Getting the most out of Fusion® 8088

Everything you need to know about maximizing the benefits of Whitford's PTFE/PFOA-free ceramic nonstick, from substrate preparation to coated product ready to ship.

Whitford

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

Whitford's Mission Statement

We combine superior service with innovative solutions to our customers' problems via our products and related technology.

Required equipment

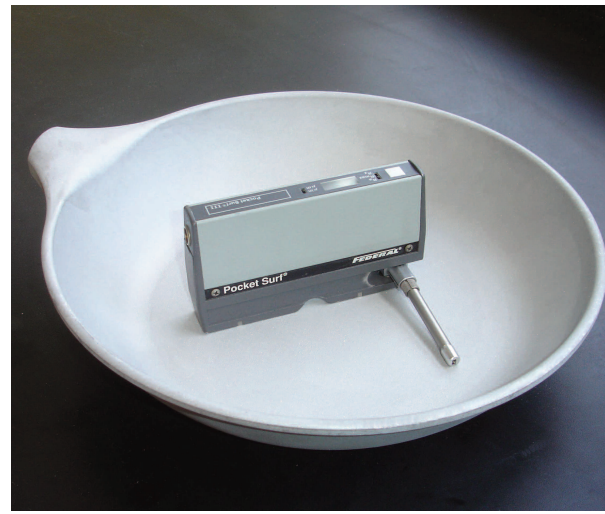
Key to the application of Fusion 8088 is the following equipment:

- Blasting machine.
- Mixing equipment: a shaft stirrer, a barrel roller.
- Spraying line with at least 2 spray booths, ideally equipped with multiple guns.

Preparation of the substrate

The ideal substrate for Fusion 8088 is an aluminum alloy pre-treated with the appropriate surface blasting. Before blasting, make sure that the surface is free of oil, since blasting does not always remove all of the oil. If the surface is contaminated, use a preliminary treatment (chemical or thermal) for the removal of the grease. Oil or grease on the substrate can contaminate the blasting media and could contribute to improper adhesion.

The use of iron-free alumina (60-100 grit) as blasting media is recommended to obtain a homogeneous surface roughness of Ra = 2.5-4.5 microns (µm).

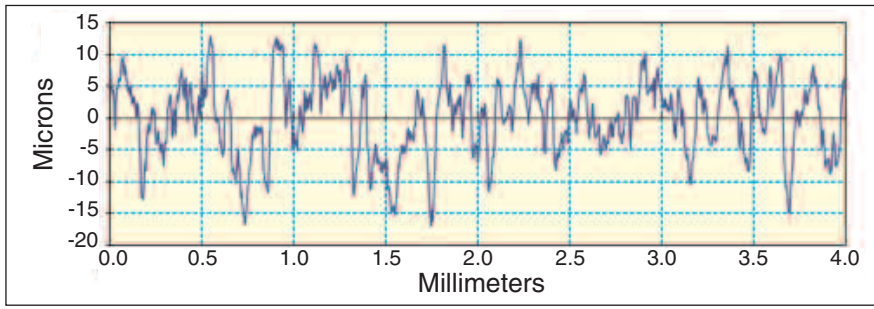


A Profilometer, shown here, provides an accurate measure of surface roughness.

A smoother surface can negatively affect both proper adhesion and the mechanical performance of the coating. A rougher surface can cause the product to be drawn into the surface profile, resulting in a dry, rough finish.

The parts should be appropriately de-dusted following blasting using a stream of clean and dry (moisture-free) compressed air. This removes all the blasting media or by-products left on the substrate.

Standard	ISO 1997	N	5
Profile	R	Cut-off	0.8 mm
Range	AUTO	Filter	Gauss
Ra	4.11 microns		
RZ	24.43 microns		



This is a typical surface-roughness profile ideal for the application of Fusion 8088.

Preparation of the products

Fusion 8088 is supplied as a one or two-coat system. Each coat is supplied as 2-pack systems, with part A (clear activator) and part B (base). Product activation for both is a critical step and, if improperly carried out, can affect the product and its performance. Special care is required when performing the following procedures.

The two components, especially the base, are very thin, so there is a tendency for the fillers to settle at the bottom of their containers. It is therefore imperative that the material be completely mixed before use. Ideally, the mixing should be at high speed to redisperse the solids to eliminate any settling. If a shaft stirrer is not available, rolling the drums for 20-30 minutes at 40-80 rpm should help to redisperse the sediment. The operators should make sure that there is no sediment on the bottom of the container before mixing the components. After the mixing, immediately prior to activation, it is recommended to stir the product every 5-10 minutes with a spatula to prevent the resettling of any particulate.

The ideal mixing operation requires a variable-speed shaft stirrer capable of stirring 10 to 50 kg of material. The shaft should have an impeller of appropriate size for the dimension of the container where the mixing is taking place. Optimum results are obtained when the diameter of the impeller is 1/2-1/3 of the diameter of the container. The

A variable-speed shaft air motor with toothed impeller is ideal for Fusion.

impeller should be toothed, to help redisperse the filler particles.

Plastic containers (HDPE) are recommended for storing and manipulating the product. We recommend that the product be stored and activated only in the original containers.

