

Anatomy of a nonstick coating

- What it is made of
- How it is applied

As a few people in our industry have said, “Making coatings is not exactly rocket science”. But it is considerably more complicated than many think.

The more one understands the process, the more likely one is to take full advantage of the many benefits these coatings offer.

This brochure explains (1) the composition of nonstick coatings, and (2) the various ways they can be applied, with the advantages and disadvantages of each.

Whitford

Makers of the world's largest, most complete line of nonstick coatings

The making of a coating

Shown here is the manufacturing process and the basic ingredients that go into a typical nonstick coating

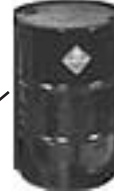
Pigments: provide color, hiding and reinforcement properties.



Fluoropolymers: provide non-stick and non-wetting properties.



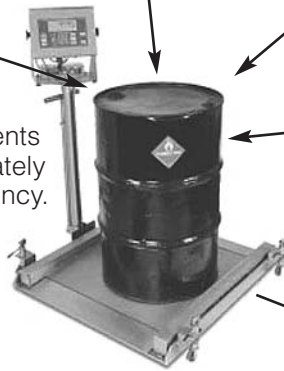
Resins: the binder or "glue" that gives adhesion and strength.



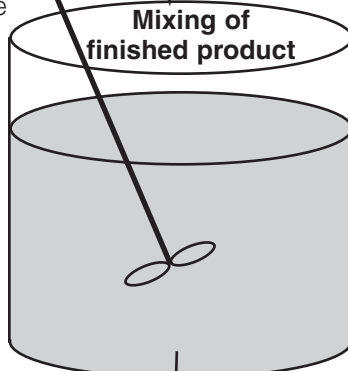
Liquids (carriers): water and solvent to carry the other ingredients (burned off at curing).



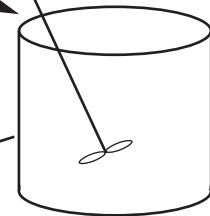
Weighing: Ingredients are weighed accurately for product consistency.



Mixing: Ingredients, pastes and bases are blended with special mixing equipment to ensure uniformity.

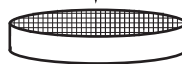


Preparation of intermediates

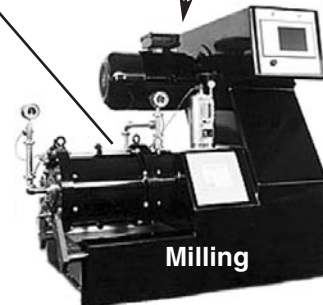


During mixing, coatings are tested and adjusted to match specifications. Records and samples are kept.

Filtering process



Filtration removes all large particles and ensures smoothness.



Milling

Milling: Some ingredients are premixed and milled to produce smooth pastes and bases.



Packaging for shipping

How coatings are applied

There are many ways to apply nonstick coatings, each with advantages and disadvantages. Here are the 4 most common methods recommended by Whitford.

1. Spray coating

Spray is the most versatile method of coating. The liquid coating is introduced into a pressurized air stream which atomizes the coating as it leaves the spray gun, thus permitting its application as a continuous film.

Advantages

1. Smooth, consistent coating.
2. Durable coating: very good performance.
3. Good resistance to abrasion and scratching.
4. Excellent release.

Disadvantages

1. Waste in overspray: 35% to 50% of the coating is lost, depending upon the skill of the applicator.
2. Slow production: no more than 1,500 pieces per hour (about half that of more efficient methods).



2. Roller coating

Roller coating is an adaptation of an offset printing press wherein the coating is “printed” on the surface of a flat metal disk. Typically there are 5 coating stations with drying ovens between them. After final curing, the coated disks are shaped to the desired forms.

Advantages

1. 95% coating efficiency; no overspray.
2. High production rates.
3. Uniform coating application.
4. Reduced pollution (less coating wasted).

Disadvantages

1. Coating surface is not smooth; the rollers leave striations (commonly called “chicken tracks”).
2. Performance is reduced (final coating is thin).
3. High equipment costs; inefficient use of space.



3. Curtain coating

Two endless belts are set close together. Between them is the “head” of the machine, which contains the coating and releases it as a thin “curtain” through which the disks pass as they move from one belt to the next. As they proceed down the line, they are dried, coated again, then cured, after which they are formed.

Advantages

1. 98% coating efficiency; no overspray.
2. High throughput with minimum personnel.
3. Uniform, smooth coating applied.
4. No track marks on the coated disk.
5. Reduced pollution (less coating wasted).

Disadvantages

1. Specialized equipment required.
2. Ordinary coatings will not work in a curtain coater (Whitford has developed coatings specifically engineered for the curtain process).



4. Coil coating

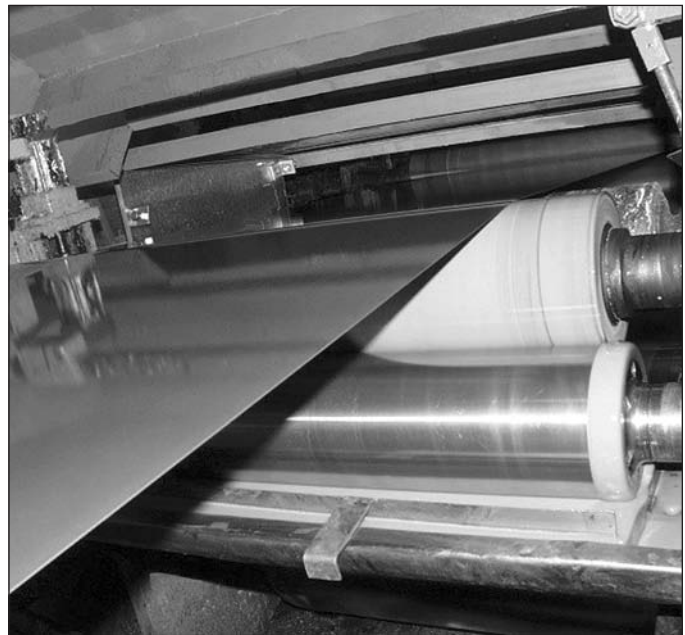
A roll of metal is uncoiled and fed into the coater where the coating is “printed” on the metal continuously (like a large newspaper printing operation). After curing, the coil is re-rolled and pressed and shipped to the manufacturer, where the final product is formed (usually as bakeware).

Advantages

1. 98% coating efficiency; no overspray.
2. Minimum personnel required.
3. Uniform, smooth coating applied.
4. No track marks on the coated disk.
5. Minimum investment for manufacturing.

Disadvantages

1. Very high equipment cost for coil coater.
2. Coated trim scrap has little value (waste).
3. Color matching is difficult.



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