

JUNE, 1945

7 G. P. M.  
INERTEEN CONDITIONER

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INSTRUCTIONS

Inerteen Characteristics

Inerteen is a synthetic non-inflammable and non-explosive insulating and cooling liquid used in Westinghouse Inerteen Transformers.

Mineral oil is completely miscible with transformer Inerteen. It is practically impossible to separate mineral oil and Inerteen; therefore it is important to avoid contamination of Inerteen with any oil as the presence of such materials markedly changes the non-inflammable and non-explosive characteristics of Inerteen.

Inerteen is chemically stable. It is not affected by reaction with other materials used in the manufacture of Inerteen Transformers. It is non-oxidizing and non-corrosive at temperatures considerably above those normally obtained in transformers. Inerteen will not form sludge under any conditions.

Inerteen exerts a strong solvent action on most of the ordinary varnishes, gums and paints commonly used in oil-insulated transformers; therefore it is important to avoid contamination of transformer oil with Inerteen.

The dielectric strength of Inerteen compares favorably with and under average normal conditions will be found higher than that of transformer oil. The same precautions are necessary with Inerteen as are taken with transformer oil. Inerteen should be kept free of moisture, lint and dirt.

Inerteen No. 7336-8 contains an agent for neutralizing the hydrogen chloride which is evolved by an electric arc under Inerteen. Without this neutralizing agent hydrogen chloride under some conditions may be harmful to transformer insulation. Where doubt may exist as to the condition of the insulation, a sample of insulation and Inerteen should be shipped to Westinghouse Electric Corporation to determine if insulation is sufficiently affected to require replacing. During the time this determination is being made, the core and coils should be kept in a tank under Inerteen and the tank sealed.

JUNE, 1944

7 G. P. M.  
INERTEEN CONDITIONER

---

Inerteen has an irritating effect upon the skin. This is more pronounced to some persons than to others. Especially the eyes, nose and lips are affected when coming in contact with Inerteen and certain safety precautions must be observed when handling it. When working with the hands in Inerteen, it will irritate skin abrasions or the tender parts between the fingers. Continued exposure may cause skin eruptions with certain individuals due to absorption of the Inerteen through the pores of the skin. Cleanliness among workmen handling Inerteen is essential and a very good safeguard against such effects. An application of castor oil is recommended for the eyes and castor oil or cold cream for the nose and lips. In case Inerteen comes in contact with the skin, the part should be thoroughly washed and cleaned. A supply of these materials should be kept available at all times where men are working with Inerteen.

Hot transformers should not be opened except in well ventilated places. Large quantities of Inerteen should be handled in a closed system. Workmen should be protected from frequent contact with any appreciable vapor concentration and from frequent skin contact with Inerteen.

In case Inerteen is spilled on one's clothing, it should be changed as soon as possible and the soiled clothing laundered before it is worn again. Gloves, S#1184650, which are resistant to Inerteen, should be worn where it is necessary to put one's hand in Inerteen or where parts of transformers are handled wet.

#### Drying and Filtering Inerteen

A different procedure than that followed for oil is required to purify Inerteen. Contamination in Inerteen cannot be removed entirely by filter paper alone. To clean Inerteen thoroughly it must be filtered through "activated clay" which absorbs impurities. In practice, it is only necessary to pass the Inerteen through the clay and to separate the clay mechanically from the Inerteen to obtain clean Inerteen of proper dielectric strength.

#### The Inerteen Conditioner

The equipment recommended for conditioning Inerteen consists of an activated clay chamber and paper filter with suitable inlet and outlet connections and other necessary fittings.

JUNE, 1944

7 G. P. M.  
INERTEEN CONDITIONER

---

The activated clay is contained in a tank mounted on one end of the filter. The Inerteen is pumped up through the clay insuring thorough agitation of the clay and Inerteen. The Inerteen is passed through a wire screen prior to entering the paper filter to remove practically all of the clay.

The cover of the tank incorporates an air-trap and vent to avoid pumping air into the transformer which might result from a leak in the suction line. A strainer is provided on the suction side of the pump, so constructed that all dirt collected is removed with the screen. A by-pass connection fitted with a needle valve is used for testing the suction line from the transformer for leaks.

The paper filter consists of 18 frames and 17 plates alternately spaced mounted in a yoke. One sheet of blotting paper is used between each plate and frame to provide a gasket seal and to remove all traces of clay from the Inerteen.

A pressure gage indicates the operation and two by-pass valves assure safe operation of the Conditioner by preventing excessive pressures and serve as a check to overloading and stalling the motor. One valve, connected across the pump, is set to by-pass the Inerteen at a pressure of 60 to 70 lbs. per square inch. The other valve is provided on the discharge side of the Conditioner connecting to the transformer. This by-pass valve, releasing at a pressure of approximately 5 lbs. per square inch, will avoid breaking the transformer relief diaphragm when no other relief is provided.