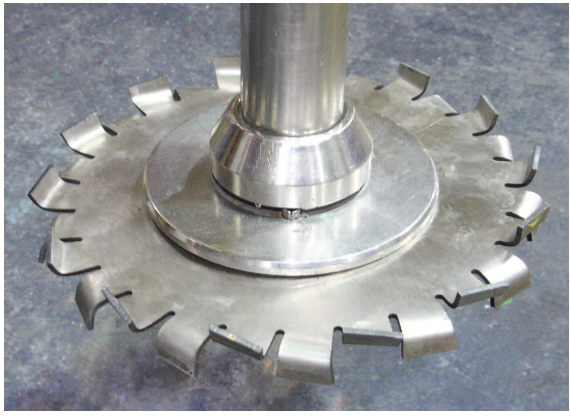
The 2 packs must be mixed in the ratios specified by the Product Data Sheet of the specific product code.

1. Component A must be placed in a container large enough so that A fills no more than 1/3 of its volume. Place the container under the variable-speed stirrer.

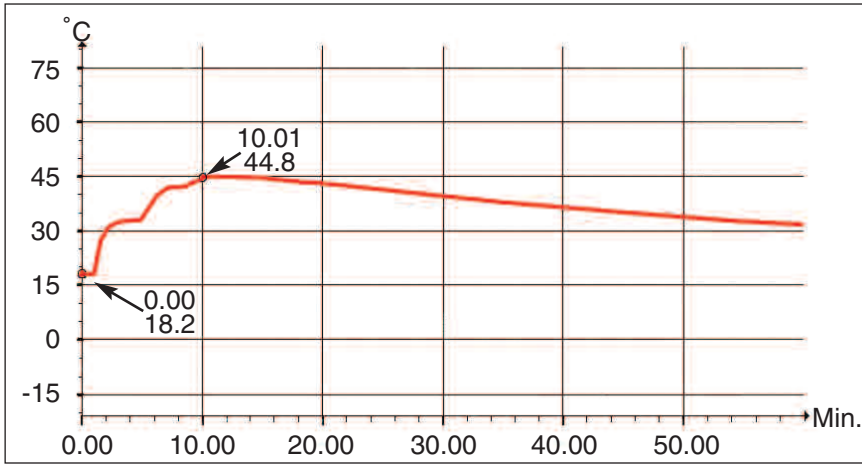
2. Start stirring component A, making sure that all the material is stirring and that a vortex forms on the surface.

3. Start adding component B to component A under agitation. The temperature should rise by about 15-20°C (60-70˚F) after the completion of the additions. (This parameter may be influenced by several factors, such as the ambient temperature, the kind of container, the speed of mixing and the time after which the addition is completed.)

4. The product must be left stirring at sufficient speed to ensure all the material is being circulated and that a sufficient vortex appears on the surface of the liquid. Putting a cover on top of the stirring mixture to prevent evaporation of the components is highly recommended. The activated materials should be left stirring for at least 1 hour after the completion of the additions. The maturation time (the time after which it is possible to apply the product safely) is about 2 hours.



*A toothed impeller for the proper mixing of the Fusion products***.**



A typical profile showing the rise in temperature during the activation of 20 kg of Fusion 8088 two-pack in a plastic bin.

Note: If a shaft stirrer is not available, the mixing procedure can be performed through the following alternative procedure:

1. Add component B to component A while stirring with a spatula, or preferably with a drill-powered stirrer, according to the procedure described in 1-3 above.

2. After the addition of B, carefully seal the container and place it on a drum roller and let it roll for the time described in the table above for maturation to occur. A rolling speed of 90-120 rpm will generally be adequate.

Starting temperature of reactants	Peak temperature of mixture	Indicative maturation time
10˚C (50˚F)	35-40˚C (95-105˚F)	2h
23˚C (73˚F)	45-50˚C (115-120˚F)	2h
35˚C (95˚F)	57-62˚C (135-145˚F)	2h

Filtering: The material is sieved before being shipped from our factory, but, as an added precaution, we strongly recommend that you filter it through a sieve after activation, prior to use. Check the PDS for the most adequate filter size for the product in use.

Pot life: The pot life of the activated product is influenced by the temperature at which the product is stored, and to some extent by the peak temperature of activation. Generally speaking, if the product is stored at room temperature (23˚C [73˚F]) after the activation, it will re-

main usable for at least 48 hours, often longer. If you need to store the activated product longer, it is strongly recommended to refrigerate the mixture at 4˚C (40˚F).

Application of the products

Fusion is designed for spray application. A coating line equipped with HVLP spray guns with 1.0-1.2 nozzles are optimal for the application. The air supply should be properly filtered, and free of oil and moisture (dry).

When setting the spray conditions, set air pressure between 3.5 and 4.5 bar. If using a pressure drum to feed the product, apply a relative pressure of 0.7-0.8 bar to the drum. These figures should be considered as starting points and may be subject to adjustments for the optimization of the process, depending on line setup.

The container in which the product is held during the application should be equipped with a stirrer to prevent the settling of particles during the application.

