled in containers, pipes, all-metal hoses, etc., which are free from oil, grease, pitch, or other foreign materials, since these contaminate the liquid and decrease its nonflammable properties. All apparatus used in sampling, filtering, storing, or transporting Pyranol must be maintained for exclusive use with Pyranol, since it is extremely difficult to remove all traces of oil or other Pyranol contaminants from equipment of this type. Also, mineral oil is completely miscible in Pyranol, and it is practically impossible to separate the two liquids after they have been mixed.

All-metal hose must be used in handling Pyranol since rubber and rubber-lined hoses are dissolved by Pyranol. This is also true of synthetic rubber hose.

Use kerosene or other approved solvent to remove all traces of Pyranol on the outside of the transformer tank. This precaution should be taken since Pyranol has a tendency to soften the paint. Examine the external surfaces of the transformer at intervals to see that the paint is unharmed. If places are found where the paint has been attacked, thoroughly clean the surface and repaint with a good grade of durable paint recommended by the General Electric Company. All Pyranol-contaminated materials are to be collected for proper disposition as outlined under "Disposal".

Shipping Notice

Whenever any Pyranol-filled transformer or shipping drum is placed in transit it should be identified with a prominent label containing the following warning or words to this effect:

NOTICE TO CARRIER

**CAUTION - YOU ARE HANDLING
A TRANSFORMER (OR DRUMS)**

FILLED WITH PYRANOL INSULATING LIQUID. THIS PRODUCT CONTAINS POLYCHLORINATED BIPHENYLS (PCB'S). CARE SHOULD BE TAKEN TO PREVENT ITS ENTRY INTO THE ENVIRONMENT. IF A SPILL OR LEAK DOES OCCUR NOTIFY THE PROPER FEDERAL AND STATE AGENCIES IMMEDIATELY.

STORAGE

Shipping drums should be stored indoors in an area especially selected for this purpose. A curb should enclose the area to provide a basin for containing the Pyranol from one or more drums should they become damaged. The area must not have a drain which is connected to a sanitary or storm sewer.

If necessary to store drums or cans containing Pyranol outdoors, protect the containers from the weather and direct contact with water. Regardless of location, all drums should be stored in a position which results in the bungs being under a positive pressure. Do not open a drum or can until the Pyranol is actually needed. Any change in temperature while the containers are open will cause an exchange of air with the possibility of moisture entering the Pyranol. Partially emptied drums must be tightly resealed and stored in the same manner as above.

PERIODIC INSPECTION

The insulating liquid must be maintained at the proper level (see nameplate) and for the longest possible service life of the transformer, the dielectric strength of the Pyranol should be maintained at a high value. It is recommended, therefore, that the liquid be sampled and tested after the first few days of operation, again after six months, and yearly thereafter. Keep accurate records of the tests and filter or replace the liquid as indicated.

The entire transformer should also be thoroughly checked for leaks at these same intervals.

SAMPLING

Pyranol samples should be taken in a manner to avoid any contamination of the environment. All rinsings and contaminated materials should be collected in suitable containers for disposition as outlined under "Disposal".

The accuracy of test data can be seriously affected by improper sampling. In order to obtain consistent results it is recommended that the methods outlined in the following paragraphs be observed.

Strict attention should be given to the cleaning and drying of sampling and testing receptacles. Samples should be taken when the insulating liquid is at least as warm as the surrounding air to avoid the possibility of moisture condensation. If the transformer or drum is outdoors, the sample should be taken on a clear day with precautions being taken to guard against contamination by windblown dust, etc. Observe the following procedure to obtain consistent results from samples taken either for field or factory tests.

SAMPLING FROM TRANSFORMERS

1. Impurities which tend to affect the dielectric strength of Pyranol will generally be found at the top and therefore the sampling valve is located on the side of the tank about one inch below the 25C liquid level.

2. Samples should be collected in one quart, small neck, brown glass bottles with foil lined screw caps. If desired, glass sampling bottles may be obtained from the General Electric Company as explained under "Testing Service."

3. To clean the bottles, rinse with non-leaded, oil-free gasoline. Then wash with strong soapsuds, rinse thoroughly with distilled water, and dry in an oven at 105C to 110C for at least 8 hours. After drying, the bottles must be tightly sealed. Store them in a dry, dust-free cabinet or compartment.

