JOTUN

Troubleshooting Guide

Jotun Powder School

DISCLAIMER
The listed causes of defects and their solutions are for general guidance only, based on Jotun's knowledge and experience, it is not meant to be an exhaustive list. There are many factors contributing to the final appearance and quality of a coated object. Always follow the powder manufacturer's recommendations for the specific powder coating in Technical Data Sheet. The overall performance of the coating system is largely dependent on the nature of the substrate, the type and quality of the pretreatment along with the application equipment. Therefore, for optimal results, it is recommended to follow the pretreatment and application equipment supplier's instructions and recommendations as well.

We can provide you with additional information or arrange Powder School training sessions. Please feel free to reach out to our dedicated Jotun representative.

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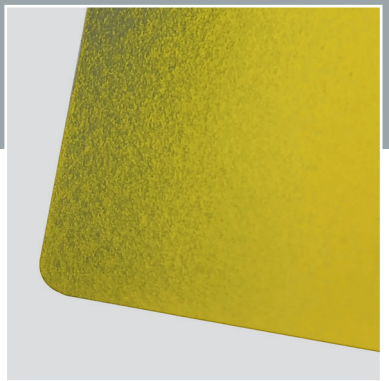
1 DECORATIVE DEFECTS



1.1 Low film thickness

May lead to lower corrosion resistance, shine-through of the substrate, incorrect surface appearance.

Cause	Solution
Gun is too far from the object	Appropriate distance between the gun and the object (in general, 15-25 cm is ideal)
Incorrect dispensing of powder by the gun (worn-out pump, blocked or bent hose, blocked gun, incorrect fluidization)	Check and secure correct functioning of the whole feeding system – fluidization, pumps, hoses, guns
Low feeding or transportation pressure of the air (small amount or low speed of powder)	Set sufficient feeding air pressure (amount of powder) and transportation air pressure (velocity of powder)
Powder is not sufficiently charged	Secure a sufficient level of powder charging
Insufficient earthing of coated parts	Secure proper earthing (< 1 MΩ)

1.2 Insufficient charging of powder

May lead to low film thickness, insufficient penetration, higher risk of back ionization, higher amount of waste.

1.2.1 Corona application

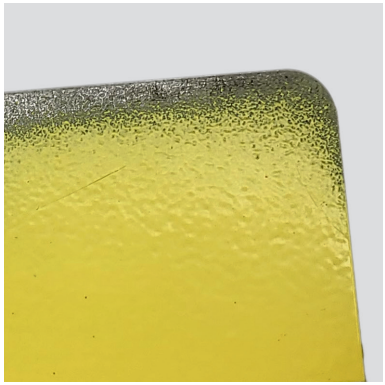
Cause	Solution
Incorrect setting of charging voltage and current	Correct setting of charging voltage and current
Bad condition or contact of the charging electrode	Inspection, alternatively replacement of the electrode

1.2.2 Tribo application

Cause	Solution
Low transportation air pressure	Sufficient transportation air pressure
Clogged or worn-out charging tube	Regular cleaning, alternatively replacement of charging tubes
Insufficient earthing of the gun	Check and ensure proper earthing (< 1 MΩ)
High proportion of fine powder (e.g., recycled powder)	Keep sufficient proportion of fresh powder (ideal ratio is 70:30 of fresh to recycled powder)

1.3 Insufficient earthing of coated objects

Insufficient earthing of coated objects causes low film thickness, insufficient spraying around the hanging points, intensification of the Faraday cage effect, increase of the back ionization effect.



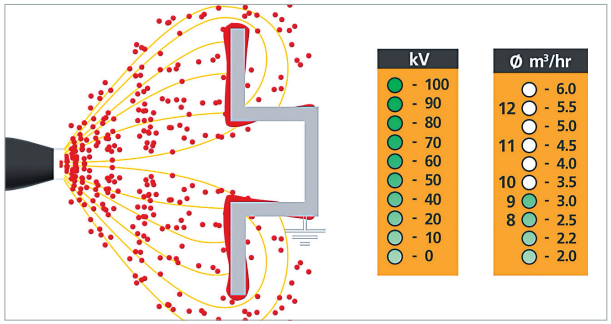
Cause	Solution
Heavily coated hinges and hooks	Regular cleaning of hinges and hooks • Controlled pyrolysis • Chemical cleaning • Mechanical cleaning (blasting, hot fluidized bed) Use blowing nozzles on hinges after spraying