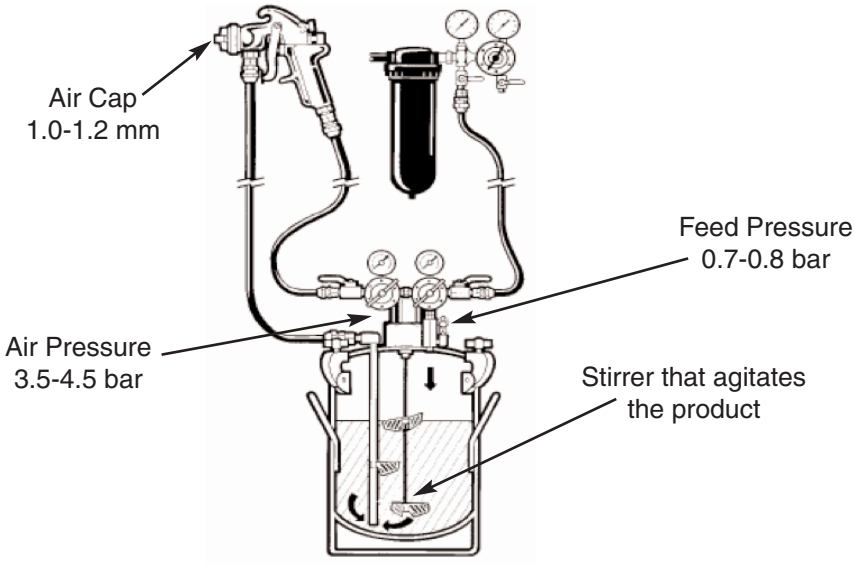
The product must be applied on preheated parts, ideally between 45 and 55°C (115-130˚F). A lower temperature can contribute to a sagging of the coating or cause substrate wetting defects. A higher temperature may result in dry spraying.

If a two-coat system is applied, the topcoat must be applied on the basecoat wet-on-wet, provided that the substrate has been conveniently preheated.

In order to have consistent application, it is recommended that you periodically check the substrate temperature with an IR thermometer.

The basecoat should be sprayed with a dry-film thickness ranging from 20-30 µm (measured on smooth aluminum).

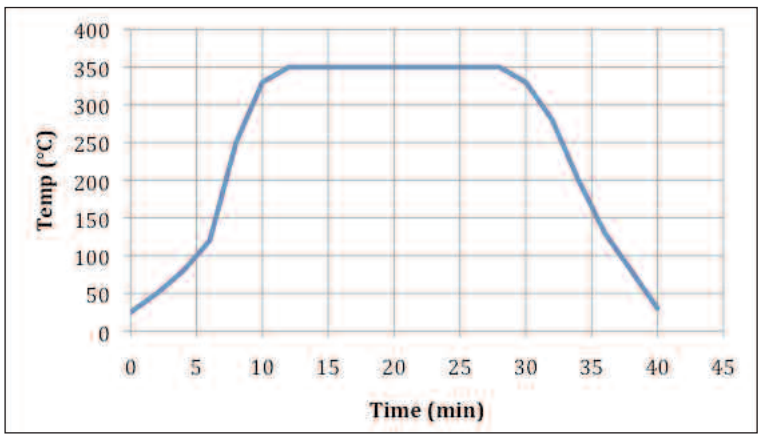
The topcoat should be sprayed with a dry-film thickness ranging from 10-20 µm (measured on smooth aluminum).



Typical layout of a pressure drum used in the application of Fusion.

Curing of the products

Once the coatings are applied to the part, they must be cured properly to develop the ideal chemical-physical characteristics. The curing stage should start with a smooth temperature ramp at low temperatures to flash off the product, then maintain a part metal temperature of 350˚C (662˚F) for 20 minutes.



Typical cure schedule for Fusion 8088.

Optimum curing for Fusion 8088 is achieved in a conveyor oven, but curing can also take place in a box oven by setting the temperature ramps and dwell time.

An undercure will typically result in lower mechanical properties, softness of the coating and less adhesion and cohesion; an overcure will typically result in stress cracking and lower gloss.

Cleaning of the equipment

All equipment should be rinsed immediately after use or at the end of the working shift.

The equipment can be rinsed with water if the coating is still fresh and wet. If the product dries or ages on the equipment, Whitford Solvent 634 is recommended to loosen and dissolve the coating.

Troubleshooting Guide for Fusion

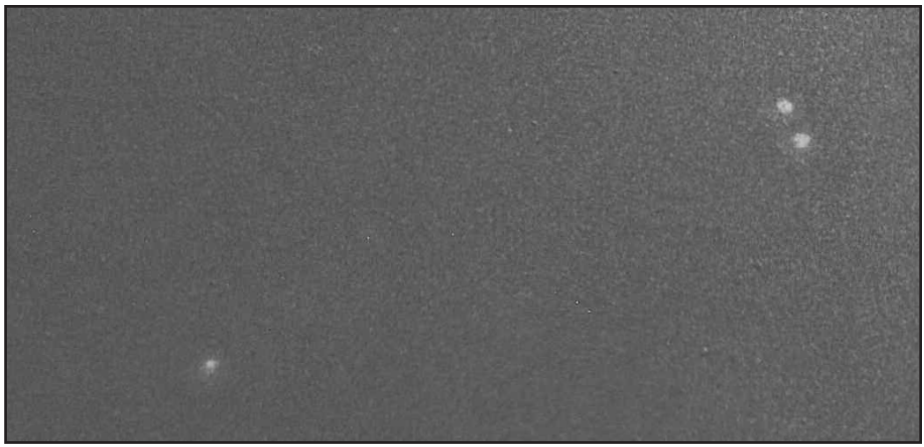
Whitford has been solving coating problems for customers since our founding in 1969. One fact has stood out during our years of trouble-shooting: When a coating fails, the chances are it is not the coating that is at fault — but the application process.

