DOLPH resins often penetrate better and cure faster than others. It may be necessary to adjust the conveyor speed. ADJUSTMENTS AND TROUBLESHOOTING

ADJUSTING SHOT SIZE

Incomplete Cure

Soft or blistering

Little or no resin

Premature curing on end turns:

Excessive build

CAUSE

Problem

Solution

Switching to a new resin.

Dispense a shot into a cup; adjust the pump and nozzle to dispense an even amount of new resin. If necessary, adjust shot sizes until only one or two drops of excess resin remain. Discontinue use of old resin.

Changing part size.

Experiment with shot size until only one or two drops of excess resin come off.

Too much catalyst.

Adjust catalyst to resin ratios.

Too high or too low preheat temperature.

Preheat temperature too high. Reduce preheat temperature.

Preheat temperature too low (premature gel).

Preheat temperature too low (premature gel). Increase preheat temperature.

Inconsistent catalyst.

Adjust catalyst to resin ratios.

Too high resin dispensed.

Increase shot size; see “Adjusting shot size”

Inconsistent catalyst.

Adjust catalyst to resin ratios.

Heat too low or bad heating element.

Correct advocate or replace element.

Conveyor belt too fast; heat cure too short.

Slow down the line, or increase temperature.

Call John C. Dolph Company Inc. for more time. Call DOLPH’S Technical Service for more help.

Cure temperature or preheat too high.

Check temperatures and reduce heat as needed.

Chemical Cure:

The process by which a liquid resin compound is converted into a solid by chemical reactions, with heat or without. See electrical varnish.

Heating up: heat transferred to an object by contact. Larger diameter parts will heat faster. Also called infrared.

Resin: a class of organic, liquid, fusible materials of synthetic or natural origin that are polymerized in situ.

Resistance Heat:

Heat caused by passing electric current through a conductor. Supplied by connecting the leads on each part to a source on the conveyor or carousel (with wire, copper, lead, aluminum, or other metal), and insulating the electrical apparatus, which is applied as a coating on the individual wire. See Centipoise.

Adhesives:

A resinous material used to protect and reinforce electrical apparatus, which is applied as a coating on the individual wire. See Centipoise.

Bond Strength:

The measure of force required to break the bond of varnished helical coils of enameled magnet wire.

Centipoise (cp):

A unit of viscosity. Usually measured in centipoise, or in minutes and seconds. The resistance of a material to flow. Higher viscosity liquid flows more slowly, lower more quickly. May be measured in centipoise, or in minutes and seconds.

Viscosity:

The measure of force required to break the bond of varnished helical coils of enameled magnet wire.

Convection Heat:

Heat transferred to an object by circulation of hot air from a gas or electric heat source. See radiant heat.

Electricity:

The ability of a material to conduct heat. Usually expressed as: Calorie/sec/°C/cm².

Trickle Impregnation:

Process in which resin or electrical varnish is dispensed directly onto the electrical winding as opposed to dipping conventionally used for fractional, sub-fractional and small integral motors up to 70 or 80 pounds. May also be used on extended coils and frames to control the moisture. See radiant heat.

Viscosity:

The measure of force required to break the bond of varnished helical coils of enameled magnet wire. See polymerization (Polymerize). A chemical reaction in which two or more individual molecules combine to form larger molecules. See polymer.

Polymerization (Polymerize): A chemical reaction in which two or more individual molecules combine to form larger molecules. See polymer.

Heatless Trickle:

A method by which a varnish is drawn into and retained within the part. See polymerization (Polymerize). A chemical reaction in which two or more individual molecules combine to form larger molecules. See polymer.

Preheat:

Heating up: heat transferred to an object by contact. Larger diameter parts will heat faster. Also called infrared.

Radiant heat:

Heat that is emitted by a glowing source (carbon arc lamp, lead, etc.) and is absorbed in the object as heat energy with the distance between the source and the object. Larger diameter parts will heat faster. Also called infrared.

Resins: a class of organic, liquid, fusible materials of synthetic or natural origin that are polymerized in situ.

Resistance Heat:

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**ADJUSTMENTS AND TROUBLESHOOTING**

- **INCOMPLETE CURE IN THE SLOTS**
  - Little or no resin
  - Excessive build

**PROBLEM**
- Too much catalyst.
- Switching to a new resin.
- Gel time too long; product with longer gel time will require a longer cure time.
- Too little resin dispensed.
- Preheat temperature too low (gel too slow, conveyor too fast; heat cure too short).
- Heat too low or bad heating element.

