



# PROVAC SYSTEMS

Everything in Vacuum Plants Engineering

# PROVAC SYSTEMS



YOUR PARTNER FOR ENERGY EFFICIENT,  
COST EFFECTIVE AND RELIABLE  
DRYING SOLUTIONS

*Moisture Removing  
processes From  
Transformers which  
Increase its  
Efficiency.*



9001:2015

ISO CERTIFIED COMPANY

Provac systems offers 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.
- Vacuum Pressure impregnation plant.
- 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.

### **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 0.001Mbar! 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.

### **What is Vacuum Drying Plant?**

Vacuum Drying Plant is one of the most common processes which reduces the moisture content from the insulation. Using hot air circulation and vacuum, rapid drying can be achieved without damaging the product. PROVAC has installed a large number of vacuum drying plants as per customer requirements. Our experience enables us to understand your requirement and provide standardized components and solutions tending to your needs.

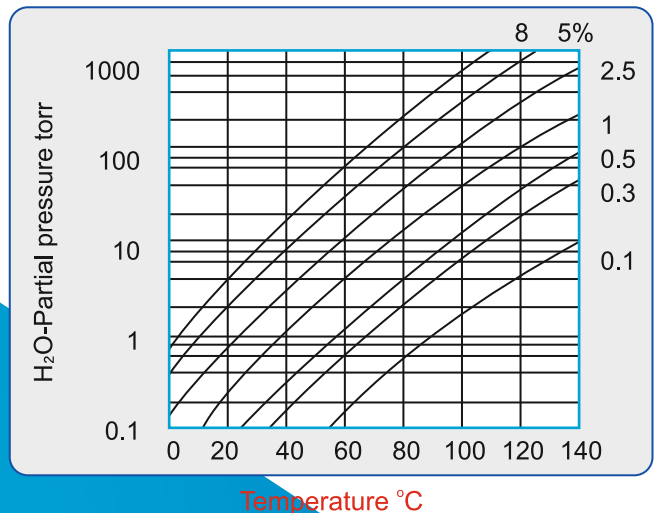
### **Application of Transformer Vacuum Drying Plant**

- Power Transformers
- Distribution Transformers
- CT & PT Drying
- Capacitor Drying
- Bushing Drying



## DRYING AND DEGASSING OF PAPER INSULATION OF TRANSFORMER:

The moisture content 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 content of the insulation doubles, the expected life of a transformer is cut to half. Paper generally consists of 6–8% moisture, of which a part of water condenses in or on the paper. Condensed water is readily separated at 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 shows partial insulation water vapor pressure/temperature for various insulation moisture contents.

Therefore it is necessary to dry the core and coil assembly by using heat / vacuum before tanking and filling the oil for the finished transformer.



### 1. VACUUM 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.

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.

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

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.

### 1. ADVANTAGE OF VDP :

- Sturdy, vacuum proof tank construction.
- Loading by trolley Manual / Motorized.
- Horizontal / Top door opening.
- Single or Double groove sealing arrangement for door.
- Easy seal replacement.

## 2. VAPOUR PHASE DRYING PLANT:

PROVAC make Vapor Phase Drying Plant is used for Drying Power Transforms & 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 schermatic.



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.

### 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 SYSTEMS

## POWER UP YOUR WORLD WITH PROVAC TRANSFORMER DRYING SOLUTIONS!

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 all 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 falls
- 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.

## 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. 10 PPM | Residual gas content approx. 0.5%  
Residual pressure in the degassing tower  $\leq 5$ mbar

### Series POV1 After the multi oil pass

Residual moisture content approx. 5PPM | Residual gas content approx. 0.2%  
Residual pressure in the degassing tower  $\leq 1$ mbar  
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  $\leq 1$ mbar

### 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  $\leq 0.5$ mbar

**PROVAC oil 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

Model	POV 501	POV 502	POV 1001	POV 1002	POV 2001	POV 2002	POV 4001	POV 4002	POV 6001	POV 6002	POV 8002	POV 10002	POV 12002	POV 15002	POV 20002	
Nominal Oil Flow Rate LPH	550	500	1000	1000	2000	2000	4000	4000	6000	6000	8000	10000	12000	15000	20000	
Heating capacity maximum temperature 60° C & AT 3D °C	6	9	12	18	24	36	48	72	84	108	144	180	216	270	360	
Vacuum Pumping Capacity Myh	18	36	36	60	60	250+36	250 + 60	500 + 60	500 + 90	500+150	800 + 300	1000+300	2000+300	2000+450	2500+450	
Oil connection in mm	15	15	20	20	25	25	32	32	40	40	50	50	65	65	75	
Filter POROSITY MICRON	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	< 1 M Micron				
Dimension stationery A=Length, B=Width C=height	A	1200	1200	1200	1400	1400	1700	1850	1850	1850	1850	2000	2100	2500	2500	2500
	B	900	900	900	1200	1200	1200	1500	1500	1650	1650	1700	1800	2000	2000	2000
	C	1670	1670	1850	1850	2000	2000	2100	2100	2100	2100	2300	2300	2800	2900	2900
Dimension Mobile with canopy, A = Length, B=Width, C=height	A	1210	1210	1250	1250	1410	1760	1860	1860	1860	1860	2010	2110	2510	2600	2700
	B	910	910	910	1000	1210	1210	1510	1510	1660	1660	1710	1810	2010	2050	2200
	C	1960	1960	2100	2300	2300	2350	2550	2550	2550	2550	2600	2600	3100	3100	3200
Road worthy Trailer with canopy, A = Length, B=Width, C=height	A	2600	2600	2600	2600	3750	3750	3750	4300	4300	4300	5000	5000	5000	5000	5000
	B	1600	1600	1600	1600	1600	1600	1800	1800	1800	2000	2000	2200	2300	2300	
	C	2200	2200	2300	2350	2650	2850	2900	3150	3150	3150	4000	4000	4100	4100	4100

Note: Due to policy of our confionecus development of our product, we reserve the right to change the above content information

### 4. VPI PLANT :

Vacuum Pressure Impregnation (VPI) is a process by which a fully wound electric apparatus stator or rotor is completely submerged in a Resin/Varnish.

Through a combination of dry and wet vacuum and pressure cycles, the resin is assimilated throughout the insulation system. Once thermally processed, the impregnated windings become a monolithic and homogenous structure.

#### The resulting benefits are :

- Improved electric motor efficiency
- Higher Dielectric Strength
- Increased Mechanical Strength,
- Greater Thermal Inductivity,
- Reduced probability of motor failure
- Superior Protection against the Ingress of Water, Chemical and Containments.



### 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.



### Office Address :

2092 Sadashiv Peth, Rohan Chambers,  
Vijayanagar Colony,  
Near Phadake Sabhagrah, Pune 411 030.  
Maharashtra. (India)

Contact : ☎ 020-24336566  
Mob.: +91 98509 07232 / +91 86687 20030

### Workshop Address :

Provac Systems, 94b, Devang Park,  
Gaikwadwadi Road, Village Wadki,  
Pune 412308.

E-mail: [provac.pune@gmail.com](mailto:provac.pune@gmail.com)  
[info@provacsystems.com](mailto:info@provacsystems.com)

[www.provacsystems.com](http://www.provacsystems.com)