There are so many variables in applying coatings that can lead to failure. The purpose of what follows is not to cast blame, but to explain what can go wrong and how to put it right.

Following are the most common complaints we hear from customers all over the world, illustrated with enlarged photographs to show the problem clearly. Each complaint is covered in three parts:

1. Appearance: what the problem looks like.
2. Probable causes of the problem.
3. Suggested solutions.

If the problem still persists, contact your Whitford representative or Whitford directly (see addresses at end) and we will do our best to solve it for you.



Fisheyes

Appearance

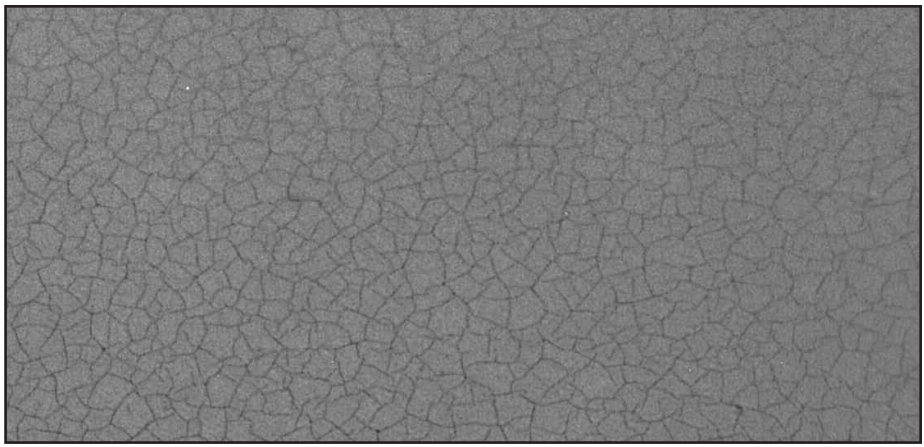
- Round, crater-like holes that penetrate to the substrate.

Probable causes

- Contaminants that prevent coating from wetting out the surface (such as grease from fingerprints or oil in the compressed air).
- Maturation time not sufficient after the activation of the products.
- Temperature of the substrate is too low.
- Temperature of the activated products is too low.

Suggested solutions

- Review the handling, cleaning and surface-preparation procedures to assure the surface is free from contamination *prior to coating*.
- Install/check efficiency of oil/water trap.
- Wait for the activated products to be properly matured.
- Increase the temperature of the substrate.
- Increase the temperature of the activated products.



Mudcracking

Appearance

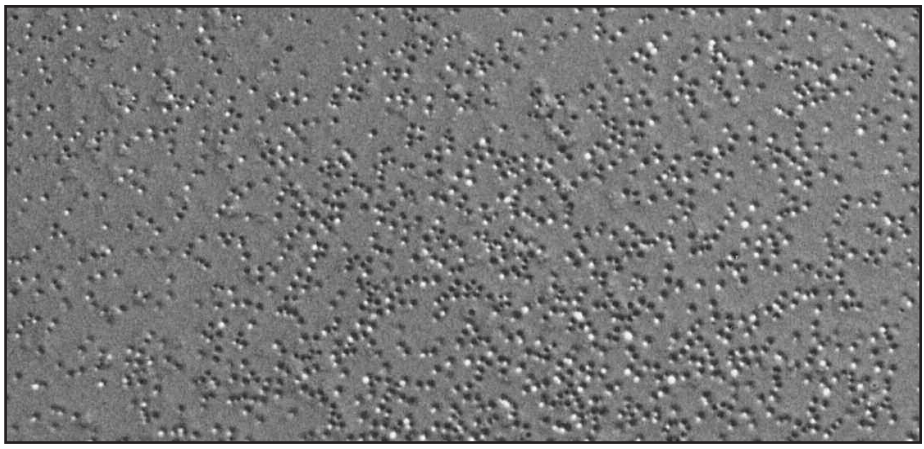
- Thousands of tiny splits or cracks in the coating surface resembling dried mud.

Probable causes

- The coating has been applied too thickly.
- Coating flashed too quickly or at too high a temperature.
- Coating cured with an improper temperature profile.

Suggested solutions

- Apply a thinner film.
- Check the flashing process.
- Check the curing curve of the oven: increase the time to reach the dwell temperature.