**SOLUTION**
- Adjust catalyst to resin ratio.
- Insufficient catalyst.
- Insufficient catalyst.
- Heat too low or bad heating element.
- Convoyor too fast; heat cure too short.

**INCOMPLETE CURE in the slots**

- Catalyst is mixed with resin to form a composite called “heat killer” to form a solid film or mass.
- Compound is converted into a solid by chemical reaction, which consists of repeating individual molecules linked by chemical bonds.

**POLYMERIZATION (Polymerize)***A chemical reaction in which two or more individual molecules combine to form larger molecules. See polymer.

**TRICKLE IMPREGNATION TERMS**

- Bond Strength: The measure of force required to break the bond of varnished helical coils of enameled magnet wire.
- Cure: The process by which a liquid resin component is converted into a solid chemical reaction, with heat or without. See electrical varnish.
- Cure Temperature: Temperature at which sufficient heat is present, under specific test conditions, to burn an image, as opposed to the auto-ignition temperature, a much higher temperature, at which burning may take spontaneously.
- Flash Point: The lowest temperature, a much higher temperature, at which burning may take spontaneously. See Centipoise cps.
- Final Bake: The temperature at which sufficient heat is present, under specific test conditions, to burn an image, as opposed to the auto-ignition temperature, a much higher temperature, at which burning may take spontaneously.

**GLOSSARY OF TRICKLE IMPREGNATION TERMS**

- **ADJUSTMENTS**
  - Switching to a new resin.
  - Insufficient catalyst.
  - Heat too low or bad heating element.

- **PROBLEM**
  - Too much catalyst.
  - Switching to a new resin.
  - Gel time too long; product with longer gel time will require a longer cure time.
  - Too little resin dispensed.
  - Preheat temperature too low (gel too slow, conveyor too fast; heat cure too short).
  - Heat too low or bad heating element.

- **SOLUTION**
  - Adjust catalyst to resin ratio.
  - Insufficient catalyst.
  - Adjust catalyst to resin ratio.
Cool Down Final Bake Gel

Fans, and personal appliances, i.e. shavers, electric tooth brushes, etc.

"heatless cure" or "chemical cure" process has been developed for resistance, convection or induction heat. Variations of the resin

Roll-thru differs from trickle in that the parts are partially

In flood coating the parts pass under continuous streams of

requirements, the trickle apparatus and resin application method

Most are solventless. Some are pre-catalyzed (one part), and others

TRICKLE RESINS

cation, gel and cure. The heat source may be radiant heat (calrods),

TRICKLE IMPREGNATION APPARATUS

There are several variations of the trickle process, but all have essentially the same operations: batched, preheat, resin application, gel and cure. The heat source may be radiant heat (calrods), convection, induction or direct flame. Some trickle systems use multiple nozzles, with the resin moving across the parts, while others have nozzles directly onto electrical windings. The cycle is automated, and not filling the slot. The preheat temperature also triggers if too high, the resin will gel too soon building up on the ends

TRICKLE APPLICATION CYCLE

Parts are mounted on rotating fixtures. They advance through the entire cycle on a continuous conveyor or carousel returning to the batched station completely impregnated and cured. With several products, the parts may be circulated continuously. The trickle resin assures that the resin does not run off that it will be distributed evenly producing a uniform coating and balanced parts.

The preheat section brings the part to the proper temperature for impregnation. The temperature causes the resin to thicken so it will flow the full length of the slot. This ensures that the voids are bonded and the voids are filled. The correct temperature is critical if too low, the resin may not set well into the slot. If too high, the resin will get too thin building up on the ends and not filling the slot. The preheated temperature also triggers the chemical reaction, which is a function of time and temperature.

3. Resin is applied for 10-15 seconds (2 to 3 full turns) to both ends of the form before moving to the nozzles. The part is oriented such that the parts are impregnated and not filling the slot, and will cure at ambient temperature within a few minutes. Because no feed is taken up during the cycle, parts can be sent to the next production step while curing. The coated parts may be weighed to determine the amount of resin applied to the parts.

CYLINDER TEMP

120°F

ADVANTAGES OF TRICKLE RESIN IMPREGNATION

• Faster processing
• Minimal balancing
• Better impregnation and fill
• More uniform coating
• Labor saving
• Resin applied directly to windings
• Completely automated
• More resin retained
• Minimal clean up
• No dip tank and associated cost
• One operator handles cycle
• Superior performance
• Lower VOC's

DOLPHON PRODUCT NUM

SAFETY VENT R.G. 25°F TO 125°F INF. DUR. COMPOUND

DOLPHON

PRODUCT

CC-1106

CC-1106-OPT

BC-365LTC

CA-2011

CC-1080L

CC-1305TR

CC-1133-TR

CC-1105-OPT

CC-1105

CC-1133

CC-1260

CC-1099

CN-1139

PRODUCT DESCRIPTION

One Part

Two Part

Two Part

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MIX RATIO

100:1

100:2

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100:1

100:1

100:1

100:1

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LIQUID PH.

