Greatly useful to extend life of parts and trays for heat-treatment furnaces and improve productivity

Calorizing Treatment

Patented in Japan & other 14 Countries abroad

High temperature oxidation resistance

The calorizing treatment creates a Fe-Al layer at the surface of the treated object. When operating, a dense Al_2O_3 protective film is formed from preferentially oxidized Al at the surface of calorized layer. Calorizing prevents oxidation inside of radiant tubes and heater tubes and stops the dropping of oxidized scales which might block the gas-flow or cause short-circuits in heater components.

Carburization resistance ・ Nitridization resistance

Free from cracking and deformation during carburization and nitridization.

Excellent corrosion resistance

Calorizing treatment improves local corrosion resistance, when operating with salt baths (KNO_3 etc.).

Stress relief

Thermal deformations of parts and trays are lowered, by removing most of the internal stress through the calorizing treatment.

Jigs, Trays, Heater Tubes, etc.,
for carburizing furnace (PAT.)

The welded area will not be degraded earlier than base material

Abrasion from shot peening, etc. will be alleviated.

Abrasion (Erosion) resistance

Welded and non-welded portions are treated by Calorizing in the same way, therefore they show a similar behaviour.

Characteristics and Advantages

■ The lifetime is extended to more than twice the original duration (up to 5 times longer, depending on operating conditions).
→ Saving on purchase costs and maintenance costs of spare parts and accessories.

■ Reduction of replacement frequency and fewer troubles for production equipments. → Improvement of productivity.

■ Calorizing prevents cracking deterioration of welded areas, and it is possible to change from expensive castings to welded structures, made by low grade materials, treated with calorizing. → Saving on furnace parts production costs.

■ Lower grade materials can be used, thanks to the Calorizing treatment. → Saving on material costs.

● Absolute strength against thermal shocks → treated parts never exfoliate under hard heating-cooling cycles.

● Calorizing can be done onto complex shapes, forming uniform calorizing layers on their entire surface.

● Superior Resistance against Carburization and Nitridization, High Temperature Oxidation, Corrosion, Abrasion (Erosion).

SHINTO

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Carburization resistance

Red and yellow colours show carburized areas.

CROSS-SECTIONAL CARBON-DISTRIBUTION MAP of test piece after carburizing test

Calorized pieces don't show any carburization.

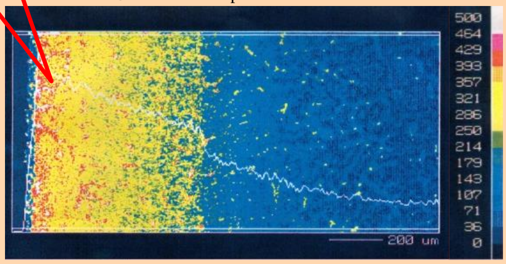
Condition : 930℃ x 12H x 10 cycles in carburizing granulate

Stainless steel castings (heat resisting)

