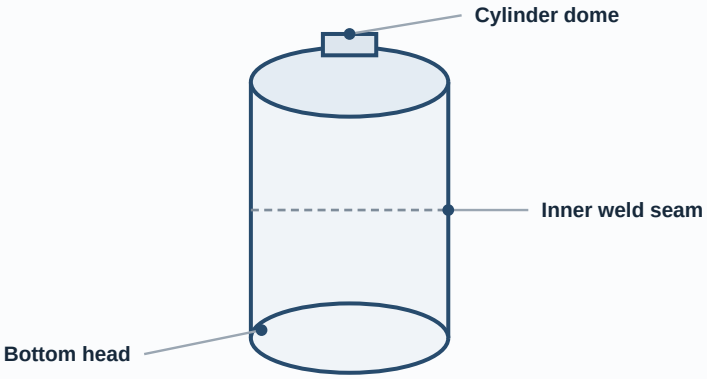
UNDERSTAND THE SURFACE BEFORE DESIGNING THE COATING.

Inner Tank (Hot Water Vessel) — Continuous corrosion load from potable-quality hot water at 6–10 bar, variable pH and dissolved oxygen. Before designing the right coating, we evaluate the material chemistry, the geometry and the service conditions together.

PART DIAGRAM — INNER TANK (HOT WATER VESSEL)



COATING CROSS-SECTION



Five questions define a coating system

1 MATERIAL
Low-carbon, decarburised enamelling steel (EN 10209 / DC04EK), 1.5–3.0 mm; welded cylindrical body. Enamel adhesion requires low hydrogen content and a microstructure resistant to outgassing.

2 SURFACE
Oil, oxide and mill scale must be removed from the inner surface; slag and spatter are cleaned along the weld seams for a uniform, active surface.

3 GEOMETRY
Inner weld seams of the cylindrical body, dome transitions and internal access to a deep body; continuous, pore-free coverage and edge coverage are critical, with a Faraday zone risk at narrow transitions.

4 SERVICE CONDITIONS
Continuous corrosion load from potable-quality hot water at 6–10 bar, variable pH and dissolved oxygen

5 PRODUCTION TARGET
High-volume tank line; automation targeting zero porosity verified by holiday (spark) testing and repeatable coat thickness.

CONCLUSION: For the Inner Tank, the goal is not just a good-looking finish; it is a pore-free, corrosion-resistant, long-lasting enamel inner surface under hot water and pressure, verified by holiday testing.

FROM SURFACE TO PROCESS ENGINEERING FLOW

The Inner Tank 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, scale/rust removal, rinsing and drying; special preparation for the different microstructure of the weld zone and surface activation before single-coat powder enamel.

CORE TARGET
Clean, active, uniform, repeatable surface

C. Enamel System Selection

An acid-resistant vitreous enamel chemistry resistant to hot-water corrosion, pressure and pH changes is selected; CTE matching targets compressive stress on cooling and, together with cathodic anode protection, a long service life.

DECISION CRITERIA
Durability • appearance • service life • cost

D. Application Engineering

Electrostatic powder enamel is applied to the inner surface of the deep body; voltage alone is not enough—current limit, powder output, lance insertion depth/distance and grounding are set together for continuous coverage along the inner weld seams.

GEOMETRY EFFECT
Inner weld seam • Cylinder dome • Bottom head

Managing the process with data, not by eye

µm
COAT THICKNESS
Enamel coat uniformity

°C
FIRING TEMPERATURE
Actual firing condition

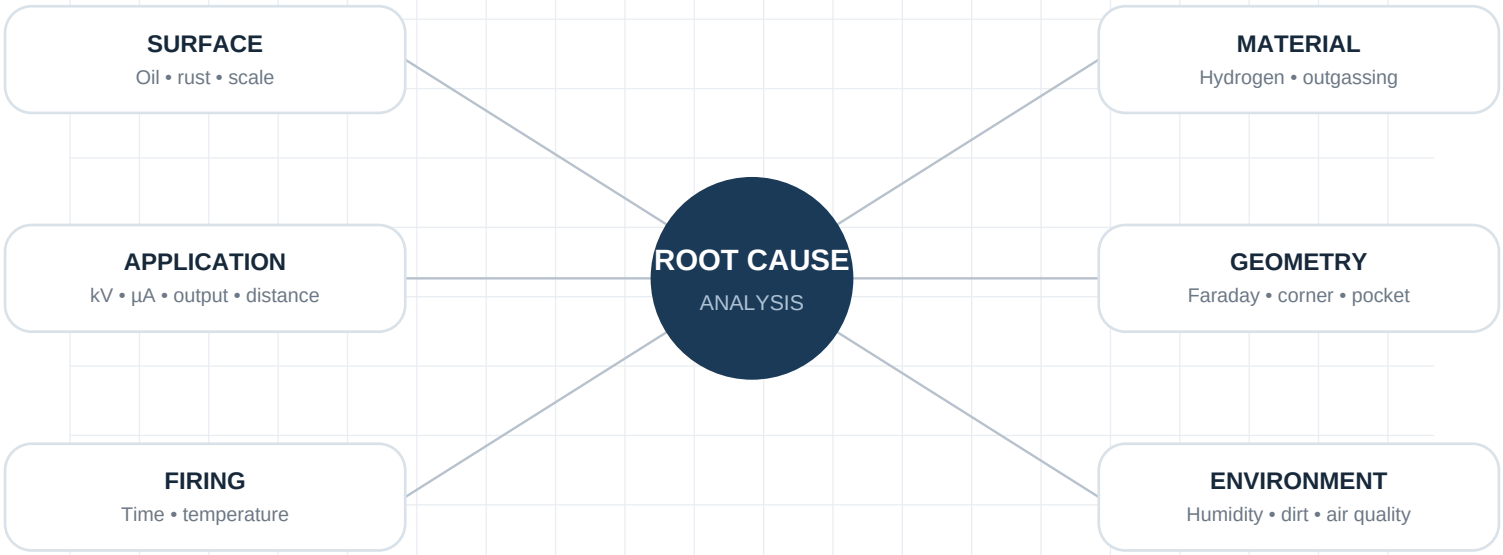
kV / µA
ELECTROSTATIC CHARGE
Transfer and penetration

Ω
GROUNDING
Charge dissipation and stability

ENGINEERING PRINCIPLE In the Inner Tank 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 Inner Tank.

THE RIGHT EQUIPMENT, AT THE RIGHT SCALE.

For the Inner Tank, 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 inner weld seam, cylinder dome, bottom head, 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