Provac Systems offers a wide range of vacuum drying Autoclave to process transformers up to 800KV class.

**PROVAC Products Range:**

- **Vacuum Drying Autoclave Plant (VDP):** For Power Transformers, Distribution Transformers, Capacitor, CT & VT, Bushing, Coil Drying.
- **Vapor Phase Drying Plant (VPD):** For Power Transformers.
- **Transformer Oil Filtration Plant:** From 500LPH to 30000LPH.
- **Transformer Oil Handling System:** With Raw & Purified Oil storage tanks.
- **Heating Oven:** For distribution transformers using Gas fired, Electrical, Steam and Indirect thermic fluid.
- **Mobile vapor phase drying plant:** For site drying.
- **PLC Based Throttling Pumping System.**
- **Customised Vacuum Pumping System.**
- **Spares and accessories for Existing vapor phase drying plant:** Vacuum drying plants & Oil filtration plants.

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INTRODUCTION:

Electrical energy is the most convenient form of energy today and will remain so in the future. Well-functioning components/Transformers are an important prerequisite for this.

PROVAC SYSTEMS make Vacuum Process Plants for heavy duty Electrical insulation systems with these you will benefited...

- Only absolutely reliable insulation guarantees, the functional reliability of your product.
- Up to date technology including engineering, consultancy & commissioning
- Add a sensible profit – for security of your investment.

All system operates in the fine-vacuum range of 1 to 0.001 Mbar! As the 0.001 mbar is no problem for us that’s our daily work!

Our Experienced engineers are specialists in entire field of vacuum processing.

DRYING AND DEGASSING OF PAPER INSULATION OF TRANSFORMER:

The moisture contain of transformer insulation i.e. paper and its product (solid insulation and oil) plays a significant role in determining a transformer service life. If (every time) the moisture contain of the insulation doubles, the expected life of a transformer is cut to half. Paper is general consists 6-8% moisture of which a part of water condenses in or on the paper. Condensed water is readily separated in the usual temperature reached during drying with few a torr. With decreasing the pressure finally the absorbed water is separated. From the below curve shows one can reach water vapor pressure of 0.1 torr at temperature of 90 deg c in order to decrease the remnant moisture less than 0.3%.

![Graph showing partial insulation water vapor pressure vs temperature](image)

Graph shows partial insulation water vapor pressure / temperature for various insulation moisture contains.

Therefore it necessitate to dry the core and coil assembly by using heat / vacuum before tanking and filling the oil for the finished transformer.
1. VACCCUM DRYING PLANT:

For Power Transformers, Distribution Transformers, Capacitor, CT & VT, Bushing, Coil Drying.

Vacuum Drying Plant is designed for drying the transformer coils, core-coil assembly by applying heating and vacuum.

Active parts of the charge are heated under hot air circulation where in larger portion of the water in the transformer insulation is readily vaporized, this water vapor is removed by applying vacuum in the vacuum oven through vacuum pumping system, here the water vapor gets condensed inside the condenser and same is measured.

Intensive heating of the complete oven is ensured by tubular elements welded to outside, which are heated either by hot water, saturated steam or heat transferring oil or direct electric heaters fitted inside the vessel.

The vacuum oven can be designed in cylindrical or rectangular shape. The oven door can be opened and closed either sliding door horizontally by electric motor or chain or hydraulically from top side. The door can be clamped either manual clamps or by hydraulic clamping arrangement.

The complete process is controlled either by manually or fully automatically by means of the electric control panel provided with a freely programmable logic control or DCS.

The quantity of condensate water collected at vacuum pumping system is recorded at regular intervals. Insulation resistance, power factor and dispersion factor of windings are also monitored.
2. VAPOUR PHASE DRYING PLANT:

PROVAC make Vapor Phase Drying Plant is used for Drying Power Transformers & Distribution Transformers. The main difference between conventional vacuum drying and vapor phase drying is that, in the latter the heat carrier is vapor of low viscosity solvent with sufficient high flash point instead of air. Also vapor phase drying system have a evaporator, condenser system in addition to vacuum vessel & vacuum pumping unit, as shown in below schematic.

In vapor phase drying system, solvent vapors are sent into the vessel. The solvent vapors are at high temperature (Up to 125 Deg C) and the job is under atmospheric temperature. The vapor meets the job directly & the job gets heated. In the process vapors are cooled & get condensed. The latent heat is released which is utilized for job heating. Along with job insulation in job gets heated & the moisture in the insulation is converted into water vapor & condenses in solvent condenser together with solvent vapor.

