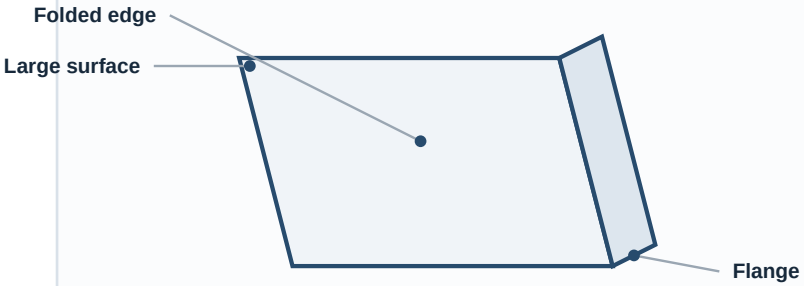
UNDERSTAND THE SURFACE BEFORE DESIGNING THE COATING.

Refrigerator Outer Panels — Indoors, humidity, frequent cleaning and expectations for visible surface quality. Before designing the right coating, we evaluate the material chemistry, the geometry and the service conditions together.

PART DIAGRAM — REFRIGERATOR OUTER PANELS



COATING CROSS-SECTION



Five questions define a coating system

1. **MATERIAL**
   Galvanised / pre-coated steel or aluminium, 0.5–0.8 mm thin sheet. Its low mass heats up quickly in the oven.
2. **SURFACE**
   Oil and residues are removed before conversion coating; a uniform, clean surface is essential on thin sheet.
3. **GEOMETRY**
   Faraday cage at folded edges and flanges; risk of colour/gloss deviation on large flat surfaces.
4. **SERVICE CONDITIONS**
   Indoors, humidity, frequent cleaning and expectations for visible surface quality
5. **PRODUCTION TARGET**
   High volume; a fast line with colour consistency and low scrap.

CONCLUSION: For the Refrigerator Outer Panels, the goal is not just a good-looking finish; it is a flexible, durable powder-coated surface that is consistent in colour and gloss across large surfaces.

FROM SURFACE TO PROCESS ENGINEERING FLOW

The Refrigerator Outer Panels 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

Nano-ceramic or phosphate conversion coating; fast, uniform pretreatment for thin sheet.

CORE TARGET
Clean, active, uniform, repeatable surface

C. Coating System Selection

A thermoset powder is selected for decorative appearance, flexibility and indoor durability.

DECISION CRITERIA
Durability • appearance • service life • cost

D. Application Engineering

Electrostatic powder coating, 60–80 µm; gun/charge settings to reach folded edges and a uniform oven profile.

GEOMETRY EFFECT
Folded edge • Flange • Large surface

Managing the process with data, not by eye

µm
FILM THICKNESS
Coating uniformity

°C
PART TEMPERATURE
Actual cure condition

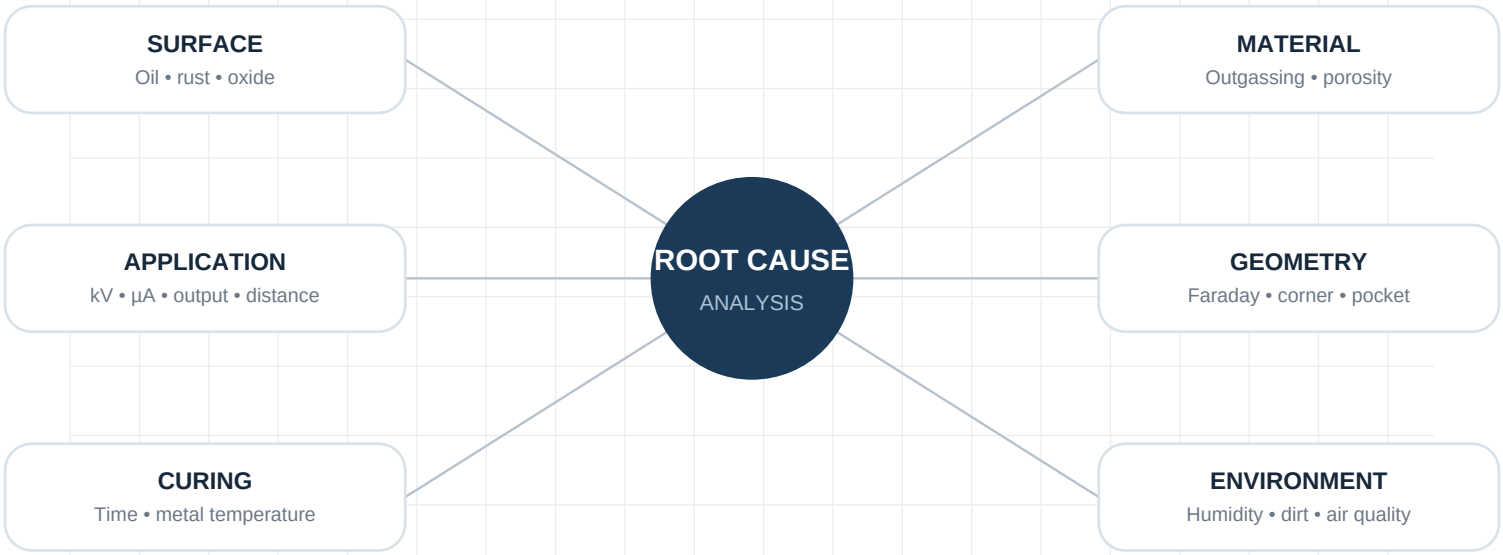
kV / µA
ELECTROSTATIC CHARGE
Transfer and penetration

Ω
GROUNDING
Charge dissipation and stability

ENGINEERING PRINCIPLE In the Refrigerator Outer Panels 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 Refrigerator Outer Panels.

THE RIGHT EQUIPMENT, AT THE RIGHT SCALE.

For the Refrigerator Outer Panels, 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.



Smart AI

The same application on every part, by recipe.



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.

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