Japan JIS=SCH13

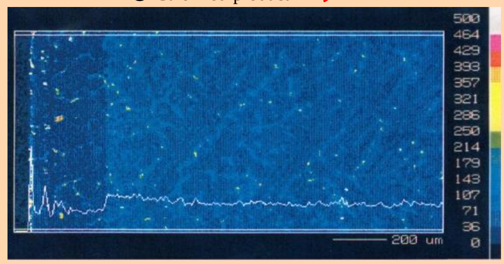
Usa ASTM=HH

● Non-treated product



Depth from Surface

● Calorized product



Depth from Surface

WEAK ← C density → STRONG

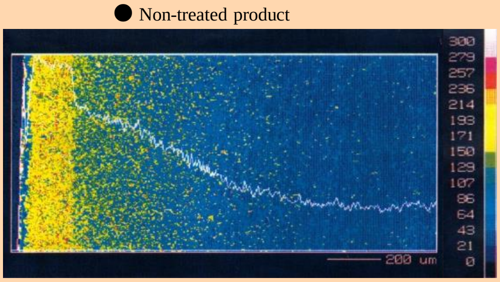
Stainless steel

Japan JIS=SUS310S

Usa ASTM=310S

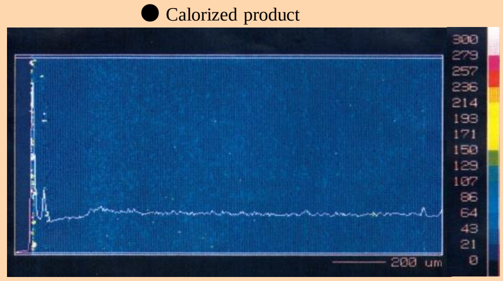
EU = 1.4845

● Non-treated product



Depth from Surface

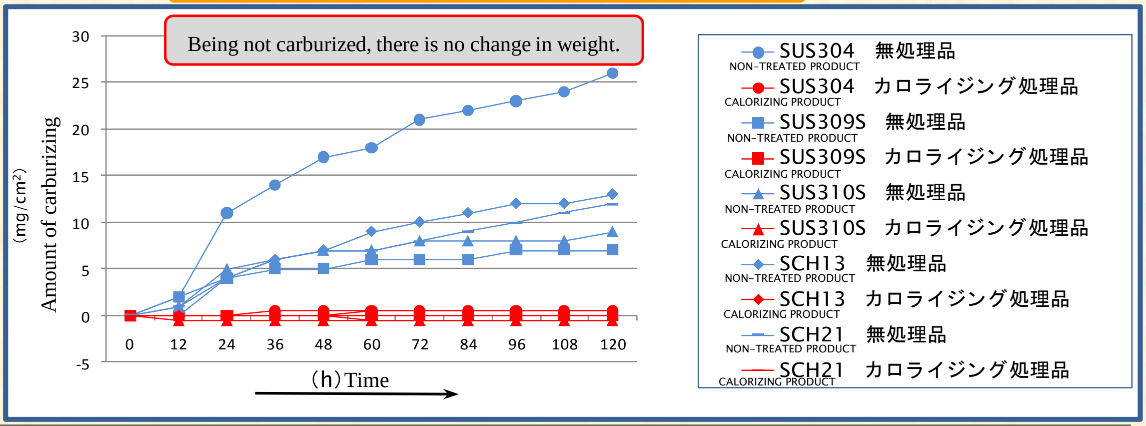
● Calorized product



Depth from Surface

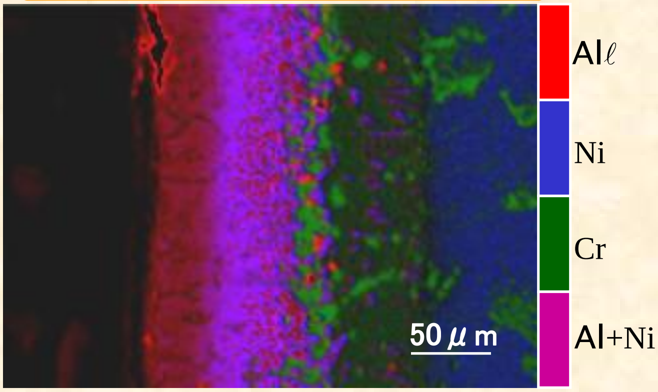
WEAK ← C density → STRONG

Graph = Amount of carburizing



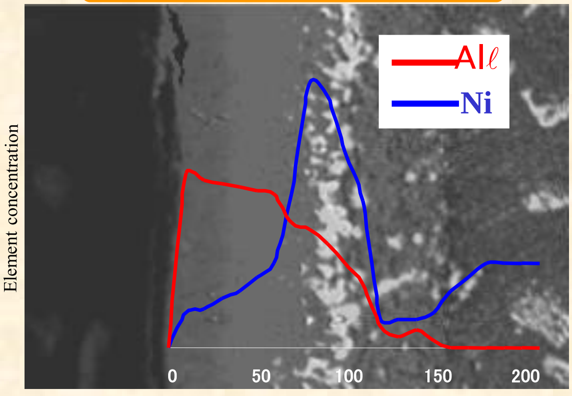
Description of Carburization resistance in JIS SCH13/ASTM HH steel (castings) + calorizing
Mapping analysis by EPMA of cross section

