User Guide: Processing and Curing

Usable life
This is the time normally in minutes that the mixed resin is 'usable'.

Working life
This is the time normally in minutes that the mixed resin is 'workable'.

Pot life
This is the time to double the initial mixed system viscosity.

Viscosity
Viscosity is the resistance to flow. A high viscosity resin has high resistance to flow e.g., treacle. A low viscosity resin has low resistance to flow e.g. water.

Curing
Curing is the process by which resins react to produce a solid infusible mass. The reaction of resin and hardener usually involves the liberation of heat called exotherm. This is generally controlled by careful formulation and the addition of fillers and additives that suppress excessive heat build up. It is however dependant on the ambient temperature and the mass of material used. Smaller masses and lower ambient temperature will extend cure time and larger masses and warmer ambient temperatures will reduce cure time. Hotter temperatures may be used for faster cure but will result in higher post cure shrinkage and higher cure exotherm. Experimentation and testing is suggested to avoid side effects. For maximum properties a post cure may be required - call Robnor Technical Service Department for advice.

Please consult the technical data sheet before using Resin-Online products.

Post Curing
In many resins the performance of the system can be enhanced by a process called post curing. This involves a secondary cure process over and above the normal conditions to provide enhanced performance. In general post curing will improve such properties as; chemical resistance, temperature stability, dimensional stability, voltage breakdown resistance, water resistance and increase glass transition temperature. Post curing is mainly used on epoxy systems but can also be used on some high performance polyurethanes to enhance them still further. In general post curing occurs at 10 – 20.C above the maximum expected service temperature.

Typical post curing (depending on system), may involve a normal cure plus:

16 hrs at 100.C or
8 hrs at 120.C or
4 hrs at 140.C or
2 hrs at 150.C

Combustion
Most epoxies and polyurethanes generally ignite above 415°C.
Decomposition products will consist of carbon, carbon dioxide, carbon monoxide, hydrogen cyanide nitriles and water, and are best avoided.

Deairing
Mixing under vacuum is the most effective way to prevent air entrapment. Alternatively the mixture may be deaerated under vacuum – allowing at least 200% ullage for the foam to expand. Some systems may benefit from warming but this should be done before adding the hardener. Brief degassing under 5 – 10 mbar improves the mixture homogeneity and enhance the dielectric and aesthetic properties of the resin.

Moulding and Casting
The use of a vacuum minimises the risk of air entrapment during mould filling and the resin mixture should enter the mould in a steady steam. Fore best results the mould should be vented to avoid air entrapment and voids. Warm moulds generally give better castings. In general when using epoxy and polyurethane materials the mould will need to be treated with a mould release agent. The quality of the moulding is largely determined by the choice of casting material and the quality of the mould finish.

Machining
Allow material to fully cure before machining. Machine using these guidelines:

Lathe speed: 150ft/min
Cut: Dry
Tools: Carbide Top Rake 6°(+/- 2°) Side/Front 8°(+/-2°)
Feed Rate (rough): Travel speed .020. Rough cut .020-.060
Feed Rate (Finishing): Travel speed .010. Finish Cut .010
Polishing: Use 400-650 grit emery paper wet.

Use suitable dust extraction as necessary.

Varnishes and Coatings
Many objects may be coated using Resin-Online varnishes and coatings either by dipping, brushing or spraying. Pneumatic guns should be used at room temperatures. Drainage retention on steel sheet is in the region of 3% with a non-diluted varnish. When coating a diluted varnish (15% dry extract), the thickness is about 15 to 20 microns.

Filler or Extender
In some instances unfilled materials may require modification with filler or extender to give certain benefits.

Adding filler or extender will:
Increase viscosity, i.e. more difficult to fill moulds and evacuate.
Increase thermal conductivity (except using glass bubbles)
Increase general mechanical properties but lower impact strength
Increase dimensional stability
Increase thermal conductivity
Increase hardness
Can make flame retardant (at certain levels)

But will reduce:
The cost per kilo
Shrinkage
Stress on curing

Properties that remain relatively unaffected include:
Chemical resistance
Electrical properties

Filler should be added to the resin by the use of a mechanical stirrer prior to adding the relevant hardener. For best results evacuate the mixed product.

Pigments
Pigments are added to a resin to give a desired colour. In general the pigment is simply stirred into the resin until uniform at a rate of between 2 to 10% by weight. Filled systems generally require more pigment to mask any effect the filler or extender may have. For best results evacuate the mixed product.