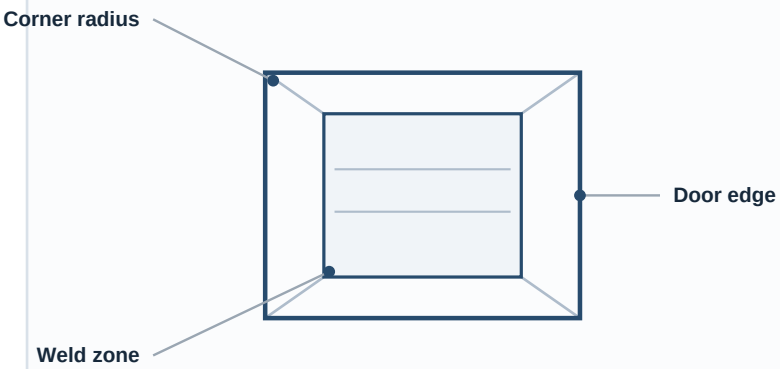
UNDERSTAND THE SURFACE BEFORE DESIGNING THE COATING.

Oven Cavity (Inner Chamber) — Pyrolysis temperatures up to 475 °C, thermal shock, acidic/alkaline food stains and mechanical cleaning load. Before designing the right coating, we evaluate the material chemistry, the geometry and the service conditions together.

PART DIAGRAM — OVEN CAVITY (INNER CHAMBER)



COATING CROSS-SECTION



Five questions define a coating system

1. **MATERIAL**
   Low-carbon, decarburised enamelling steel (EN 10209 / DC04EK), 0.6–1.2 mm. Enamel adhesion requires low hydrogen content and a suitable surface chemistry.

2. **SURFACE**
   Oil, oxide and mill scale must be cleaned; an active, uniform surface must be achieved before enamelling.

3. **GEOMETRY**
   Corner radii, edges around the door and spot welds; they carry a risk of Faraday zones and edge pull-back.

4. **SERVICE CONDITIONS**
   Pyrolysis temperatures up to 475 °C, thermal shock, acidic/alkaline food stains and mechanical cleaning load

5. **PRODUCTION TARGET**
   High-volume home appliance line; automation targeting repeatable quality and low scrap.

CONCLUSION: For the Oven Cavity, the goal is not just a good-looking finish; it is a pore-free, repeatable enamel surface that withstands 475 °C pyrolysis and thermal cycling.

FROM SURFACE TO PROCESS ENGINEERING FLOW

The Oven Cavity 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 + surface
03 **ENAMEL** Chemistry + coat
04 **APPLICATION** Electrostatics + flow
05 **FIRING** 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, rust/scale removal, rinsing and drying are designed around the cavity geometry; surface activation is provided for single-coat enamel.

CORE TARGET
Clean, active, uniform, repeatable surface

C. Enamel System Selection

A vitreous enamel chemistry is selected for pyrolysis temperature, thermal shock and stain resistance. CTE matching targets compressive stress on cooling.

DECISION CRITERIA
Durability • appearance • service life • cost

D. Application Engineering

In electrostatic powder enamel, voltage alone is not enough; current limit, powder output, gun distance, grounding and the corner/edge motion recipe are set together.