Overspray cratering

Appearance

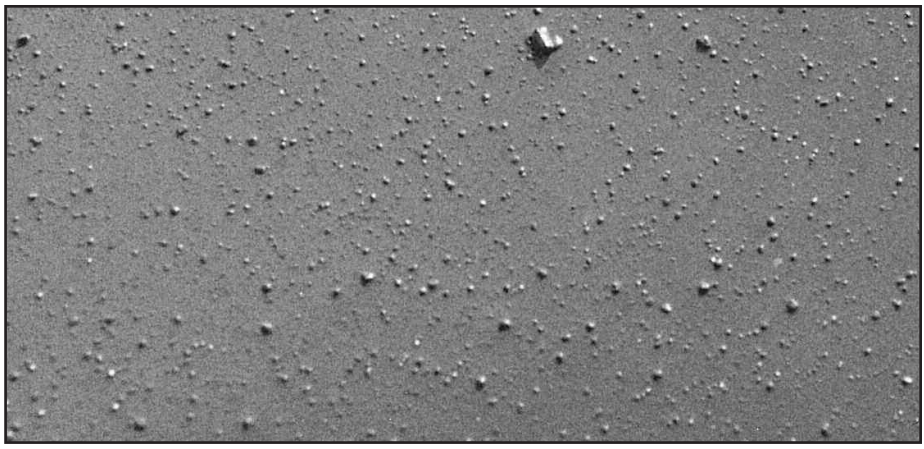
- Small particles of coating that reach a surface not intentionally sprayed (such as overspray from an exterior enamel reaching the interior of a pan).

Probable cause

- Too much overspray in application process.

Suggested solutions

- Move the spray gun closer to the surface; reduce the velocity of the spray; or increase the ratio of coating to air in the spray.
- Mask part to avoid overspray reaching other surfaces.
- Increase air exhaust around the parts to remove spray.



Particulate contamination

Appearance

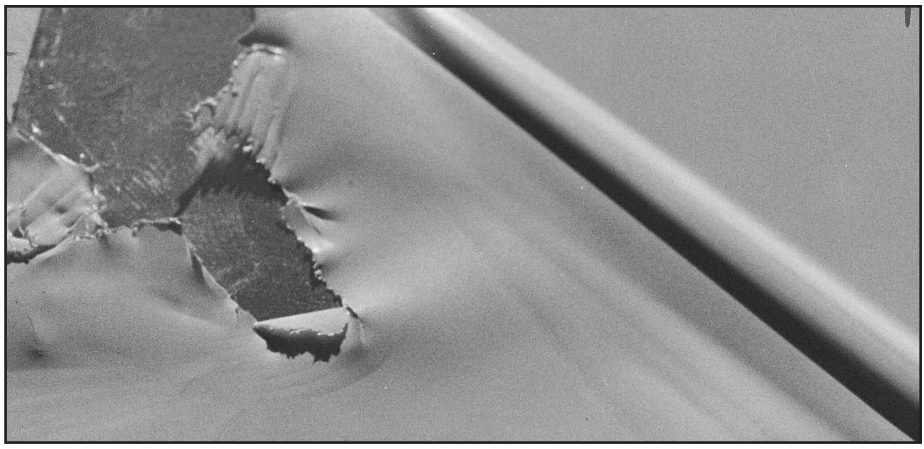
- Hard bits (particles) on the surface of coated parts.

Probable causes

- Dried coating inside the container falling back into coating.
- Airborne particles either in the spray area or oven.
- Incorrect activation of the product.
- Temperature reached was too high during activation (>50˚C/122˚F).

Suggested solutions

- Filter the coating before using.
- Keep the spray area clean and free of dust.
- Vacuum and remove any particulate matter from the oven.
- Repeat the activation by checking the sequence of additions.
- Reduce the starting temperature of the reactants or reduce heat during activation by means of a jacketed container.



Peeling, flaking

Appearance

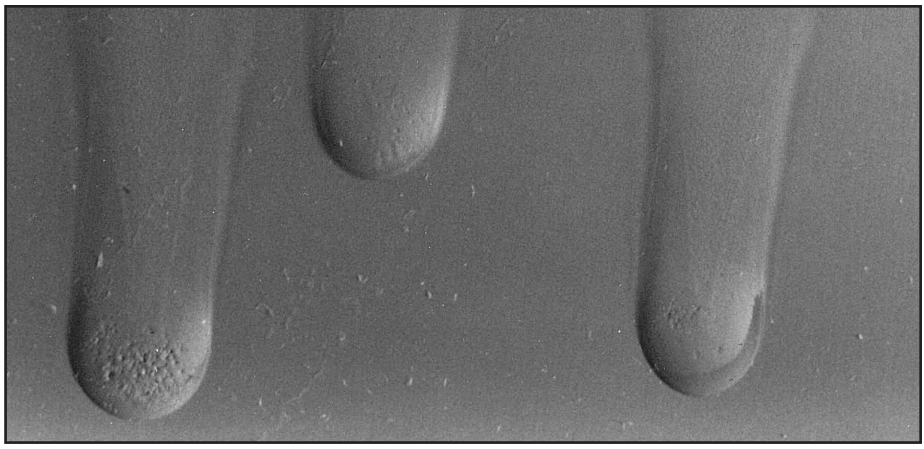
- Sections of coating that lift easily off the substrate.

Probable causes

- Contamination, improper surface preparation.
- Improper cure.
- Incompatibility of substrate.

Suggested solutions

- Improve process of cleaning substrate to assure a sufficient surface roughness (>2.5 Ra).
- Check curing procedure.



