

Contamination Spy – Manual



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Introduction

Contamination Spy is an examination powder used for plastic parts. A large variety of contaminations, e. g. finger prints, residues of creams, corrosion protection sprays and release agents as well as fats, can be detected easily, extensively and quickly on plastic surfaces. The powder is composed of fine particles, which adhere on the contaminations, but do not or only slightly moisten clean surfaces, so that contaminated areas can well be identified. Since the powder appears silver on dark surfaces and dark grey on light surfaces, a clear contrast between surface and the contaminations marked with the powder is always available.

In the following the application of *Contamination Spy*, the possible results and their interpretation will be elucidated.

1. Filmic contaminations

Filmic contamination on uncoated plastic parts could have a variety of causes, e. g. finger prints, release and cleaning agents, preserving sprays for machines and components. These contaminations are normally not visible in the first instance, though become visible by refining the parts, e. g. by painting, electroplating or vacuum metallization, causing rejects.

Contaminations form a barrier between the applied metal or varnish layer and the plastic surface and thus reduce the adhesion of the applied media on the parts drastically. This results in gloss differences, shadows on the surface and blistering or delamination of the metal/ varnish layer. In worst case the adhesion is disturbed in a way that the refining layer can be easily wiped from the plastic surface. The contamination acts as separating agent and lubricant.

Besides the negative influence of the contaminations on the plastic parts, they also cause a contamination of the used equipment (electroplating bathes, painting chamber, vacuum metallization chamber).

2. Working principle

Contamination Spy is a fine powder, which sticks on filmic contaminations of diverse types and highlights them by the color of the powder. *Contamination Spy* adheres in lesser quantities on clean surfaces, so that the contaminations contrast from the clean surface. Moreover, the powder appears silver on dark surfaces and dark grey on light surfaces, so that a remarkable contrast to the parts surface is always given and the detection of the contaminations is facilitated. The amount of contamination on the surface is mirrored by the amount of adherent powder and thereby in the intensity of the silver/ dark grey coloration.

Contamination Spy can be used for a variety of plastic types. The following materials were already tested:

- polycarbonate	PC
- styrene-copolymers / blends	ABS PC/ABS ABS/PA
- polyamide	PA
- polybutylene terephthalate	PBT
- polyolefines	PP
- polyphenylene ether	PPE

On smooth and high polished surfaces the contaminations can be visualized especially well. Also on slightly structured surfaces the contaminations highlighted with the powder can be easily identified. A clean, structured surface is weakly moistened with the powder. On intensively structured surfaces the powder might also cover the structures, even in clean areas, whereby the identification of contaminations is hampered.

Contamination Spy is not appropriate to identify contaminations on (thermoplastic) elastomers, since the powder also heavily moistens clean surfaces, so that an explicit identification of contaminations is strongly hampered or even impossible.

3. Application

Prearrangement

Since the powder is very fine, it leaves a slight film on the impinged parts and the surrounding. This film can be removed with water, ethanol, isopropanol or acetone. If the surrounding surface is not smooth, it becomes more difficult to remove the powder completely. It is therefore recommended to cover the working area with paper, a smooth, wipeable base or a foil, which can be cleaned or disposed afterwards.

As personal protective equipment gloves, goggles and dusk mask are recommended. A coat is advisable to protect the clothes when working longer time with the powder. The application should be limited to the plastic parts and the distribution of the powder in the air should be avoided. Please consider the hints in the safety data sheet.

The parts to be proved should not be cleaned previously to avoid a blurring or the removal of the contaminations.

Application of *Contamination Spy*

To avoid a contamination of the powder, it should be poured into a bowl (e. g. an aluminum bowl or a petri dish) or onto a paper and then tip with the zephyr brush slightly on the powder. *Contamination Spy* can be applied very economically, it is sufficient when the powder comes in contact with the end of the zephyr fibers. Alternatively, the cap of the powder container can be used, the adherent powder is sufficient. Move the brush slightly over the inner side of the cap. This can also be done in a slight rotating movement.



Figure 1: Wetting of the zephyr brush with the *Contamination Spy* powder, which adheres on the cap of the product vessel

Apply the *Contamination Spy* powder uniformly with the zephyr brush by rotating the brush with your fingers and moving it over the surface to be examined.



Figure 2: Wetting of the part with *Contamination Spy* powder by a rotating movement of the zephyr brush

Surplus powder can easily be removed from the part's surface with the Marabu brush. Therefore move the brush gently over the whole surface. On clean areas the powder can be removed almost completely. On contaminations the powder adheres so strongly that it cannot be removed with the Marabu brush.

The contaminations on the surface are now clearly visible due to the *Contamination Spy* powder.

Cleaning

Parts without contaminations can be cleaned under running water or with ethanol and the adherent powder can be removed. From sensitive parts the powder can also be removed with a soft wipe moistened with water or ethanol. For the cleaning of the brushes, wiping with a wipe wetted with ethanol and air drying is recommended.

4. Detectable contaminations

Detection of different contaminations with *Contamination Spy* was examined at the Kunststoff-Institut. The results are summarized in table 1.

Different types of plastics react differently to the contaminations and media. Dependent on the material and the color the contaminations could be detected with different intensity. The contaminated parts were analyzed after one day as well as after six weeks after the contamination.