4. Carefully clean the sampling valve or plug and allow enough insulating liquid to run out to remove any moisture or foreign matter which may have collected.

5. Rinse the bottle carefully, at least three times, with small portions of liquid drawn from the sampling valve. Allow the sampling bottle to drain thoroughly between rinses.

6. Draw a sample into the bottle, leaving sufficient air space to allow for possible expansion of the liquid. Reseal the transformer and carefully seal the container to prevent exposure to the atmosphere.

7. When making repeated samplings, observe the transformer liquid level and add make-up as required.

SAMPLING FROM DRUMS

1. Drums should remain undisturbed for at least eight hours before being sampled.

2. Glass thieves should be cleaned,

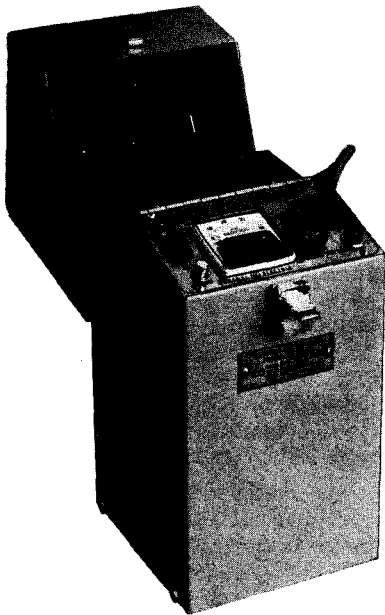


Fig. 1 Typical portable dielectric test set

dried, and stored in the same manner as outlined for bottles.

3. Take the sample from the top of the drum, observing the precautions previously outlined.

TESTING

Field and laboratory test samples, washings, etc., should also be collected for proper disposal. Prior to testing, the sample should be examined visually for the presence of moisture, either in the form of separate droplets or as a cloud dispersed throughout the Pyranol, and for particles of insulation, evidence of carbonization, etc.

DIELECTRIC STRENGTH

A variety of high-voltage dielectric testing equipment may be purchased from the General Electric Company. A typical portable test set (Model No. 9T11Y8454) is shown in Fig. 1 and various console models are also available. Follow the technique specified by the American Society for Testing and Materials, Designation: D877. The following paragraphs give a general outline of the procedure.

1. Set the spacing of the 1-inch diameter electrodes at 0.100-inch.

2. Wipe the test cup and electrodes clean with dry, calendered tissue or clean, dry chamois and thoroughly rinse with non-leaded, oil-free, dry gasoline.

3. Fill the test cup with dry gasoline and make a breakdown test under

standard conditions of voltage application (3kV per second rise). If the cup has a dielectric strength above 25 kV, it is considered suitable for testing purposes. Observe the usual precautions in handling gasoline.

4. Immediately after the final rinsing with gasoline, rinse the test cup with the sample under investigation, and proceed with the test at once.

5. The temperature of the sample when tested should be the same as that of the room, which should be between 20 C and 30 C (68 F and 86 F). Tests made on samples above this temperature can be misleading. Under no circumstances should the test cup be colder than the sample being tested.

6. Agitate the sample gently before each filling to prevent variations in results due to a settling of contaminants. Pour the liquid into the receptacle slowly to avoid the formation of air bubbles and fill to overflowing. If air bubbles are present, gently rock the test cup a few times and wait at least 3 minutes before applying voltage.

7. Fill the cup at least five times, making one test per filling, and average the results.

Since the Pyranol is a major portion of the insulation system in the transformer, its dielectric strength should be maintained as high as possible. A low breakdown voltage is an indication that impurities such as moisture, conducting dust, lint, or carbonized particles have entered the liquid. Pyranol testing lower than 26kV (30 kV when new) should either be filtered to bring it back to its original condition or be replaced, depending on the condition of the liquid and economic considerations. Under normal operating conditions values of 30 kV and above can be maintained.

FIELD TEST FOR MOISTURE CONTENT

The following field test can be used to detect the presence of excessive amounts of moisture in the insulating liquid:

1. Obtain a sample of the insulating liquid when the transformer is at operating temperature. (Preferably above 40 C.)

2. Starting with the hot sample, rinse a clean, dry test tube with the liquid to be tested, fill half full and stir continuously with a centigrade thermometer while cooling to approximately 20 C. Cool as much as possible in the ambient air and complete the cooling by momentarily dipping the test tube

in an ice bath, removing and stirring and then redipping, etc.