Sagging

Appearance

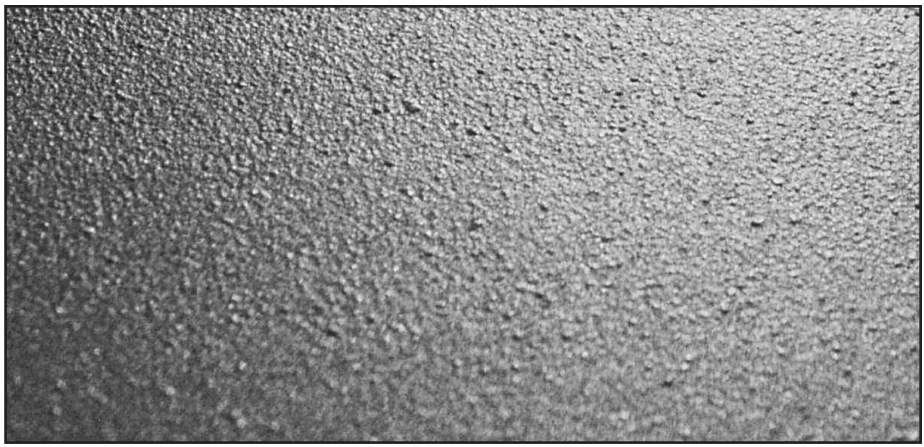
- Coating that runs before drying, leaving raised rivulets.

Probable causes

- Temperature of the substrate is too low.
- The coating is applied too thickly.

Suggested solutions

- Apply thinner coats.
- Apply to pre-heated parts.



Dry spray

Appearance

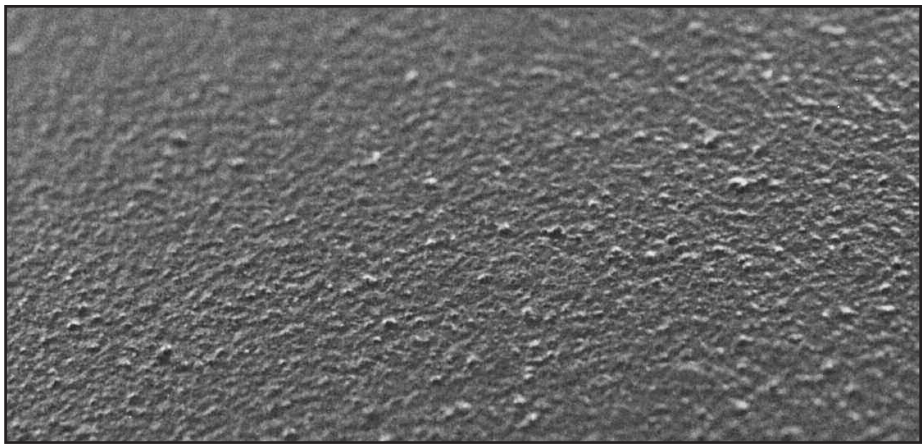
- A rough, mottled surface, similar to orange peel, with low gloss.

Probable causes

- Dry-film thickness (DFT) is too low; the coating is being drawn in by the substrate surface roughness.
- Substrate surface roughness is too high.
- Temperature of the substrate is too high.
- The pot life of the coating has expired.

Suggested solutions

- Increase the amount of coating.
- Check the surface preparation and makes sure it is in the range indicated by the product specifications.
- Check and eventually reduce the substrate temperature.
- Activate a fresh batch.



Blisters

Appearance

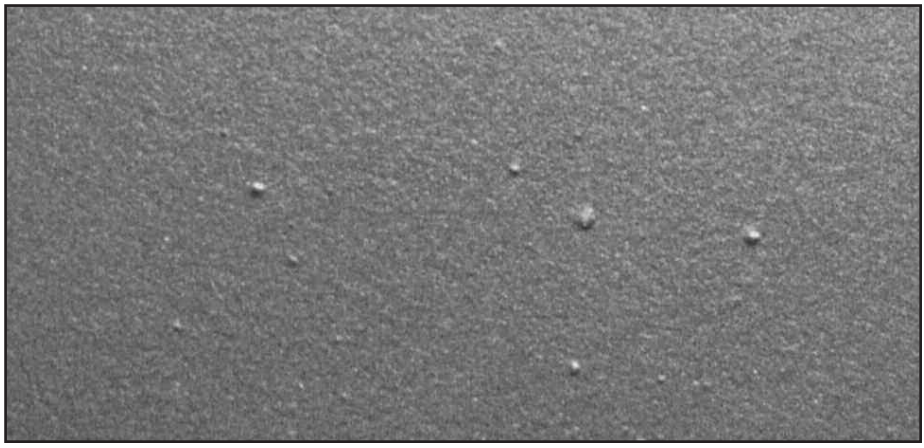
- Small blister-like bumps on the coating surface.

Probable causes

- Coating has been applied too thickly with a fast film formation.
- Rapid evaporation of solvents, or increasing part temperature too quickly.

Suggested solutions

- Apply a thinner coat.
- Reduce the heating rate of the coated article.
- Preheat parts, then coat and cure immediately.
- Increase the length of the flash-off.



Gun spitting

Appearance

- Coarse drops of coating thrown from the spraying gun onto the surface of the coated article.

Probable causes

- Dirty air cap or needle of the spraying equipment.
- Inadequate air capping size.
- Air pressure too high or too low.

Suggested solutions

- Dismantle the spray gun and check the cleanliness of the equipment.
- Check if the used air capping has the correct size as per technical specifications (1.0-1.2mm).
- Increase or reduce the spraying pressure to optimize the spraying.