These units are designed to operate under working pressures up to 60 pounds per square inch. However, the usual operating pressure is 30 to 40 pounds per square inch. If for any reason the pressure should increase to the order of 65 or 70 pounds, the pressure relief by-pass valve will operate and permit the pump to circulate the fluid freely. This feature prevents any possible damage to the pump due to excessive pressure. When excessive pressures are indicated on the gauge it means that the clay has the filter paper clogged and paper should be replaced.

The primary function of the Inerteen filter is to restore the dielectric properties of the inerteen. This function is accomplished through a catalytic action as the Inerteen flows through the activated clay. In addition to this the filter will also remove water and dirt from the Inerteen being reconditioned.

JUNE, 1944

7 G. P. M.  
INERTEEN CONDITIONER

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One charge of clay is composed of approximately 40 pounds of 15-30 mesh activated clay. This relatively large volume of clay makes only occasional changes of clay necessary, depending of course on the amount and condition of the Inerteen filtered. The coarse granulated clay used gives maximum surface contact between clay and liquid and makes possible a rapid and thorough mixing of the clay and Inerteen to accomplish complete reconditioning of the Inerteen as it passes through the clay tank. The clay granules are removed from the Inerteen by means of fine screen on the 3 g.p.m. filter and by screen and paper on the 7 g.p.m. filter.

The clay never passes through the pump to cause wear on pump parts and consequent loss of pumping capacity. As soon as the charge of activated clay is placed in the tank and the cover clamped in place, the unit is ready for immediate use.

Neither clay nor filter paper can be effectively dried after they have once become saturated with Inerteen. Therefore, extreme care should be taken to see that both clay and filter paper are thoroughly dried when placed in the filter.

The clay may be dried in a high temperature oven at 200 deg. C or below, and shallow pans are preferred as containers for the clay while drying. A paper drying oven may be used if a high temperature oven is not available, with a drying time extended to approximately twenty-four hours at the oven's highest temperature. The filter paper should be dried six to twelve hours at 85 to 100 degrees C depending on the condition of the paper and the spacing of the sheets in the oven. Both paper and clay should be placed directly in the filter after the drying process as either, if exposed, will absorb considerable moisture from the atmosphere in a very short time.

Each fresh charge of clay will absorb about 3 gallons of Inerteen. This should be provided for to prevent depleting the supply in the apparatus. Most of this Inerteen may be recovered when changing clay.

This can be accomplished most effectively by removing the used clay from the filter and placing it in a tank of approximately 30 gallons capacity containing about 5 gallons of water. The tank should have a drain valve at its bottom edge and should be tilted somewhat toward this valve. The clay thus placed in water, having a greater affinity for water, will give up the Inerteen it has absorbed and become saturated with water. The Inerteen being heavier than water will sink to the bottom; the clay and water will float on top. After setting for several hours, most of the Inerteen may be drawn off through the valve. This Inerteen may be refiltered and used again.

JUNE, 1944

7 G. P. M.  
INERTEEN CONDITIONERTo Prepare the Conditioner for Operation

Remove the cover and screen from the clay tank and fill the tank with activated clay, M-6934, to within four inches of the bottom edge on the inner flange. Replace screen and cover. Release the pressure-screw of the filter press and loosen plates and frames. Place one sheet of "B" size blotting paper between the face of each frame and plate. Care should be used to see that the holes through the plates, frames and paper are in proper alignment before the pressure screw is tightened. Close the discharge, tank by-pass, tank drain, suction and suction-test valves. Pour sufficient Iner-teen into the drip pan to fill the clay tank and wet the clay. This will require approximately eight gallons of Iner-teen. Start the motor and open the drip pan valve so that not less than 5 minutes are required to fill the clay tank, saturating the clay with Iner-teen. With the valve at the transformer closed, open the suction-test valve to subject the suction line to pressure and thus check it for leaks.

Since the density of Iner-teen is considerably greater than that of water, moisture will float on the surface of the Iner-teen. It is therefore considered advisable to condition Iner-teen from the top and return it to the bottom of the tank. To begin conditioning Iner-teen in a transformer, close the suction test valve and stop the motor. Open the transformer valves. Open the Conditioner discharge and suction valves. Close the drip pan valve and start the motor.

One charge of clay will condition approximately 3000 gallons of Iner-teen, depending upon the amount of contamination present.

When it is necessary to change the clay, first close the valve in the suction line, close the tank inlet and outlet valves, open the tank by-pass valve, the tank drain valve and the air vent valve to permit the free Iner-teen in the tank to drain into the lower drip pan. Open the drip pan valve and pump the Iner-teen from the drip pan through the filter press. Shut down the motor and remove the clay from the tank and refill with fresh clay as previously described.

To change the filter or blotting papers, stop the motor and close suction and discharge valves. Slowly back off the pressure screw, permitting the Iner-teen trapped in the frames to be released gradually. Then back off the pressure screw completely, open up the press and let the surplus Iner-teen drain from the papers. Replace the saturated papers by clean dry paper and re-tighten the press.

If the system-seal is not broken, it will only be necessary to open the discharge and suction valves and start the motor to again resume conditioning the Iner-teen.