1.4 Insufficient penetration of inner recesses, Faraday cage effect

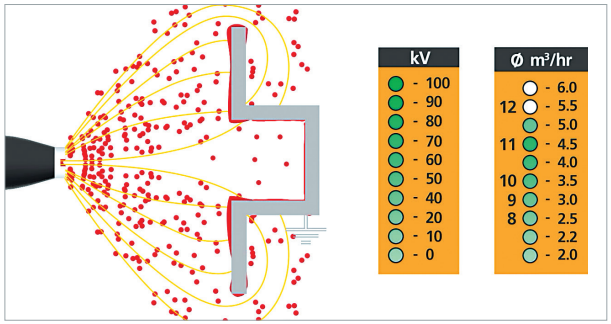
Cause	Solution
Too broad a shape of the powder cloud (e.g., from the deflector nozzle)	Use the slit nozzle
Small amount or velocity of powder	Set sufficient feeding air pressure (amount of powder) and transportation air pressure (velocity of powder)
Insufficient earthing	Check and ensure proper earthing (< 1 MΩ)
Incorrect direction of the coating application	Correct direction of the coating application
High air flow rate	Adjust air flow rate according to the coated material
Charging voltage is too high (Corona application)	Decrease the charging voltage

Faraday cage effect

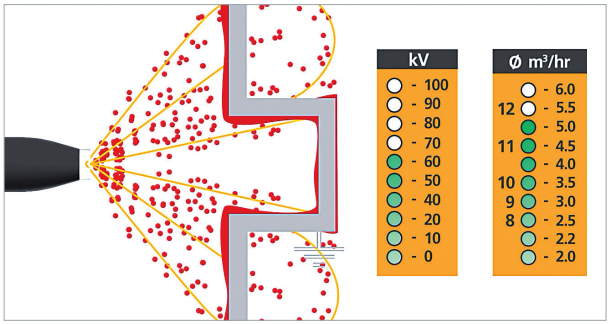
Picture 1:
High voltage causes worse penetration of the powder into inner recesses.



Picture 2:
Increase of the transportation air pressure enables the powder particles to escape the electrostatic field and penetrate into recesses.



Picture 3:
Lower voltage weakens the electrostatic field and enables the powder particles to penetrate into recesses.

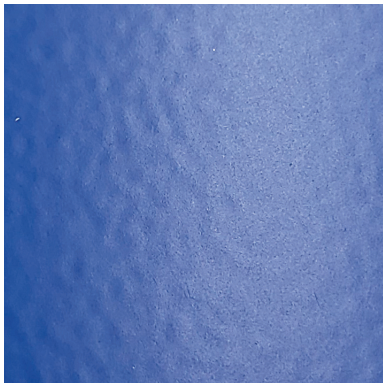


1.5 Back ionization (overcharging of the powder coating layer)

Commonly occurs with Corona application, minimally with Tribo application.

Cause	Solution
Excessive film thickness	Apply film thickness recommended in TDS Adjust powder output
High charging voltage and current	Decrease the charging values Use automatic charging current regulation function (standard for newer Corona guns) Use the free ion collector
Insufficient earthing	Check and ensure proper earthing (< 1 MΩ)
Gun is too close to the object	Appropriate distance between the gun and the object (in general, 15-25 cm is ideal)
High proportion of fine powder (e.g., recycled powder)	Keep sufficient proportion of fresh powder (ideal ratio is 70:30 of fresh to recycled powder)
Complex geometry of coated objects	Use appropriate hanging technique Check gun configuration
Spraying one spot for too long	Avoid concentrating the electrostatic field to one spot, use appropriate spraying technique

1.6 Orange peel effect

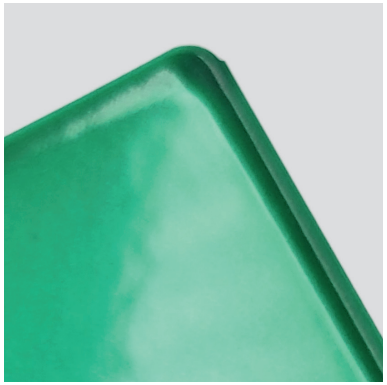


Cause	Solution
Film thickness outside the specification (too low or too high)	Apply film thickness recommended in TDS Adjust powder output
Back ionization effect (overcharging) with Corona application	Correct setting of Corona application Use the free ion collector
Gun is too close to the object	Appropriate distance between the gun and the object (15-25 cm is ideal)
Heat-up rate is too fast	Measure the oven temperature profile and adjust the heat-up rate