The Fusion Critical Path Check List

Fusion 8088 is a two-coat system, with a primer and a topcoat. Both primer and topcoat are two-pack systems, with a part A (activator) and a part B (base). These two packs must be mixed carefully to achieve maximum benefit from the primer and the topcoat which, together, make the finished Fusion coating.

How the ingredients in Fusion are mixed is crucially important. So, too, is the order in which the steps take place.

Whitford created a tear-out check list to help assure that Fusion comes out perfect every time. There are six pages that follow, each with a full check list for both primer and topcoat.

Critical steps Primer	Part A	Part B	Parts A+B mixed
1. Premixing (stir/roll)	_____min.	_____min.	N/A
2. Temp. after premixing	_____˚C/˚F	_____˚C/˚F	N/A
3. Add B to A	N/A	N/A	N/A
• Time activation starts	N/A	N/A	_____
• Temp. at 10 min.	N/A	N/A	_____˚C/˚F
• Temp. at 15 min.	N/A	N/A	_____˚C/˚F
• Temp. at 60 min.	N/A	N/A	_____˚C/˚F
• Peak temperature	N/A	N/A	_____˚C/˚F
4. Filter	N/A	N/A	_____
5. Storage temperature	N/A	N/A	_____˚C/˚F
6. Time put on line	N/A	N/A	_____
7. Time taken off line	N/A	N/A	_____

Critical steps Topcoat	Part A	Part B	Parts A+B mixed
1. Premixing (stir/roll)	_____min.	_____min.	N/A
2. Temp. after premixing	_____˚C/˚F	_____˚C/˚F	N/A
3. Add B to A	N/A	N/A	N/A
• Time activation starts	N/A	N/A	_____
• Temp. at 10 min.	N/A	N/A	_____˚C/˚F
• Temp. at 15 min.	N/A	N/A	_____˚C/˚F
• Temp. at 60 min.	N/A	N/A	_____˚C/˚F
• Peak temperature	N/A	N/A	_____˚C/˚F
4. Filter	N/A	N/A	_____
5. Storage temperature	N/A	N/A	_____˚C/˚F
6. Time put on line	N/A	N/A	_____
7. Time taken off line	N/A	N/A	_____

Critical steps Primer	Part A	Part B	Parts A+B mixed
1. Premixing (stir/roll)	_____min.	_____min.	N/A
2. Temp. after premixing	_____˚C/˚F	_____˚C/˚F	N/A
3. Add B to A	N/A	N/A	N/A
• Time activation starts	N/A	N/A	_____
• Temp. at 10 min.	N/A	N/A	_____˚C/˚F
• Temp. at 15 min.	N/A	N/A	_____˚C/˚F
• Temp. at 60 min.	N/A	N/A	_____˚C/˚F
• Peak temperature	N/A	N/A	_____˚C/˚F
4. Filter	N/A	N/A	_____
5. Storage temperature	N/A	N/A	_____˚C/˚F
6. Time put on line	N/A	N/A	_____
7. Time taken off line	N/A	N/A	_____

Critical steps Topcoat	Part A	Part B	Parts A+B mixed
1. Premixing (stir/roll)	_____min.	_____min.	N/A
2. Temp. after premixing	_____˚C/˚F	_____˚C/˚F	N/A
3. Add B to A	N/A	N/A	N/A
• Time activation starts	N/A	N/A	_____
• Temp. at 10 min.	N/A	N/A	_____˚C/˚F
• Temp. at 15 min.	N/A	N/A	_____˚C/˚F
• Temp. at 60 min.	N/A	N/A	_____˚C/˚F
• Peak temperature	N/A	N/A	_____˚C/˚F
4. Filter	N/A	N/A	_____
5. Storage temperature	N/A	N/A	_____˚C/˚F
6. Time put on line	N/A	N/A	_____
7. Time taken off line	N/A	N/A	_____

Critical steps Primer	Part A	Part B	Parts A+B mixed
1. Premixing (stir/roll)	_____min.	_____min.	N/A
2. Temp. after premixing	_____˚C/˚F	_____˚C/˚F	N/A
3. Add B to A	N/A	N/A	N/A
• Time activation starts	N/A	N/A	_____
• Temp. at 10 min.	N/A	N/A	_____˚C/˚F
• Temp. at 15 min.	N/A	N/A	_____˚C/˚F
• Temp. at 60 min.	N/A	N/A	_____˚C/˚F
• Peak temperature	N/A	N/A	_____˚C/˚F
4. Filter	N/A	N/A	_____
5. Storage temperature	N/A	N/A	_____˚C/˚F
6. Time put on line	N/A	N/A	_____
7. Time taken off line	N/A	N/A	_____

Critical steps Topcoat	Part A	Part B	Parts A+B mixed
1. Premixing (stir/roll)	_____min.	_____min.	N/A
2. Temp. after premixing	_____˚C/˚F	_____˚C/˚F	N/A
3. Add B to A	N/A	N/A	N/A
• Time activation starts	N/A	N/A	_____
• Temp. at 10 min.	N/A	N/A	_____˚C/˚F
• Temp. at 15 min.	N/A	N/A	_____˚C/˚F
• Temp. at 60 min.	N/A	N/A	_____˚C/˚F
• Peak temperature	N/A	N/A	_____˚C/˚F
4. Filter	N/A	N/A	_____
5. Storage temperature	N/A	N/A	_____˚C/˚F
6. Time put on line	N/A	N/A	_____
7. Time taken off line	N/A	N/A	_____

