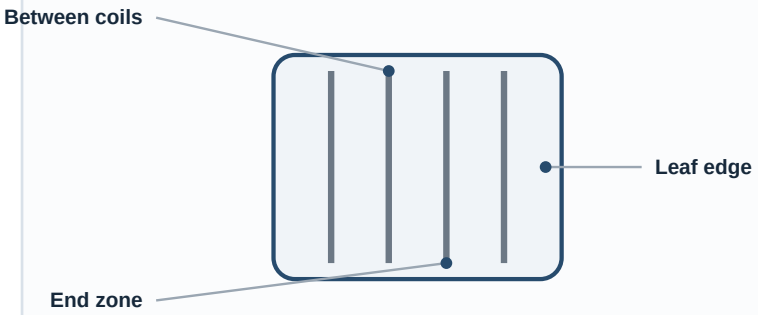
UNDERSTAND THE SURFACE BEFORE DESIGNING THE COATING.

Suspension Springs (Coil & Leaf Spring) — Continuous cyclic flexing (fatigue), road-salt corrosion, gravel/stone impact and mud abrasion. Before designing the right coating, we evaluate the material chemistry, the geometry and the service conditions together.

PART DIAGRAM — SUSPENSION SPRINGS (COIL & LEAF SPRING)



COATING CROSS-SECTION



Five questions define a coating system

1 MATERIAL
Spring steel (SiCr / 51CrV4 class), heat-treated high-strength wire/bar. Surface decarburisation and residual stress affect adhesion.

2 SURFACE
Shot blasting removes scale and oxide; the residual compressive stress is preserved for fatigue life, and oil and residues are cleaned.

3 GEOMETRY
On coil springs, narrow gaps between coils create a Faraday cage and powder build-up; on leaf springs, overlap surfaces and sharp edges are hard to cover.

4 SERVICE CONDITIONS
Continuous cyclic flexing (fatigue), road-salt corrosion, gravel/stone impact and mud abrasion

5 PRODUCTION TARGET
Medium-high volume; a flexible but strongly adhering film that survives cycling, with a corrosion guarantee.

CONCLUSION: For the Suspension Springs, the goal is not just a good-looking finish; it is a flexible powder-coated surface that follows cyclic flexing without cracking and withstands road salt and stone chipping.

FROM SURFACE TO PROCESS ENGINEERING FLOW

The Suspension Springs cannot be coated like just any part. A sound process needs measurement, pretreatment, the right coating selection, application and verification to work together.

01 **ANALYSIS** Substrate + surface
02 **PRETREATMENT** Cleaning + conversion
03 **COATING** Chemistry + film
04 **APPLICATION** Electrostatics + flow
05 **CURING** Time + temperature
06 **VERIFICATION** Test + record

A. Surface Characterisation

The condition of the substrate surface (cleanliness, roughness, oxide/scale and any weld zones) is determined. The right process starts with the right definition of the surface.

MEASURABLE INPUTS
Surface cleanliness • roughness • weld marks

B. Pretreatment Design

Shot blasting + zinc phosphate conversion coating; a controlled pretreatment that does not disturb the residual stress, for fatigue performance.

CORE TARGET
Clean, active, uniform, repeatable surface

C. Coating System Selection

A toughened, stone-chip-resistant epoxy/hybrid powder flexible enough to follow the spring's movement is selected; a film that does not crack under cyclic flexing is targeted.

DECISION CRITERIA
Durability • appearance • service life • cost

D. Application Engineering

Electrostatic powder coating, 60–90 µm; a low ramp rate and guns on both sides give penetration between narrow coils, and edge coverage is optimised.