1.7 Sagging

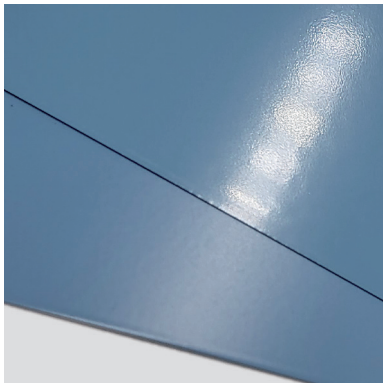
Cause	Solution
Piling up on edges	Make sure the recommended film thickness is kept Decrease the charging voltage Use appropriate hanging technique Use a “powder thief” - a dummy object to spread the electrostatic field
Excessive film thickness	Apply film thickness recommended in TDS
Slow heat-up rate	Ensure adequate temperature rise during the curing process Use IR booster
Unsuitable powder formulation for the given use	Use a more reactive powder, consult the powder manufacturer

1.8 Frame effect



Cause	Solution
Excessive film thickness	Apply film thickness recommended in TDS
Charging voltage is too high (Corona application)	Use appropriate charging voltage
Sprayed objects are too far from each other	Use appropriate hanging technique
Inappropriate hanging	Check configuration of guns Use appropriate hanging technique to spread the electrostatic field across more objects

1.9 Gloss difference



1.9.1 Gloss is too low

Cause	Solution
Overcuring, temperature too high and/or curing time too long	Prevent overcuring – correct setting of temperature/time according to TDS
Gloss influenced by gas burning residues (in direct gas ovens)	Use powder resistant to gas-oven residues
Contamination by incompatible powder coating – creation of pinholes	Avoid mixing with incompatible powder coating
Incorrect film thickness – creation of the „frozen" effect due to excessive thickness	Apply film thickness recommended in TDS

1.9.2 Gloss is too high

Cause	Solution
Insufficient curing time and/or curing temperature is too low	Ensure sufficient curing – measure the temperature profile of the oven, use correct setting of temperature/curing time

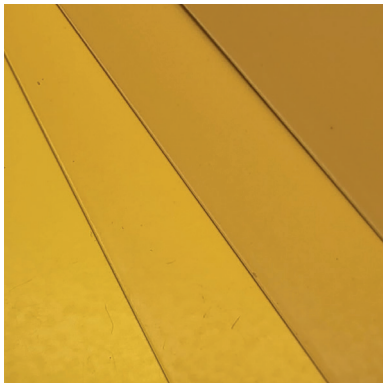
1.10 Incorrectly structured finish

Cause	Solution
Holes reaching to the substrate: low film thickness	Apply film thickness recommended in TDS
Flat finish, incomplete texture, fine texture too rough: • Excessive film thickness • Heat-up rate is too slow (heavy pieces, slow rise of temperature in the oven)	Apply film thickness recommended in TDS Ensure adequate temperature rise during the curing process
Insufficient earthing	Check and ensure proper earthing (< 1 MΩ) Use clean hooks
Incorrect distance of the gun from the object	Appropriate distance between the gun and the object (in general, 15-25 cm is ideal)

1.11 Changes of metallic effect

Cause	Solution
Separation of metallic pigment during the recycling process (excessive proportion of recycled powder in the system)	Use bonded metallic powder instead of dry-blended Ensure continuous and sufficient feeding of fresh powder into the system (ideal ratio is 70:30 of fresh to recycled powder)
Charging values are too high (Corona application)	Decrease the charging values
Insufficient earthing	Check and ensure proper earthing (< 1 MΩ)
Insufficient fluidization	Secure correct fluidization

1.12 Colour change



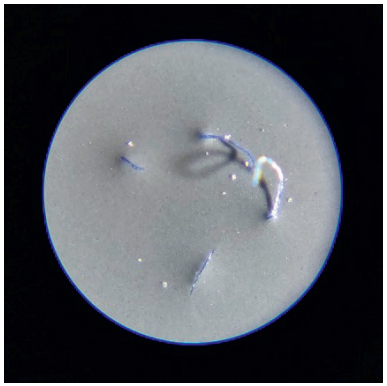
Cause	Solution
Overcuring – degradation of organic pigments (bright colours), yellowing of resin	Monitor and correct setting of the curing process
Yellowing of resin as a reaction to gas burning residues (in direct gas ovens)	Use powder resistant to gas burning residues
High, low or non-homogenous film thickness	Apply film thickness recommended in TDS
Different curing types (IR, direct or indirect gas, ...)	Cure powder with the same oven type, per recommended curing conditions
Curing materials with different object thickness at the same time	Cure objects only with similar thickness at the same time Use powder with enhanced yellowing resistance