High Lights of Vapor Phase Drying Plant:
- Shortest Possible processing time&Superior drying quality
- Low energy consumption&Fast investment return
- Self Optimizing process control system&Monitoring/recording of process data
- Regenerating aged/oily transformers&Minimum space requirement.

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Advantages of Vapor Phase Drying Plant:

- Most efficient method for power transformers from 100 MVA up to the top range.
- Energy saving due to shorter and more efficient drying method
- 50 – 70 % reduction of drying times & Less de-polymerization of insulation paper due to drying under vacuum
- Cleaning of the active part from old transformer oil during heating up and drying
- Less residual moisture in the insulation - compared to conventional drying (<0, 3%)

PROVAC technical team has contributed in development of vapor phase drying plant having more than two decades of expertise in the process. Vapor Phase Drying process comprises of following process:

Evacuation:
The vacuum vessel, evaporator & condenser system are evacuated up to 7 mbar by means of vacuum pumping unit.

Heating –Up with intermediate pressure reduction phases:
In this phase three way control valve is used to regulate the vapor temperature for maximum job temperature of 125 Deg C. based on the weight of insulation total heating cycle can split into 4 to 8 intervals & desired heating temperature is achieved with intermediate pressure reduction phase.

Pressure reduction Phase:
In this phase solvent vapor supply is stopped. The solvent absorbed in the insulation evaporates and is fed back in the condensation system. Simultaneously in this phase, distillation process can be carried out to remove transformer oil which is mixed with solvent.

Fine Vacuum:
After completion of evaporation and condensation process, start the fine vacuum process. Vacuum pumps should continue to start until steady and end pressure of 0.1 to 0.2 mbar reaches at this pressure the drying process is normally completed.

Aeration Phase:
After confirmation of the process end through the operator, the autoclave is automatically aerated.

Supplementary equipment and features:
For the decision to terminate the drying process, the following features:
- Automatic measuring
- Automatic data recording

PROVAC offer VPD plants with Autoclave having maximum size of 6 mtr width x 6.5 mtr Height x 15 mtr length and evaporator capacity range from 200 to 500KW.
3. Transformer Oil Filtration Plant:

**PROVAC** make Oil filtration plant suitable for purification and filtration of insulating oils.

**APPLICATION:**
- PRO-VAC make single/double stage high vacuum transformer oil filtration plants are designed for purification of transformer oil, high voltage transformer oil, switch oil and other insulating oil.
- It is very suitable for power/distribution transformer, power grid and various companies which need to install and maintain oil immersed transformers.
- **Single /Double-stage, high vacuum and high flow rate** that helps remove water, air, gases, solid particulates and other impurities from oil quickly and efficiently so as to improve the breakdown voltage of oil and maintain its insulating property, the dielectric loss factor & insulation resistance.
- It is used filtration of transformer oil up to higher rating power transformers.

**FEATURES:**
- **Advanced dehydrating and degassing system** that uses large area of degassing packed column technique to remove harmful composition in the oil, such as water, air and gases.
- **Precise fine filtration system** helps remove mechanical impurities in oil; high-quality filter element is of corrosion proof, strong mechanical strength and wear resistance.
- **Safe and reliable heating system.** If there is no oil in the machine, the machine will stop automatically. This can protect the machine for operational errors.
- Safety thermostat is provided for additional safety to cut off all heaters in case of temperature sensor fails.
- A mobile/stationary oil filtration plant is used for transformer oil filling. It has hoses with flanged fittings, circulating pumps, vacuum pumps, oil filters and heaters to restore the used and in-service insulating oil to its required reconditioned in-service.

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• Following advanced separation technique is adopted in filtration plant.
  ● Magnetic separation technique to remove metallic particulates from oil
  ● Liquid film fine filtration technique to remove micro impurities from oil
  ● Vacuum degassing technique to break emulsion and remove water and light hydro carbon material

PERFORMANCE :
Considering the treatment of new oil with initial content of moisture up to 50ppm and 10% in volume of gas.

