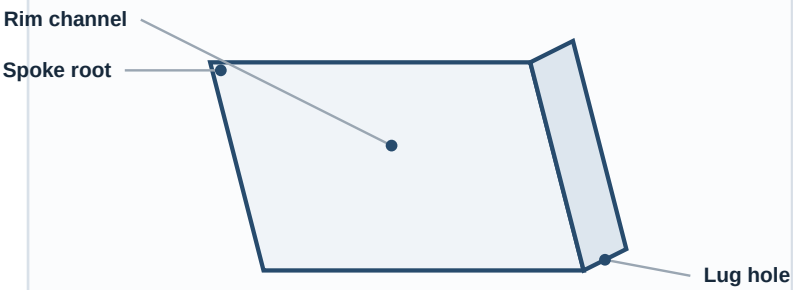
UNDERSTAND THE SURFACE BEFORE DESIGNING THE COATING.

Alloy Wheel (Cast/Forged Aluminium) — Road salt and chemicals, brake dust, stone chipping, UV and high expectations for visible surface quality. Before designing the right coating, we evaluate the material chemistry, the geometry and the service conditions together.

PART DIAGRAM — ALLOY WHEEL (CAST/FORGED ALUMINIUM)



COATING CROSS-SECTION



Five questions define a coating system

1 MATERIAL
Cast or forged aluminium alloy (A356 / 6061 class), machined surface. Aluminium porosity makes it prone to outgassing during curing.

2 SURFACE
Machining oil, chips and casting residues are removed; a uniform, active surface must be achieved after shot blasting/polishing.

3 GEOMETRY
Rim channels, spoke roots and lug holes form a Faraday cage; sharp flange edges carry a risk of edge pull-back.

4 SERVICE CONDITIONS
Road salt and chemicals, brake dust, stone chipping, UV and high expectations for visible surface quality

5 PRODUCTION TARGET
High-volume wheel line; automation targeting colour/gloss consistency and low scrap.

CONCLUSION: For the Alloy Wheel, the goal is not just a good-looking finish; it is a deep, consistent powder-coated surface in colour and gloss that withstands road salt, stone chipping and UV.

FROM SURFACE TO PROCESS ENGINEERING FLOW

The Alloy Wheel 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

Alkaline degreasing, acid etching, rinsing and a chrome-free silane/nano-ceramic conversion coating; controlled preheating (degassing) before curing drives out pore gas from the aluminium.

CORE TARGET
Clean, active, uniform, repeatable surface

C. Coating System Selection

A multi-layer system of primer powder + polyurethane/polyester base + clear powder is selected; UV, stone-chip and chemical resistance are targeted together with a deep appearance.

DECISION CRITERIA
Durability • appearance • service life • cost

D. Application Engineering

Electrostatic powder coating, 60–100 µm; a low ramp rate, current limit and a robotic/multi-axis motion recipe address the Faraday effect in rim channels and spoke roots.

GEOMETRY EFFECT
Rim channel • Lug hole • Spoke root

Managing the process with data, not by eye

µm
FILM THICKNESS
Coating uniformity

°C
PART TEMPERATURE
Actual cure condition

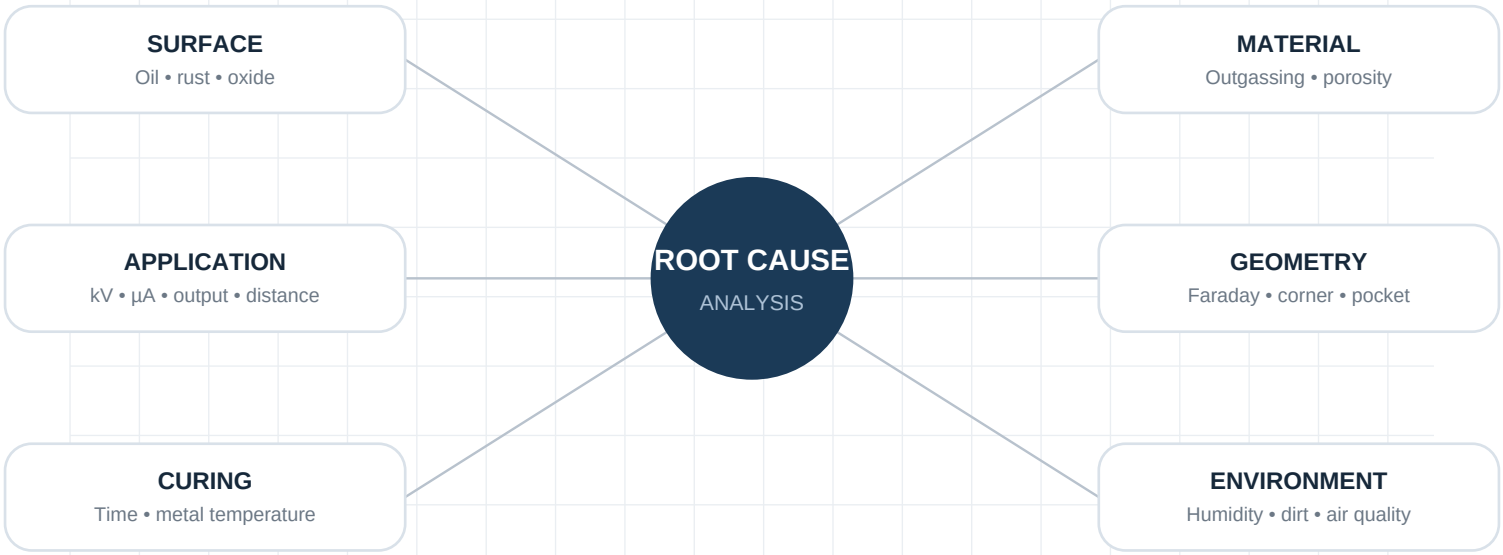
kV / µA
ELECTROSTATIC CHARGE
Transfer and penetration

Ω
GROUNDING
Charge dissipation and stability

ENGINEERING PRINCIPLE In the Alloy Wheel 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 Alloy Wheel.

THE RIGHT EQUIPMENT, AT THE RIGHT SCALE.

For the Alloy Wheel, 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 rim channel, lug hole, spoke root, OWL applies targeted, zone-by-zone coating with a Smart AI recipe. For details, see the “OWL — Wheel Rim” 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