1.13 Contamination by solid particles

Cause	Solution
Powder residues after insufficient cleaning	Regular and thorough cleaning of the booth, application and recycling system
Contamination from the paint shop (fibers, dust and metal particles, ...)	Isolate the booth Do not allow mechanical processing around the booth Balance the air flow in the paint shop
Contamination from the curing oven (benzyl, dust, ...)	Clean the inside of the curing oven periodically
Contamination from materials (metal particles from cutting, blasting, sanding and welding, ...)	Isolate such processes from the paint shop

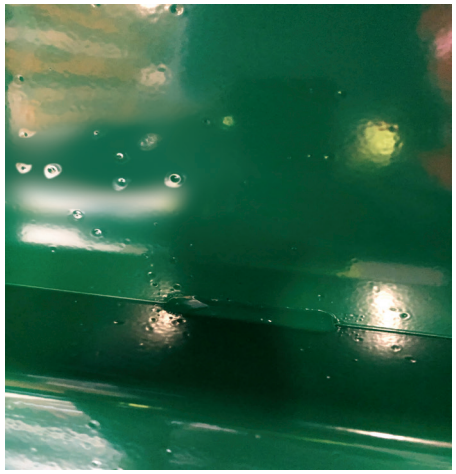
1. CONTAMINATION WITH POWDER PARTICLES

2. FIBRE IN POWDER COATING



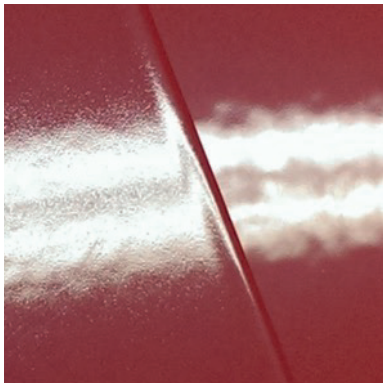
1.14 Craters and defects from degassing of porous substrates

Cause	Solution
Contamination from silicones, oil, vaseline, grease	Eliminate all silicone-based materials from the paint shop and clean the booth system Avoid using oil-based spray Use only approved lubricants for conveyors etc.
Contamination by incompatible powder coating	Clean the booth system and the paint shop
Insufficiently degreased substrate	Test pretreatment conditions, adjust where necessary
Presence of oil and humidity in compressed air	Check the air filter Consult the maintenance department Check compressed air system (in general, dew point < 3 °C, oil content < 0.1 ppm, particle size < 0.3 micron)
Highly porous substrate releasing gases creating closed or opened bubbles	Degassing by high temperature in the oven before coating Use powder for porous substrates – “degassing” products



1.15 Pinholes

Pinholes are not only a decorative defect which may cause lower gloss, but also may lead to lower corrosion resistance.

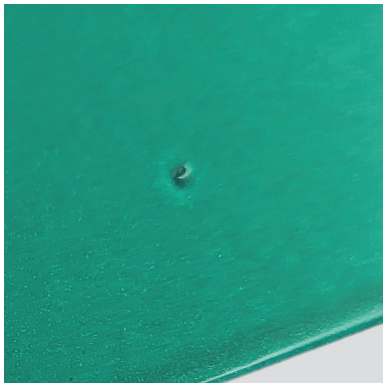


Cause	Solution
Degassing of the powder coating layer: • Excessive film thickness • Heat-up rate is too fast	Apply film thickness recommended in TDS Slower rise of the temperature
Contamination by incompatible powder coating	Avoid mixing with incompatible powder coating
Insufficient substrate pretreatment	Degrease the substrate properly Surface conversion per supplier specification

1.16 Water residues

Cause	Solution
Water residues from pretreatment	Use appropriate hanging technique
	Secure technological holes for drainage of hollows
	Ensure sufficiently high temperature and sufficiently long drying process – but avoid burning of the conversion layer (generally, chromate < 90 °C, phosphate < 120 °C, nanoceramic < 160 °C; always follow the pretreatment supplier's recommendation).