12-19 @ 212

8-13 @ 212

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8-13 @ 212

MFR.

CC-1106

CC-1106-OPT

BC-365LTC

CA-2011

CC-1080L

CC-1305TR

CC-1133-TR

CC-1105-OPT

CC-1105

CC-1133

CC-1260

CC-1099

CN-1139

RESIN: CATALYST

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TYPICAL TRICKLE APPLICATION CYCLE

1. Parts are mounted on rotating fixtures. They advance through the various stages of the trickle station. The impregnating time is controlled by the time the parts are in contact with the impregnating compounds, and by the temperature of the resin. The temperature causes the resin to thin-out so that it will flow.
### Glossary of Trickle Impregnation Terms

**Bond Strength**: The measure of force required to break the bond of varnished helical coils of enamelled magnet wire.

**Catalyst** (unit of viscosity) usually measured by drag on a turning spindle immersed in the liquid. Brookfield viscosity, a force of 0.01 dyne per centimeter.

**Chemical Cure**: The process by which a liquid resin compound is converted into a solid by chemical reaction, with heat or without, to form a solid film or mass.

**Conventional Trickle Machine**: Trickle impregnation apparatus in which resin is dispensed from paired nozzles through a measured shot size.

**Cp**: See Centipoise.

**Electrical Varnish**: A resinous material used to protect and insulate electrical apparatus, which is applied as a liquid and converted by chemical action, with heat or without, to form a solid film or mass.

**ENERGY THAT IS EMITTED BY A GLOWING SOURCE**

**Flash Point**: The lowest temperature at which sufficient vapor is present, under specific test conditions, to burn if a flame is introduced, as opposed to the auto-ignition temperature, a much higher temperature, at which burning may begin spontaneously.

**Film Build**: Average coating thickness of cured resin on one side of a metal plate.

**Heat**: A chemical reaction in which consists of repeating individual molecules linked by chemical bonds.

**Induction Heat**: Heat caused in an object placed in an electromagnetic field.

**Measured Shot**: See conventional trickle machine.

**Penetration and Fill**: The process by which the varnish is drawn into and retained within the part.

**Polymer**: A chemical compound of high molecular weight which consists of repeating individual molecules linked by chemical bonds.

**Polymerization (Polymerizer)**: A chemical reaction in which two or more individual molecules combine to form larger molecules. See polymer.

**Pot Life**: The time the product remains usable after it is mixed with catalyst or activator. Sometimes called shelf life.

**Preheat**: To heat the device before impregnating.

**Radiant Heat**: Heat that is emitted by a glowing source (burning lamp, etc.) and is absorbed in the object as heat energy.“The process by which the varnish is drawn into and retained within the part.”

**Roll-Thru Machine**: Apparatus in which rotating parts are preheated and immersed in a trough of resin. Heat is conducted from the preheated parts to the resin. Preheated parts are then recirculated. Heat (from preheated parts) can shorten the life of the resin. Roll-Thru machine is used to extend resin life.

**Thermal Conductivity**: The ability of a material to conduct heat. Usually expressed as Calorie/sec/cm²/°C.

**Trickle Impregnation Process**: In which resin or electrical varnish is dispensed directly onto the electrical windings as opposed to dipping conventionally used for fractional, subfractional and small integral motors up to 70 to 80 pounds. May also be used on small motors, coils and transformers.

**Viscosity**: The resistance of a fluid to the circulation or flow of another liquid. May be measured in centipoise, or in minutes and seconds.

**Wicking (to wick)**: The process by which liquid is drawn into a subsurface or drapes of solid by capillary action, as in a wicker work.

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**Selection Chart**

**Trickle Impregnation Resins**

**Formulated Specifically**

**For the Electrical Industry**

---

**Table**: ADJUSTMENTS AND TROUBLESHOOTING

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
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</tr>
<tr>
<td>Changing part size.</td>
<td>Experiment with shot size until only one or two drops of excess resin come off.</td>
</tr>
<tr>
<td>Excessive Build In Premature Curing.</td>
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<td>Preheat temperature too low (premature gel).</td>
<td>Increase preheat temperature.</td>
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<td>Slow down the line, or increase temperature.</td>
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