The average performance of PROVAC make POV-1 & POV-2 Series oil filtration Plants are :

Series POV1 - After the first oil pass
Residual moisture content approx. 10PPM | Residual gas content approx. 0.5%
Residual pressure in the degassing tower <= 5mbar

Series POV1 - After the multi oil pass
Residual moisture content approx. 5PPM | Residual gas content approx. 0.2%
Residual pressure in the degassing tower <= 1mbar

Oil dielectric rigidity better than 60KV according IEC specification

Series POV2- After the first oil pass
Residual moisture content approx. 5PPM | Residual gas content approx. 0.2%
Oil dielectric rigidity better than 60KV according IEC specification
Residual pressure in the degassing tower <= 1mbar

Series POV2- After multi oil pass
Residual moisture content approx. 2PPM | Residual gas content approx. 0.1%
Oil dielectric rigidity better than 60KV according IEC specification
Residual pressure in the degassing tower <= 0.5mbar

PROVACoil purifiers offered as stationary, mobile, mobile with weather protection canopy;
We also design and build special customer tailored execution.

The capacity of the oil processing plant will vary from 500 LPH to 30000 LPH,

**Technical Specification for Transformer Oil Filtration plant**

<table>
<thead>
<tr>
<th>Model</th>
<th>POV 501</th>
<th>POV 502</th>
<th>POV 1001</th>
<th>POV 1002</th>
<th>POV 2001</th>
<th>POV 2002</th>
<th>POV 4001</th>
<th>POV 4002</th>
<th>POV 6001</th>
<th>POV 6002</th>
<th>POV 12001</th>
<th>POV 12002</th>
<th>POV 2500</th>
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<tr>
<td>Nominal Oil Flow Rate, LPH</td>
<td>500</td>
<td>500</td>
<td>1000</td>
<td>1000</td>
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<td>2000</td>
<td>4000</td>
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<td>6000</td>
<td>8000</td>
<td>8000</td>
<td>16000</td>
<td>20000</td>
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<tr>
<td>Heating Capacity Maximum Temperature 50°C &amp; 45°C</td>
<td>6</td>
<td>9</td>
<td>12</td>
<td>18</td>
<td>24</td>
<td>36</td>
<td>48</td>
<td>72</td>
<td>84</td>
<td>108</td>
<td>144</td>
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<tr>
<td>Vacuum Pumping Capacity, Mph</td>
<td>18</td>
<td>36</td>
<td>50</td>
<td>60</td>
<td>250+150</td>
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<td>1200+300</td>
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<td>Oil Connexion in mm</td>
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<td>Filter POROSITY MICRON</td>
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<td>Dimension stationary, A = Length, B = Width, C = Height,</td>
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<tr>
<td>Dimension mobile with canopy, A = length, B = Width, C = Height,</td>
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<tr>
<td>Load worthy taller with canopy, A = Length, B = Width, C = Height</td>
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**Note:** Due to policy of our continuous development of our product, we reserve the right to change the above content information.

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4. PLC Based Throttling Pumping System

As a recognized business name, we are dedicatedly betrothed in offering a finest class spectrum of Vacuum Drying Autoclave Throttling System. Widely cherished owing to their ruggedness, durability and high performance, these are highly demanded. In addition to this, these are well examined before getting delivered at the destination of our customers.

Throttling system protects vacuum pump, and vacuum pump oil. Our newly developed technology will prevent condensation of water vapor in the pump and avoids emulsification of vacuum pump oil. Increase the life of vacuum oil and vacuum pump.

5. Customised Vacuum Pumping System

Due to our proficiency and wide expertise in this business sector, we are willingly affianced in presenting to our patrons a diverse assortment of Custom Built Mobile Vacuum Pumping System. Made-up with precision, these could be purchased from us at most affordable rates. Also, these are accessible with us in a range of sizes and provisions to meet with the varying desires of our customers.

Services:

- We take annual maintenance contract for Vacuum Drying Autoclave, Vapor phase drying plant, Oil filtration of any make.
- We also provide total re-vamping, re-conditioning, & atomization of your existing Autoclaves/Oil filtration plants with advance technology and very competitive price for transformer Industries.
- We keep adequate quantity of stock of all spares required for above equipments.
- We have dedicated service team, which will respond our customer round the clock for 24 x 7 days Service.
- We also undertake conversion of your existing Autoclave into Vapor Phase Drying plant.
- We undertake Training programmers for maintenance and operations of our supplied equipments.