1.17 Bits, lumps



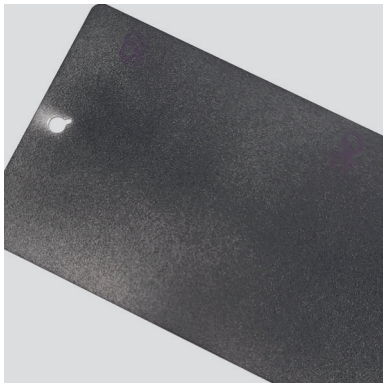
1.17.1 Bits

Cause	Solution
Low film thickness	Apply film thickness recommended in TDS

1.17.2 Lumps

Cause	Solution
Spitting of guns	Secure fluent feeding of the powder (e.g., use correct air pressure setting, check the condition of powder pumps and hoses)
Moist powder	Follow storage conditions (up to 25 °C and 60 % humidity) Use a sieve in the recycling system Secure proper fluidization
Loosened clumps of powder from the recycling or application system	Use a sieve in the recycling system Clean the application system or change its parts
Improper storage or transport conditions	Follow storage conditions (up to 25 °C and 60 % humidity) Check powder expiry date

1.18 Striping



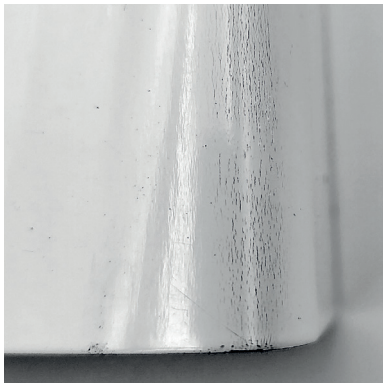
Cause	Solution
Incorrect distance of the gun from the object	Appropriate distance between the gun and the object (in general, 15-25 cm is ideal)
Incorrect stroke settings (robotic systems)	Adjust the sinus curve, balance the oscillator stroke according to the conveyor speed
Insufficient charging or overcharging	Use voltage and current setting appropriate to the object geometry and application conditions Check the charging performance of guns
Insufficient earthing	Check and ensure proper earthing (< 1 MΩ) Use clean hooks
High proportion of fine powder (e.g., recycled powder)	Keep sufficient proportion of fresh powder (ideal ratio is 70:30 of fresh to recycled powder)

2 MECHANICAL PROPERTIES, CHEMICAL AND CORROSION RESISTANCE

2.1 Poor adhesion of the powder to the substrate

Cause	Solution
Insufficient curing	Ensure full curing as recommended in TDS
Extreme overcuring	Check oven temperature settings
Insufficient substrate pretreatment	Check pretreatment parameters Regular adhesion testing (cross-cut test) is recommended

2.2 Cracking of the coating in bends and after impact

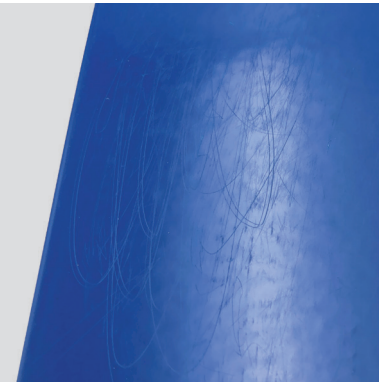


Cause	Solution
Insufficient curing – such coating is always more fragile	Ensure full curing as recommended in TDS
Excessive film thickness	Apply film thickness recommended in TDS
Contamination from the curing oven (benzyl, dust, ...)	Check and secure sufficient substrate pretreatment
Insufficient substrate pretreatment	Check pretreatment parameters Regular adhesion testing (cross-cut test) is recommended

2.3 Poor chemical resistance

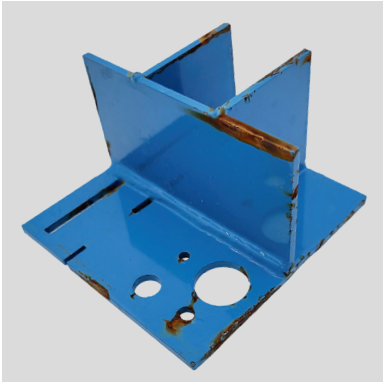
Cause	Solution
Insufficient curing	Ensure full curing as recommended in TDS Regular monitoring by a MEK-test

2.4 Poor scratch resistance



Cause	Solution
Insufficient curing	Ensure full curing as recommended in TDS
Improper assembly, handling, packaging or transport	Avoid sliding material against each other Use suitable packaging material (bubble wrap, foam, tissue paper, ...)