3. Observe the sample carefully and note the temperature at which initial cloudiness appears. Wipe the outside of the tube with a clean rag or paper towel to facilitate observation of the slight moisture cloud that may form. Compare to clean insulating liquid at ambient temperature in a similar tube if necessary. Examination for the presence of a cloud should preferably be made against a dark background and not directly into the sunlight.

4. If cloudiness appears at 20 C or above, high to excessive moisture content is indicated.

A. Inspect the unit for free water on the surface of the Pyranol.

B. If free water is not present, a sample should be forwarded to the Laboratory for a quantitative analysis and recommendations on treatment of the unit. See "Testing Service."

5. If cloudiness does not appear until the temperature is below 20 C, an acceptable moisture content range is indicated.

6. This field test for moisture should be regarded as a rough test only and if there is any reason to question the condition of the insulating liquid, a sample should be sent to a laboratory for an accurate analysis.

TESTING SERVICE

Where suitable equipment and qualified personnel are not available for conducting the necessary tests, the user may wish to avail himself of the following testing service offered by the General Electric Company. This service includes preparation of the sample bottle, laboratory analysis, report of test results and recommendations on continued use or treatment.

Upon receipt of an order through one of its apparatus Sales Offices, the Company will furnish the required one-quart sample bottles. These will be cleaned and dried at the factory and to insure dryness will be shipped containing a small desiccant which is to be discarded prior to sampling. Since reliable tests are dependent upon reliable samples, the sampling procedures described under "Sampleline" and on the bottle itself should be carefully observed.

Return sample containers to the Laboratory, Medium Transformer Pro-

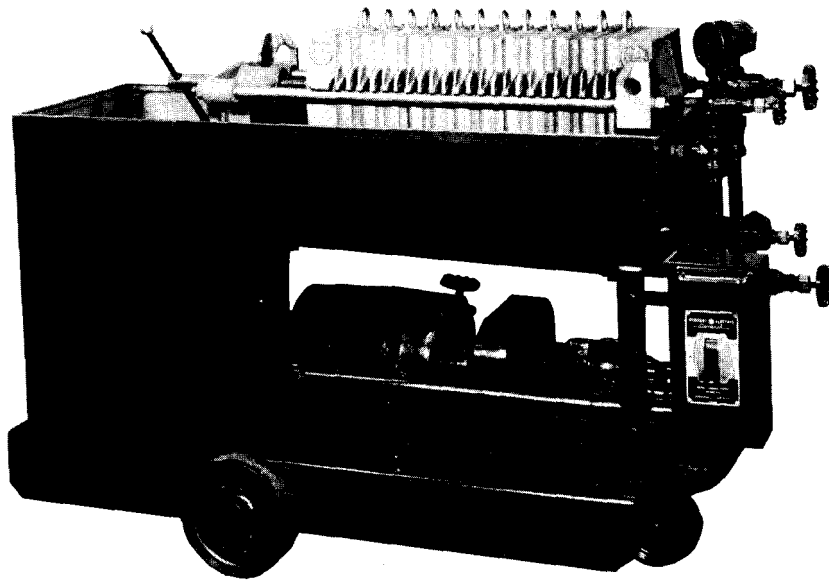


Fig. 2 Typical Pyranol purifier

ducts Department, General Electric Company, Rome, Georgia 30161. Pack these samples carefully to avoid breakage in transit. Recommendations for continued use or treatment will be furnished based on the following tests conducted in accordance with the indicated ASTM methods.

1. Dielectric strength, D877
2. Acidity, D974
3. Water content, D1533
4. Color, D2129
5. Condition (Visual), D1702
6. Scavenger content (when requested), D1701

Be sure to answer the questions on the sample bottle label. This information is essential if conclusions or recommendations are to be made concerning the sample. For further information concerning specific problems, consult the nearest apparatus Sales Office of the General Electric Company. If the Pyranol in question is known to be highly contaminated, transactions concerning sampling, testing, returning for reclamation or credit, etc., should be handled directly with the Monsanto Chemical Co., St. Louis, Missouri.

FILTERING

If test results indicate that moisture or other contaminants are present, they can usually be removed by passing the insulating liquid through a Pyranol purifier (Fig. 2). This device may be used either as a paper filter press for drying or with fuller's earth and paper for purifying. For details of

the filtering procedure refer to instructions GEH-1031, copies of which are available upon request. For information on drying and filtering equipment contact the nearest apparatus Sales Office of the General Electric Company.