GEOMETRY EFFECT
Corner radius • Door edge • Weld zone

Managing the process with data, not by eye

µm
COAT THICKNESS
Enamel coat uniformity

°C
FIRING TEMPERATURE
Actual firing condition

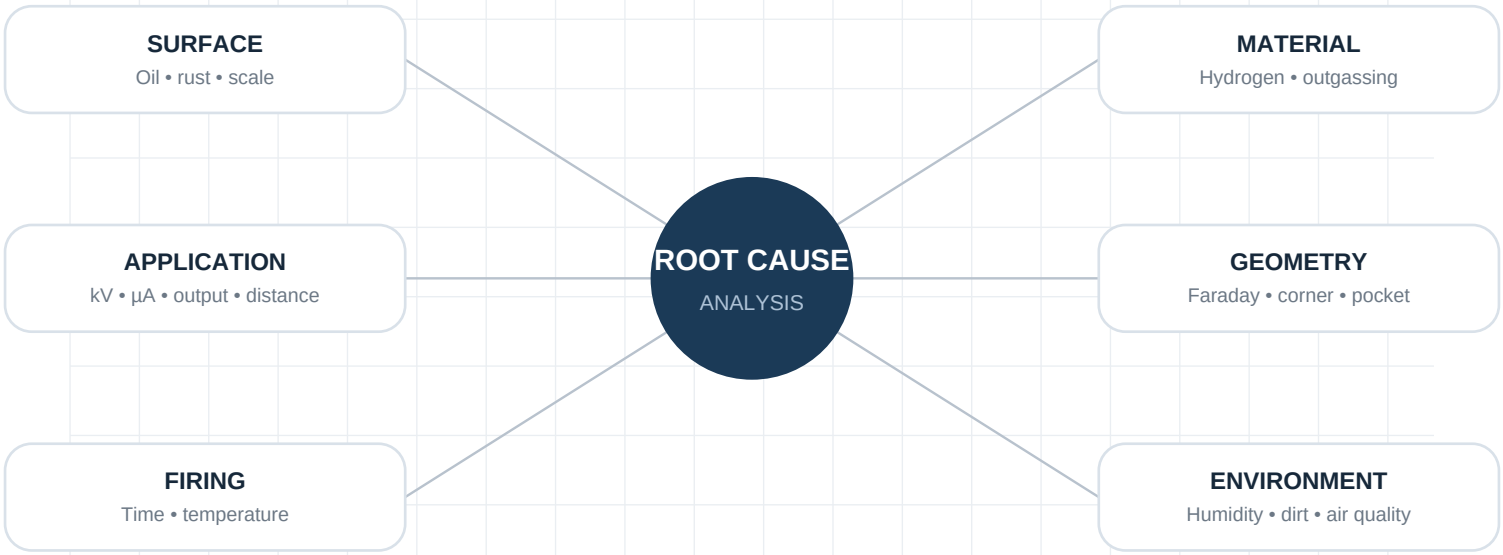
kV / µA
ELECTROSTATIC CHARGE
Transfer and penetration

Ω
GROUNDING
Charge dissipation and stability

ENGINEERING PRINCIPLE In the Oven Cavity 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

Enamel defects rarely come from a single setting. The same symptom may stem from surface preparation, the steel structure, electrostatic behaviour, coat thickness or firing.



Common defects and diagnostic approach

POOR ADHESION

The enamel detaches from the substrate or fails the impact test.

CHECK: surface / pretreatment / firing

FISH-SCALING

Scale-shaped enamel spalling appears after firing.

CHECK: steel / hydrogen / firing

PINHOLE / BLISTER

Pinholes or blisters 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 Oven Cavity.

THE RIGHT EQUIPMENT, AT THE RIGHT SCALE.

For the Oven Cavity, 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



Smart (Powder Enamel)
Control unit for powder enamel application.



Powder Enamel Gun
Manual gun suited to enamel powder.



Powder Enamel Injectors
Feeding for abrasive enamel powder.



Powder Enamel Booth
Part-specific manual application booth.



Box Enamel Furnace
Firing in batch production.

SERIES PRODUCTION

Automatic line



Smart Automatic Powder Enamel
Line application with automatic guns.



OWL + Smart AI
Zone-by-zone application on corners, cavities and difficult areas.



Reciprocator
Automates the gun motion.



Automatic Powder Enamel Booth
In-line application and powder recovery.



Ultrasonic Recovery
Sieves recovered powder and separates foreign metal.



Powder Enamel Firing Furnace
Continuous firing, U-type or line-type.

OWL INTEGRATION In difficult areas such as corner radius, door edge, weld zone, OWL applies targeted, zone-by-zone coating with a Smart AI recipe. For details, see the “OWL — Cavity” 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