INTRODUCTION TO NYLON COATING

Substrate Pretreatment.

Soil, rust, grease, oil and other substances must be fully cleaned from surfaces to be coated in order to achieve maximum adhesion, end product performance and appearance. Normal surface cleaning procedures include solvent rinses, shot or grit blasting and chemically treating the substrate. Commercial chemical pretreatment systems are available. There are several different commercial systems available, one of the most common is a five-stage system which may include alkali wash, water rinse, zinc or iron phosphate bath water rinse, non chromate sealer, water rinse. Although this type of pretreatment system is common, the number of wash stages will vary depending on the substrate to be cleaned. The following methods, or a combination thereof, have been successfully employed; they are listed in increasing order of effectiveness:

- Vapor degreasing
- Grit or shot blasting
- Hot alkaline clean, water rinse
- Sand blasting
- Solvent clean, sand blast
- Hot alkaline clean, rinse, acid pickle, rinse, dry
- Three stage iron or zinc phosphate system
- Five stage iron or zinc phosphate system
- Seven stage iron or zinc phosphate system

The rule of thumb is the cleaner the part the better the bond will be.

After cleaning, avoid touching the surfaces and coat as soon as possible.

Nylon Primers and their application.

When physical adhesion between the substrate and the nylon powder coating is necessary, the substrate should be coated with a nylon primer. Duralon nylon primers are most commonly used straight at 9.6% solids, but may be diluted depending on substrate mass, temperature and application system. There are several dilution solvents approved for our Solvent primers, among these are MEK, MIBK, or Diacetone Alcohol, with MEK being the most common. Our Water based primers are diluted with normal tap water.

Primers may be applied by dipping, spraying, flow coating or brushing. The preheat and fusion temperatures encountered in the coating process may affect primer selection. Vinyl primers are available in both solvent base and water base solutions.

Dipping into a tankful of reduced primer is the most economical and practical method of priming, however spray or flow-coat may be more suitable for some continuous conveyorized systems. After the part has been totally ‘wetted’ by the primer, a drain period and excess droplet removal is recommended to minimize subsequent blistering in the preheat oven.
Thermoclad produces two types of Nylon primers, solvent based primers and water based primers. When choosing what type of primer will be best suited to your application several factors must be considered. Solvent primers are better suited when substrate cleaning is limited or not possible, or if the flash off time (the time from the application of the wet primer till it dries) is limited.

Water based primers are used for obvious reasons; safety, emission compliance among and ease of use among them. To work properly water based primers require a very clean substrate and a much longer flash off area. Ask your Thermoclad representative for the primer that is best suited for your application.

**Jigging and Masking.**

In automatic or semi-automatic powder coating systems the parts to be coated must be fastened or held to the conveying system. Jigs to hold the parts must hold them securely but must allow cleaning solutions and primers to drain away completely. The part should be positioned in the jig to prevent over-coating or an excessive build-up in any one area.

When sections of a part are not to be coated, masking or special application systems can be used. For masking, use heat resistant, pressure sensitive tape or cold fixtures. Special application procedures include designing the jig to cover part sections, partial immersion in the fluidized bed, and leaving part sections unprimed to strip away after curing.

**Preheating the Substrate.**

Gas or electric ovens with recirculated convected heated air are the most common method of bringing the substrate up to coating temperatures. Other processes include infrared heaters and induction and resistance heating equipment. Preheating the substrate crosslinks the primer to the part and prepares it for the top coat.

For good flow and controlled coating thickness, the temperature of the part must be above the compound's fusion temperature at the moment of dipping.

Preheating temperatures will be determined to fit each part's configuration, size, thickness and heat loss while moving the part from the ovens to the coating station.

Application temperatures may vary depending on the idiosyncrasies of the specific Duralon compound, the substrate and often equipment. Minimum part temperatures for dip or hot spray electrostatic applications should exceed 450° F (232°C) to realize practical production cycles. For wire goods, a 5 to 10 minute preheat cycle at 550 to 650°F (288-343°C) will suffice to achieve proper temperature, where as lower and longer preheat temperatures would be called for when coating heavier parts, or parts having substantial mass differential, such as large springs, castings, or complex parts combining tubular and wire goods, where 10 to 30 minutes at 475 to 550°F may be more suitable.
Dip Cycle or Spray Cycle.
The length of time the preheated substrate is introduced to the powder either by dipping or spraying, the thicker the coating will build on the part. Care should be taken to give the part a uniform powder applications.

In a fluidized bed system a slight side to side or up and down motion of the part while dipping will help the powder reach most hidden or hard to reach areas. In most cases a dip time of 5 to 10 seconds will be sufficient (a 5 second dip will build approx. 10 mils in coating). In some extreme cases where a very thick coating is desired a dip cycle of 20 to 30 seconds may be required, and in some extreme cases repetition of the preheat and dip cycles can be used to achieve an exceptional coating thickness.

In electrostatic applications, care should be taken in reference to gun placement to give a uniform coating, and the line speed will need to be adjusted to give the part sufficient time in proximity to the guns.

Post-heating.
The times and temperatures needed to completely fuse nylon powder vary with each application. Parts with high mass and high heat retention usually require shorter fusion times. Post-heat temperatures can range from 350-700°F (177-371°C) for 5 to 45 second to as much as 5 minutes.

In electrostatic applications of cold or cool parts a post-heat or cure cycle of 410-475°F (210-232°C) for 5 to 15 minutes may be needed.

The same types of heating equipment are used successfully for both preheating and postheating.

Quenching.
Although quenching of the coated part is not always necessary it is recommended to prevent discoloration or loss of gloss in parts that have high heat retention. The most commonly used methods are dipping or spraying ordinary tap water to the cured part. During this operation an additive may be needed to prevent water spots on dark colored parts.

SUMMARY
Properly applied, Duralon powder coatings produce uniform finishes that are free from sags, tears or runs in a practical range of thicknesses from 7 to 40 mils with a single application. Thinner or heavier coatings are possible by special coating techniques. During the fusion or melting process, Duralon coatings develop a high degree of surface tension to smooth out rough surfaces such as castings, welds and forming imperfections. These characteristics allow minimum surface preparation, aside from normal pretreatment, which reduces preparation costs required for painted or other thin film powder coated surfaces.