CROSS-SECTIONAL Aluminum ・Nickel DISTRIBUTION MAP



Depth from surface (μm)

distribution of Aluminum ・Nickel



Depth from surface (μm)

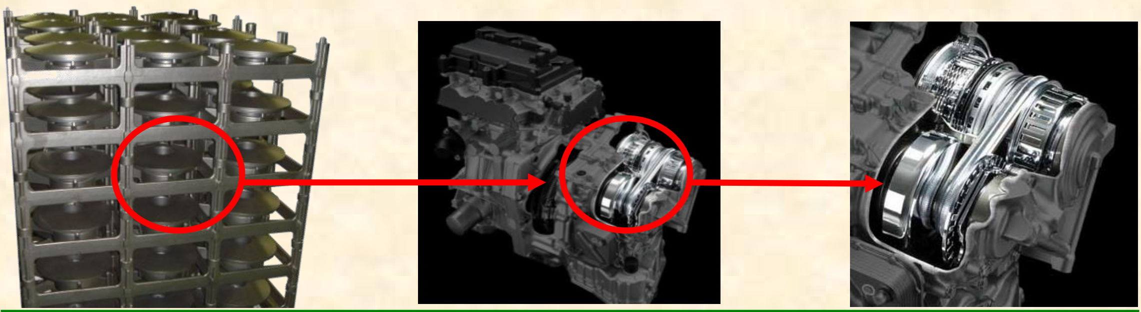
Nickel from a base material surface is enriched by Calorizing treatment, and carburizing is prevented by a compound layer, with high % of Ni-Al.

Gas-Carburizing Furnace
Tray and Basket

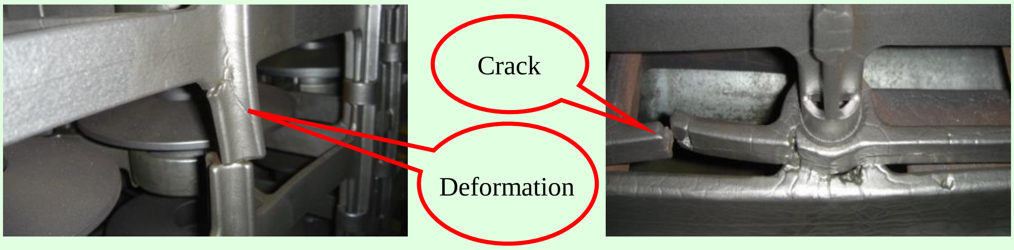
Calorizing treatment demonstrates a superior durability!

Actual example

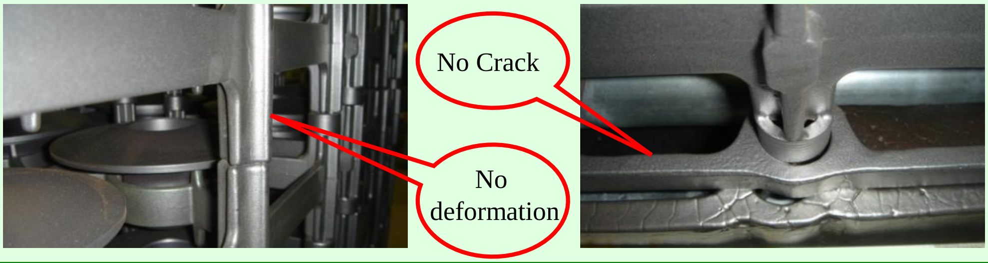
Usable period : For about one year(1〜2 cycles/day Sum total: 200〜300 cycles)
Condition : Carburizing temp. = 1020℃(High temperature carburizing)
Basket material : Heat resisting steel casting (Japan) JIS=SCH24 / (Usa) ASTM=HP / EU 1.4857 (lost wax casting)
1 cycle: Carburizing → hardening → washing → tempering → shot blasting