GEOMETRY EFFECT
Between coils • Leaf edge • End zone

Managing the process with data, not by eye

µm
FILM THICKNESS
Coating uniformity

°C
PART TEMPERATURE
Actual cure condition

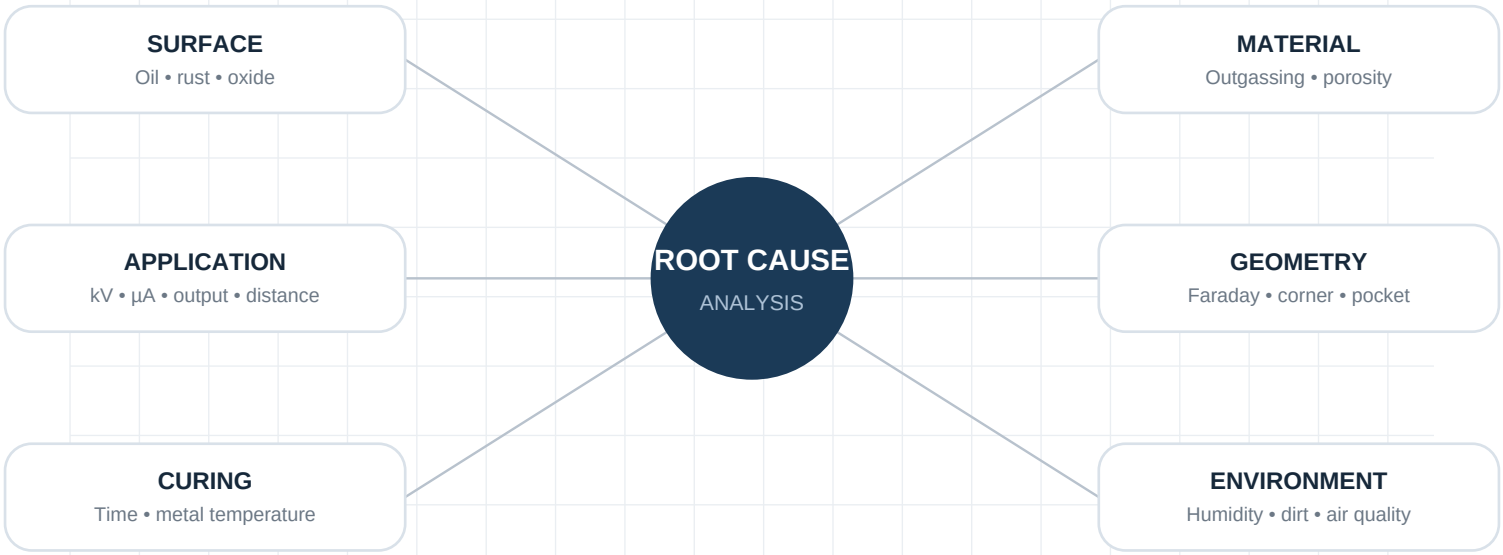
kV / µA
ELECTROSTATIC CHARGE
Transfer and penetration

Ω
GROUNDING
Charge dissipation and stability

ENGINEERING PRINCIPLE In the Suspension Springs process, we define a process window rather than a single parameter. The aim is to reproduce the same surface quality across different shifts and part conditions.

A SURFACE DEFECT IS A SYMPTOM, NOT THE ROOT CAUSE

Coating defects rarely come from a single setting. The same symptom may stem from surface preparation, material, electrostatic behaviour, film thickness or curing.



Common defects and diagnostic approach

POOR ADHESION

The coating detaches from the surface or fails in testing.

CHECK: cleaning / pretreatment / cure

ORANGE PEEL

Uneven flow; the surface looks wavy or rough.

CHECK: film / flow / temperature

PINHOLE / CRATER

Pinholes or local craters form on the surface.

CHECK: dirt / gas / humidity / oven

FARADAY ZONE

Insufficient penetration in deep corners and pockets.

CHECK: geometry / kV-µA / air

BACK-IONIZATION

Star/blister defects from overcharging.

CHECK: current / distance / thickness

UNEVEN THICKNESS

Thin and thick areas on the same part.

CHECK: position / motion / output

DIAGNOSTIC PROTOCOL

1 Define the symptom → **2** Measure the data → **3** Isolate the cause → **4** Test one variable → **5** Standardise

A GOOD SURFACE PROCESS must be measurable • repeatable • traceable • optimisable. This approach is the basis of part-specific application guides for parts such as the Suspension Springs.

THE RIGHT EQUIPMENT, AT THE RIGHT SCALE.

For the Suspension Springs, production volume drives the equipment choice. At low and medium volume, manual systems give flexibility; in series production, automatic systems apply the same recipe to every part.

LOW / MEDIUM VOLUME

Manual application



Elite / Elite Plus

Manual powder coating units; kV, µA and air settings.



Smart AI

Suggests settings for the part; guides the operator in manual work.



Manual Powder Coating Gun

Light, ergonomic hand gun.



Manual Powder Booth

Manual application and powder recovery.



Box Oven

Curing in batch production.

SERIES PRODUCTION

Automatic line



Automatic Powder Coating Gun

Series application in fixed or moving arrays.



OWL + Smart AI

Recipe-based, zone-by-zone application in difficult areas.



Single / Two-Axis Reciprocator

Automates the gun motion.



PVC Monocyclone Booth

Fast cleaning and powder recovery.



Powder Center

Fast colour change on automatic lines.



Conveyor Oven & Pretreatment

Surface preparation and curing on a continuous line.

OWL INTEGRATION In difficult areas such as between coils, leaf edge, end zone, OWL applies targeted, zone-by-zone coating with a Smart AI recipe. For details, see the “OWL — Wire & Mesh” application sheet.

PROJECT SUPPORT Share your line, your part and your production target, and we will define the equipment selection and the booth, oven and conveyor layout together. strong3000.com · info@strong3000.com · WhatsApp +90 537 353 54 19