When filtering or conditioning Pyranol, all of the precautions previously described for handling and disposal also apply to the filter papers, fuller's earth, etc. involved in this operation. See "Disposal".

Filtration can be accomplished in the transformer or other container by circulating the Pyranol from the top to the bottom through a filter press. However, this method is quite slow since the filtered Pyranol is continuously being mixed with the unfiltered. Filtering can be done faster and more efficiently by passing the liquid from the transformer, through the filter and into a separate, clean, dry container and then back through the filter again to refill the transformer. In this manner all of the Pyranol will be given two complete passes through the filter press. If additional filtering is still required, the entire procedure can be repeated.

The filter press will not remove large quantities of free water from the Pyranol. When a large quantity of free water is introduced into the filter it will be passed on through, emerging as finely divided droplets dispersed throughout the Pyranol. Therefore, if free water is present it should be removed before filtering is started. As moisture is extracted from the Pyranol during the drying process, the filtering medium will become wet. Frequent samples of the outgoing Pyranol should be tested

to determine when the filtering medium should be replaced.

NOTE - A scavenger has been added to the Pyranol to chemically neutralize any hydrogen chloride gas which may be absorbed by the liquid as a result of arcing. A portion of this scavenger may be lost during filtering operations, especially if the Pyranol is passed through fuller's earth. A test should therefore be made following filtering to determine how much of the scavenger has been lost and the quantity required to restore the Pyranol to its original condition. Laboratory testing facilities are available through the General Electric Company as outlined under "Testing Service."

A transformer contaminated with moisture may not only have moisture suspended in the insulating liquid, but may also have it in the windings and insulation. The most efficient temperature for filtering moisture from the Pyranol is between 20 C and 40 C, but at this temperature the transfer of moisture from the windings and insulation to the insulating liquid is quite slow.

If the dielectric strength of the Pyranol is still below 30 kV after filtering, consult the nearest apparatus Sales Office of the General Electric Company for additional information including possible recommendations on drying the entire transformer.

DISPOSAL

Disposal of Pyranol and Pyranol-soaked materials should be accomplished by means in which there is no significant release of Pyranol to the environment. Methods employed for this purpose include incineration of liquids and soaked software under carefully controlled conditions at very high temperatures and by controlled landfill burial of apparatus and other hardware. A number of commercial firms have established Pyranol disposal facilities of this type as indicated under "Disposal Services".

The ultimate disposal of a Pyranol-filled transformer may be accomplished by draining the Pyranol and then thoroughly flushing the interior with kerosene or other approved solvent such as perchloroethylene or trichloroethylene. After removal of the PCB's in this manner the transformer is to be dismantled with the burnable solids such as wood, cellulosic insulation, gaskets, etc. being set aside for proper disposal along with the accumulation of all liquids, washings, soaked rags, etc. The remaining metallic components

can then be handled as normal scrap.

Shipping drums should likewise be drained and flushed before being handled as normal scrap.

DISPOSAL SERVICES

In addition to the supervised dry landfill sites which may be used for the disposal of Pyranol-contaminated scrap, the following organizations may be contacted concerning use of their incineration and/or landfill facilities. These firms offer a variety of services at a number of locations and therefore

it is generally advisable to make several inquiries in order to determine which is best suited to handle a particular disposal problem. Specific disposal procedures, shipping instructions and cost should be discussed. Other firms may also offer suitable facilities from time to time so additional inquiries may be in order. If preferred, any of the General Electric Company Apparatus Service Shops may be contacted to serve as an intermediary. Known home offices and phone numbers include:

Chem-Trol Pollution Services, Inc.
4818 Lake Avenue

Blasdell, New York 14219
716*826-5850

Monsanto Company
800 N. Lindbergh Blvd.
St. Louis, Missouri 63166
314*694-3352

Nuclear Engineering Company
P. O. Box 146
Morehead, Kentucky 40351
606*784-6611

Rollins-Purle, Inc.
P. O. Box 3349
Wilmington, Delaware 19899
302*478-5150

**MEDIUM TRANSFORMER PRODUCTS DEPARTMENT
GENERAL ELECTRIC COMPANY
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