2.5 Corrosion



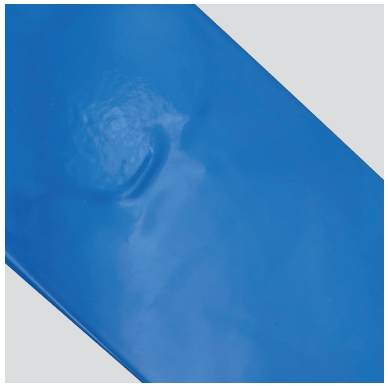
Cause	Solution
Insufficient substrate pretreatment	Check and secure sufficient substrate pretreatment
Unsuitable pretreatment type	Use pretreatment per the required corrosion resistance
Low film thickness	Apply film thickness recommended in TDS – monitor mainly sharp edges and recesses
Insufficient curing	Ensure full curing as recommended in TDS
Object edges are too sharp	Consider rounding sharp edges

3 APPLICATION DEVICES – IMPACT ON QUALITY AND EFFICIENCY OF POWDER COATING

3.1 Powder pumps

Damaged pumps may lead to lower corrosion resistance, shine-through of the substrate, incorrect surface appearance.

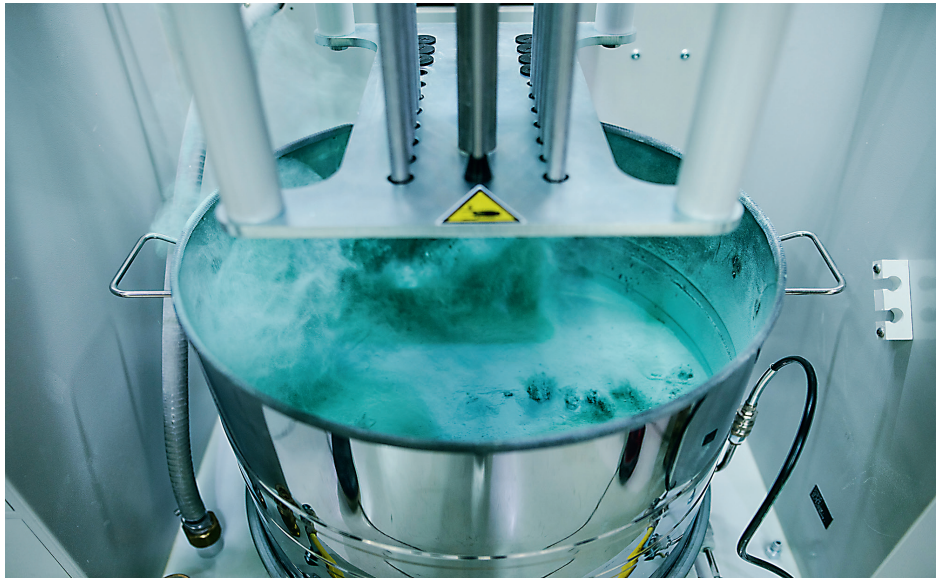
Cause	Solution
Worn-out or clogged ejector inserts	Regular checks and replacement of ejector inserts
Incorrect setting of ejection and transportation air pressure	Correct setting of feeding and transportation air pressure: optimal amount and speed of powder in order to reach maximum efficiency of spraying the powder – ideal thickness, minimum of powder to be recycled



3.2 Hopper – fluidization

Correct fluidization is necessary for pumping and transporting powder to guns. Incorrect fluidization can cause insufficient or irregular feeding of powder into guns leading to irregular film thickness, spitting.

