

Dip & Bake vs. Vacuum Pressure Impregnation

Most stator, armature and transformer windings are insulated using a varnish/resin to protect & increase the life of the winding. The varnish is typically applied using either a Dip & Bake or a Vacuum Pressure Impregnation (VPI) method

Dip & Bake Process

1. Wound apparatus is heated to remove excess moisture
2. While still warm, the apparatus is fully submerged into a tank of varnish. The heat of the wound apparatus helps to lower the viscosity of the varnish and increase varnish penetration
3. When the varnish stops bubbling, the apparatus is raised and hung to allow excess varnish to drip back into the tank.
4. Apparatus is placed in a bake oven to cure and harden the insulated windings.

Dip & Bake Shortfalls

The primary pitfall of the dip & bake method is that it tends to leave voids (air pockets) in the insulation that can lead to premature winding failures. As a result, a process was developed to increase resin penetration, retention and ultimately create a completely solid winding space without voids. This process is called Vacuum Pressure Impregnation and produces windings with the following advantages:

- Increased dielectric (insulation) strength
- Better resistance to contaminants
- Improved heat transfer
- Greater structural strength

VPI Process

1. Wound apparatus is heated to remove excess moisture
2. Apparatus is placed in VPI tank and a dry vacuum is drawn removing air and gases from the tank as well as any remaining moisture in the windings.
3. Resin is added to the VPI tank from a storage vessel until the apparatus is fully submerged. A wet vacuum is created for a period of time to allow resin to impregnate the winding.
4. VPI tank is restored to atmospheric pressure
5. Dry compressed air is blown into the tank until pressure reaches 85 to 90 psi. This added pressure is used to force resin into any remaining voids between the winding and slots of the apparatus, resulting in a virtually void free winding.
6. Apparatus is placed in a bake oven to cure and harden the insulated windings.