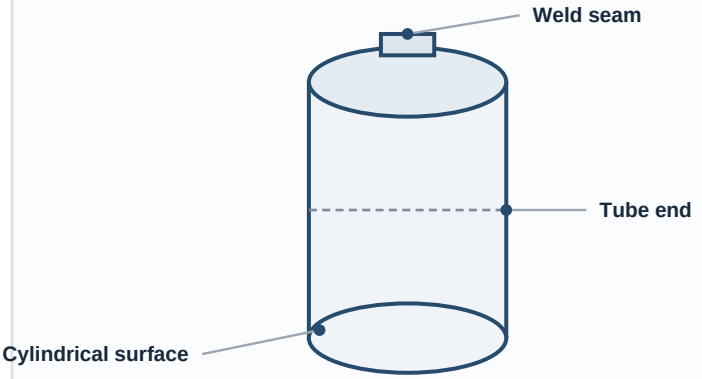
UNDERSTAND THE SURFACE BEFORE DESIGNING THE COATING.

Round Steel Tube (Continuous Line) — Outdoors, humidity and UV; long-term corrosion protection in construction/fencing applications. Before designing the right coating, we evaluate the material chemistry, the geometry and the service conditions together.

PART DIAGRAM — ROUND STEEL TUBE (CONTINUOUS LINE)



COATING CROSS-SECTION



Five questions define a coating system

1 MATERIAL
Welded/seamless carbon steel tube (S235/S355 or galvanised), 1.5–4 mm wall thickness. Coated on a continuous line, either hung or processed from coil.

2 SURFACE
Mill scale, rust and drawing oils must be removed; a uniform, active surface must be achieved at continuous line speed.

3 GEOMETRY
Keeping a constant gun-to-part distance on the cylindrical surface and edge coverage at tube ends; a uniform film along the ERW weld seam is critical.

4 SERVICE CONDITIONS
Outdoors, humidity and UV; long-term corrosion protection in construction/fencing applications

5 PRODUCTION TARGET
High line speed; continuous production with low scrap and consistent film thickness.

CONCLUSION: For the Round Steel Tube, the goal is not just a good-looking finish; it is a consistent, fully covered powder-coated surface on a continuous line that withstands outdoor corrosion and UV.

FROM SURFACE TO PROCESS ENGINEERING FLOW

The Round Steel Tube 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, scale/rust removal, rinsing and drying on a continuous line; on galvanised tube, passivation/conversion coating secures adhesion.

CORE TARGET
Clean, active, uniform, repeatable surface

C. Coating System Selection

A polyester (TGIC/HAA) powder is selected for outdoor durability and colour stability; high-performance polyester is preferred for applications with high UV exposure.

DECISION CRITERIA
Durability • appearance • service life • cost

D. Application Engineering

Electrostatic powder coating, 60–90 µm; gun arrays and tube rotation/hanger motion are set to the line speed for all-round coverage on the cylindrical surface in a recovery booth.

GEOMETRY EFFECT
Tube end • Weld seam • Cylindrical surface

Managing the process with data, not by eye

µm
FILM THICKNESS
Coating uniformity

°C
PART TEMPERATURE
Actual cure condition

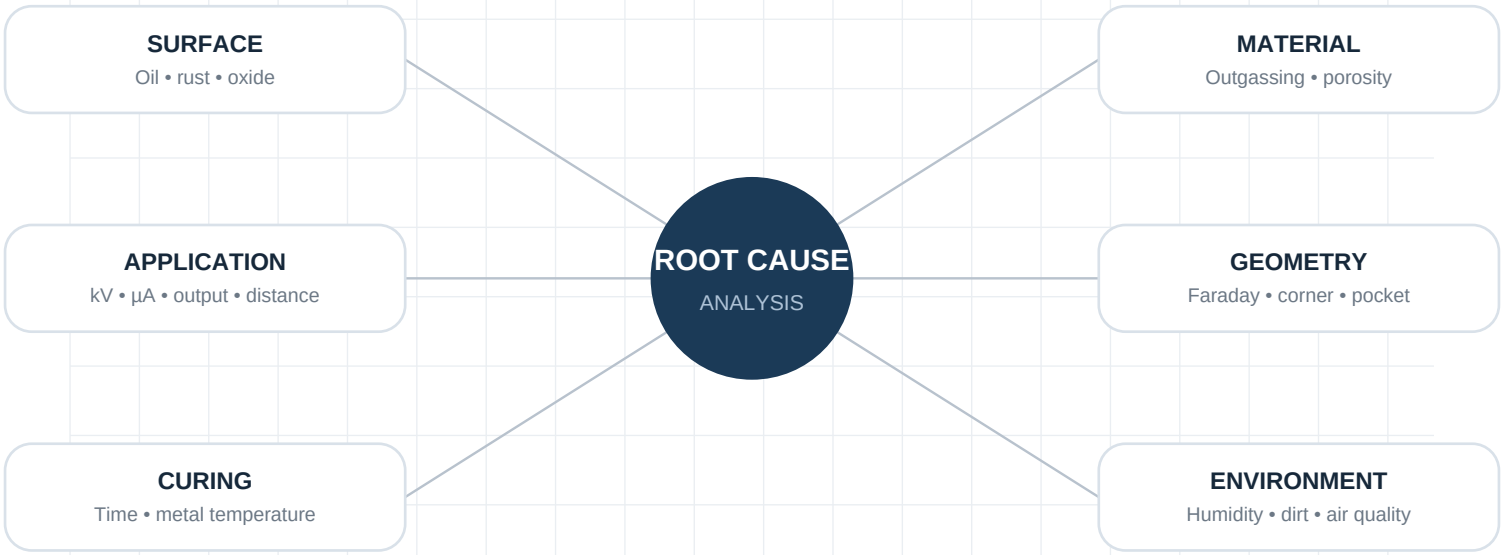
kV / µA
ELECTROSTATIC CHARGE
Transfer and penetration

Ω
GROUNDING
Charge dissipation and stability

ENGINEERING PRINCIPLE In the Round Steel Tube 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 Round Steel Tube.

THE RIGHT EQUIPMENT, AT THE RIGHT SCALE.

For the Round Steel Tube, 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 tube end, weld seam, cylindrical surface, OWL applies targeted, zone-by-zone coating with a Smart AI recipe. For details, see the “OWL — Profile & Pipe” 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