Critical steps Primer	Part A	Part B	Parts A+B mixed
1. Premixing (stir/roll)	_____min.	_____min.	N/A
2. Temp. after premixing	_____°C/°F	_____°C/°F	N/A
3. Add B to A	N/A	N/A	N/A
• Time activation starts	N/A	N/A	_____
• Temp. at 10 min.	N/A	N/A	_____°C/°F
• Temp. at 15 min.	N/A	N/A	_____°C/°F
• Temp. at 60 min.	N/A	N/A	_____°C/°F
• Peak temperature	N/A	N/A	_____°C/°F
4. Filter	N/A	N/A	_____
5. Storage temperature	N/A	N/A	_____°C/°F
6. Time put on line	N/A	N/A	_____
7. Time taken off line	N/A	N/A	_____

Critical steps Topcoat	Part A	Part B	Parts A+B mixed
1. Premixing (stir/roll)	_____min.	_____min.	N/A
2. Temp. after premixing	_____°C/°F	_____°C/°F	N/A
3. Add B to A	N/A	N/A	N/A
• Time activation starts	N/A	N/A	_____
• Temp. at 10 min.	N/A	N/A	_____°C/°F
• Temp. at 15 min.	N/A	N/A	_____°C/°F
• Temp. at 60 min.	N/A	N/A	_____°C/°F
• Peak temperature	N/A	N/A	_____°C/°F
4. Filter	N/A	N/A	_____
5. Storage temperature	N/A	N/A	_____°C/°F
6. Time put on line	N/A	N/A	_____
7. Time taken off line	N/A	N/A	_____

Critical steps Primer	Part A	Part B	Parts A+B mixed
1. Premixing (stir/roll)	_____min.	_____min.	N/A
2. Temp. after premixing	_____°C/°F	_____°C/°F	N/A
3. Add B to A	N/A	N/A	N/A
• Time activation starts	N/A	N/A	_____
• Temp. at 10 min.	N/A	N/A	_____°C/°F
• Temp. at 15 min.	N/A	N/A	_____°C/°F
• Temp. at 60 min.	N/A	N/A	_____°C/°F
• Peak temperature	N/A	N/A	_____°C/°F
4. Filter	N/A	N/A	_____
5. Storage temperature	N/A	N/A	_____°C/°F
6. Time put on line	N/A	N/A	_____
7. Time taken off line	N/A	N/A	_____

Critical steps Topcoat	Part A	Part B	Parts A+B mixed
1. Premixing (stir/roll)	_____min.	_____min.	N/A
2. Temp. after premixing	_____°C/°F	_____°C/°F	N/A
3. Add B to A	N/A	N/A	N/A
• Time activation starts	N/A	N/A	_____
• Temp. at 10 min.	N/A	N/A	_____°C/°F
• Temp. at 15 min.	N/A	N/A	_____°C/°F
• Temp. at 60 min.	N/A	N/A	_____°C/°F
• Peak temperature	N/A	N/A	_____°C/°F
4. Filter	N/A	N/A	_____
5. Storage temperature	N/A	N/A	_____°C/°F
6. Time put on line	N/A	N/A	_____
7. Time taken off line	N/A	N/A	_____

Critical steps Primer	Part A	Part B	Parts A+B mixed
1. Premixing (stir/roll)	_____min.	_____min.	N/A
2. Temp. after premixing	_____˚C/˚F	_____˚C/˚F	N/A
3. Add B to A	N/A	N/A	N/A
• Time activation starts	N/A	N/A	_____
• Temp. at 10 min.	N/A	N/A	_____˚C/˚F
• Temp. at 15 min.	N/A	N/A	_____˚C/˚F
• Temp. at 60 min.	N/A	N/A	_____˚C/˚F
• Peak temperature	N/A	N/A	_____˚C/˚F
4. Filter	N/A	N/A	_____
5. Storage temperature	N/A	N/A	_____˚C/˚F
6. Time put on line	N/A	N/A	_____
7. Time taken off line	N/A	N/A	_____

Critical steps Topcoat	Part A	Part B	Parts A+B mixed
1. Premixing (stir/roll)	_____min.	_____min.	N/A
2. Temp. after premixing	_____˚C/˚F	_____˚C/˚F	N/A
3. Add B to A	N/A	N/A	N/A
• Time activation starts	N/A	N/A	_____
• Temp. at 10 min.	N/A	N/A	_____˚C/˚F
• Temp. at 15 min.	N/A	N/A	_____˚C/˚F
• Temp. at 60 min.	N/A	N/A	_____˚C/˚F
• Peak temperature	N/A	N/A	_____˚C/˚F
4. Filter	N/A	N/A	_____
5. Storage temperature	N/A	N/A	_____˚C/˚F
6. Time put on line	N/A	N/A	_____
7. Time taken off line	N/A	N/A	_____

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How to contact Whitford

Whitford manufactures and maintains offices in many countries around the world. For more information, please contact your Whitford representative or the nearest Whitford office (see our website: whitfordww.com) or email sales@whitfordww.com.

Whitford

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