Cause	Solution
Blocked or defective fluidizing membrane	Regular checks of fluidized bed condition, its tightness
Inadequate air pressure	Set the appropriate fluidization air amount; small amount causes incorrect fluidization, excessive amount causes wild fluidization (dust rising, excessive amount of air in the mixture)
Moist powder	Follow storage conditions (up to 25 °C and 60 % humidity) Check powder expiry date Check compressed air system (in general, dew point < 3 °C, oil content < 0.1 ppm, particle size < 0.3 micron) Humidity could be removed by sufficiently long fluidization
Powder affected by too high temperatures	Consult powder coating manufacturer
High proportion of fine powder (e.g., recycled powder)	Keep sufficient proportion of fresh powder (ideal ratio is 70:30 of fresh to recycled powder) Secure fluent feeding of the powder Reduced content of the free-flow additive, contact powder coating manufacturer

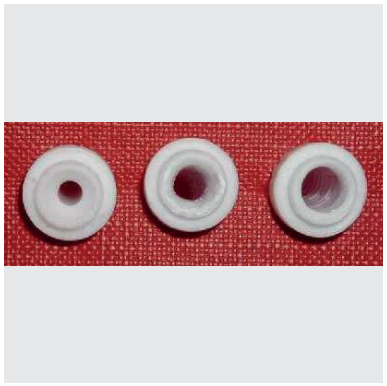


3.3 Clogging of hoses, impact fusion

Cause	Solution
Pinched hose, sharp bends, excessive wear and tear	Choose suitable hose type with adequate length and diameter, recommended by supplier Regular checks, cleaning and replacements of hoses
High or low air flow rate	Adjust the air flow rate

3.4 Application guns

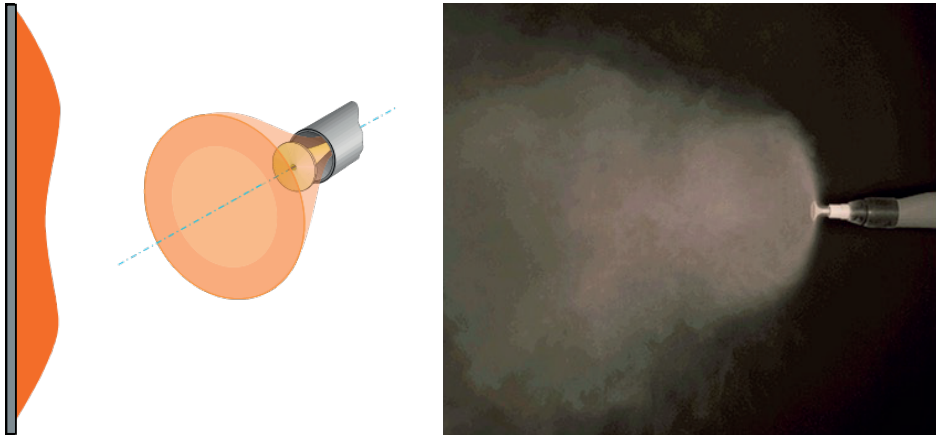
Correct functioning and setting of guns is crucial for efficient application without needless losses, reaching the necessary film thickness and elimination of negative effects like back ionization, Faraday cage effect etc.



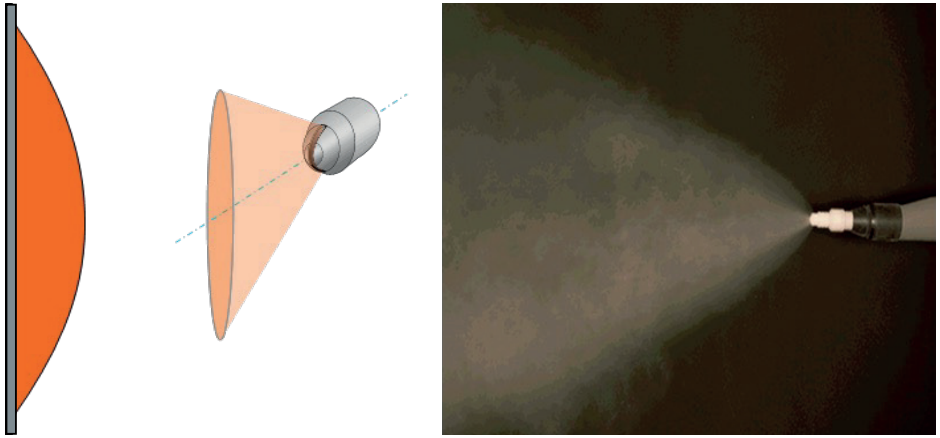
Cause	Solution
Worn-out internal parts of the gun or impact fusion of powder	Regular cleaning and checking of passability of the gun
Bad contact or damage of charging electrode or another electric component of the gun	Regular checks of the electrode condition, measuring real values of charging voltage

3.4.1 Nozzle types

Deflector nozzle – suitable for coating flat surfaces, simpler shapes.



Slit nozzle – suitable for coating more complex shapes, inner corners etc.



Notes

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