■ JIS=SCH24 / ASTM=HP / 1.4857 NON-TREATED PRODUCT



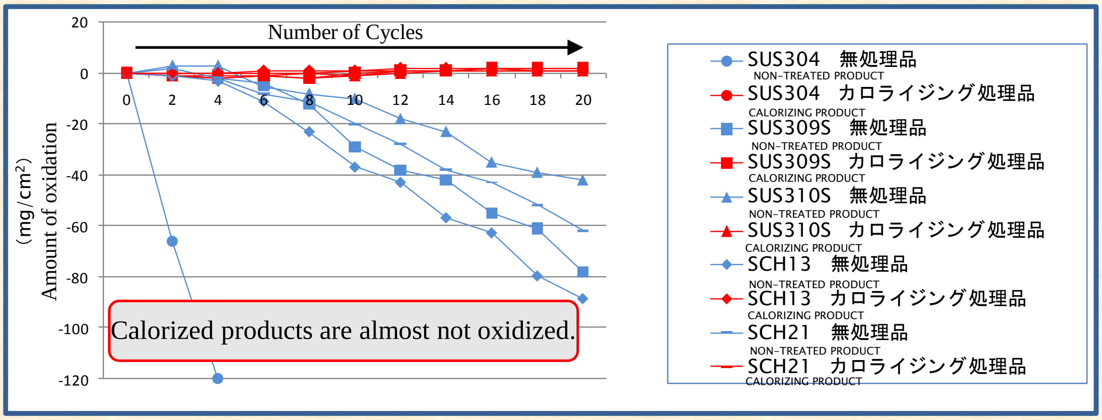
■ JIS=SCH24 / ASTM=HP / 1.4857 CALORIZED PRODUCT



High temperature oxidation resistance

Graph – Oxidation amount measurement

Conditions : (1050℃x15h→air cooling→ordinary temp.) x 20 cycles



Gas Carburizing Furnace
Radiant-Heater Tube

Actual example

Conditions: Carburizing temperature:= 930°C;
Tube material: Stainless steel JIS=SUS310S / ASTM=310S / No. 1.4845

■ Non-Treated Tube (About eight-months use)

■ Calorized Tube (About 15-months use)

Carburization resistance (Outside of tube).

Prevention against cracking and deformation by carburization.

High temperature oxidation resistance (inside part)

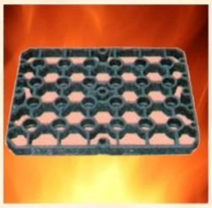
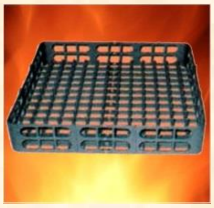
Prevention against internal oxidation of radiant tube and against oxidized scales dropping, which might block the gas-flow or cause short-circuits in heater elements.

Target Furnaces

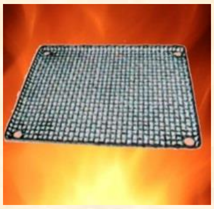
●Gas-Carburizing ●Vacuum Carburizing ●Quenching ●Annealing ●Tempering ●Refining ● Gas-Nitriding ● Salt-Bath Nitriding

Target parts and trays

●Base Tray ●Lost Wax Casting Basket ●Stainless Steel Basket ●Support ●Crossbar ●Side Plate ●Heater Tube ●Radiant Tube ●Wire Net ●Roller Rail ●Roller ●Chain Guide Rail ●Fan ●Fan Sleeve ●Hearth Roll ●Hearth Roll Sleeve ●Grid ●Spacer ●Mesh Belt ●Gas Inlet Tube ●Gas Sampling Tube of Conversion Furnace ●O2 Sensor ●Protection Tube For Thermocouple ●Stud Bolt Nut ● Intermediate Door ●Cylinder rod ●Retort ●Others




Basic materials

● Heat-Resisting Steel castings ●Stainless Steel ●Cast Iron ● Carbon Steel ●Super-alloys ●Nickel ●Copper ●Titanium ●Others

Shinto Technologies Spreading all over the World

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