No.	medium	application method	plastic material of the plates		
			PC/ABS Bayblend T65, black	ABS Terluran GP 35, nature	PC Makrolon, crystal clear
1	hand cream by VW	with a cotton-swap a bit of cream was applied and after 5-10 minutes removed with a soft wipe until one cannot see a contamination anymore	traces of wiping are detectable	traces of wiping are detectable; after 6 weeks no contamination could be detected.	traces of wiping are detectable, after 6 weeks the traces were only weakly detectable
2	sun cream by VW				
3	lubricating grease for tools (Hasco)	applied with a brush	traces clearly detectable		
4	corrosion protection agent Antikor (Buchem)	applied with a spray can, a paper template was used to protect the rest of the plastic surface	traces of droplets clearly visible		
5	release agent containing silicone (Felder)				
6	silicone free release agent (OSEXO)		weak wetting with powder, white coloring due to the release agent	almost no wetting with the powder	homogeneous wetting with the powder, traces are hardly detectable, white coating due to the release agent
7	silicone/ vacuum suction cup	imprints of the suction cup detectable	imprints of the suction cup detectable	wetting, but imprints of the suction cup are not detectable	imprints of the suction cup detectable
8	hand sweat solution DIN 53160-2/2001	solution/ spray applied on a fleece wipe and the wipe was dabbed on the plastic plates	traces detectable, without clear contours	blurred traces, hardly to detect	homogeneous wetting, traces are hard to detect
9	silicone spray (Caramba)				

table 1: used test media to contaminate the plastic plates with the respective application method and the comparison of the detection of the contaminations with the powder on different plastic materials.

Since *Contamination Spy* should detect contaminations on plastic surfaces which lead to rejects after the refining of the parts, the contaminated parts were painted, electroplated and vacuum metallized (PVD coated) on the next day as well as after six weeks after their contamination. Thereby the visibility of the contaminations after the refinement and the verification of the contaminations with the powder were correlated. The results are summarized in table 2 and table 3.

No.	medium	with powder		after electroplating	correlation
		1 day	6 weeks		
1	hand cream by VW	+	–	cream speck and traces of wiping visible in different intensity	
2	sun cream by VW	+	–		
3	lubricating grease for tools (Hasco)	+	+	no fat traces of traces of wiping visible, but cloudy surface	
4	corrosion protection agent Antikor (Buchem)	+	+	opaque surface, flow lines visible, no spray traces visible any more	
5	release agent containing silicone (Felder)	+	+	spray traces clearly visible	
6	silicone free release agent (OSEXO)	+	+	opaque, cloudy surface, flow lines are partly visible, compared to the other plates and the plate before the electroplating less opaque surface	
7	silicone/ vacuum suction cup	–	–	no traces of the suction cup visible, surface looks good, due to effects of the other media opaque surface	
8	hand sweat solution DIN 53160-2/2001	+–	+–	opaque surface, imprints are not visible	
9	silicone spray (Caramba)	+	+	imprints of the silicone spray clearly visible, imprints appear more opaque than the rest of the surface.	

table 2: result of the visibility of the contaminations after application of the powder and electroplating, examination plates made of ABS Terluran GP 35 (nature); the last column shows the correlation between the detection of the contaminations by the powder and the electroplating of the parts.

Legend:

+: clearly visible

+–: difficult to detect/ hardly visible

–: not visible

: Correlation between detection by the powder and the result after electroplating

: Correlation between detection by the powder and the result after electroplating after six weeks only conditionally available.

No.	medium	with powder		after painting		after vacuum metallization (PVD coating)	correlation
		1 Tag	6 Wochen	1 Tag	6 Wochen		
1	hand cream by VW	+	+	+	+	shadows, scratches and traces of wiping visible	
2	sun cream by VW	+	+	+	+	shadows, scratches and traces of wiping visible	
3	lubricating grease for tools (Hasco)	+	+	+	+	brush traces of fat clearly visible, less adhesion problems on the plates stored for six weeks	
4	corrosion protection agent Antikor (Buchem)	+	+	+	+	opaque surface, spray traces clearly visible, remarkable adhesion problems, surface seems to be wet	
5	release agent containing silicone (Felder)	+	+	+	+	traces clearly visible, cloudy surface	
6	silicone free release agent (OSEXO)	+	+	+	+	inhomogenous coating	
7	silicone/ vacuum suction cup	+	+-	+-	+-	imprints of the suction cup visible	
8	hand sweat solution DIN 53160-2/2001	+	+	+	+	traces of the hand sweat solution visible	
9	silicone spray (Caramba)	+	+	+	+	remarkable imprints, partly no adhesion at all (black areas)	

table 3: results and visibility of the contaminations after application of the powder, after painting and after vacuum metallization (PVD coating) of the examination plates made of PC/ABS Bayblend T65 (black); the last column shows the correlation between the detection of the traces by the powder and the effects visible after refinement of the plastic parts

Legend:

+: clearly visible

+ -: difficult to detect/ hardly visible

—: not visible

: Correlation between detection by the powder and the result after electroplating

Accompanying and applicable documents: safety data sheet