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Alumite Processes

# Plate Heat Exchanger



**HISAKA**

# Alumite Processes

Aluminium is a soft metal that is very prone to scratches and environmental damage. Hence, processing aluminium and its alloy parts increases its strength and durability against corrosion and weather damage. Processed aluminium is known as Alumite; a technology developed in Japan by forming an aluminium oxide film on the aluminium (or its alloy) surface.

The oxygen produced at the anode (positive pole) will produce a porous layer with great electrical isolation characteristics to improve on:

- Corrosion resistance
- Water resistance
- Heat absorbance
- Optical reflection
- Coloration properties

Therefore, alumite is suitable to be used in various contemporary industries such as:

- \* Construction materials
- \* Automotive components
- \* Optical device components
- \* Solar heat absorbent panels
- \* Printed Wiring Boards
- \* Electrolytic condensers
- \* Reflector panels
- \* Magnetic storage disks

HISAKA plate heat exchanger (PHE) is ideal for alumite processing is because of its high performing and high alteration flexibility to correspond to specific processes, especially when highly corrosive solutions such as sulfuric acids and oxalic acids are involved.

Furthermore, the usage of HISAKA PHE is vast in the alumite production process, of which including:

- Heating of degreasing solutions
- Heating of etching solutions
- Heating of sulfuric acid solutions
- Cooling of alumite solutions



HISAKA WORKS is a comprehensive and integrated manufacturer of plate heat exchangers having the most advanced production facilities.

Overview of HISAKA WORKS Konoike Plant

# HISAKA Plate Heat Exchanger

## Structure of a Plate Heat Exchanger (PHE)

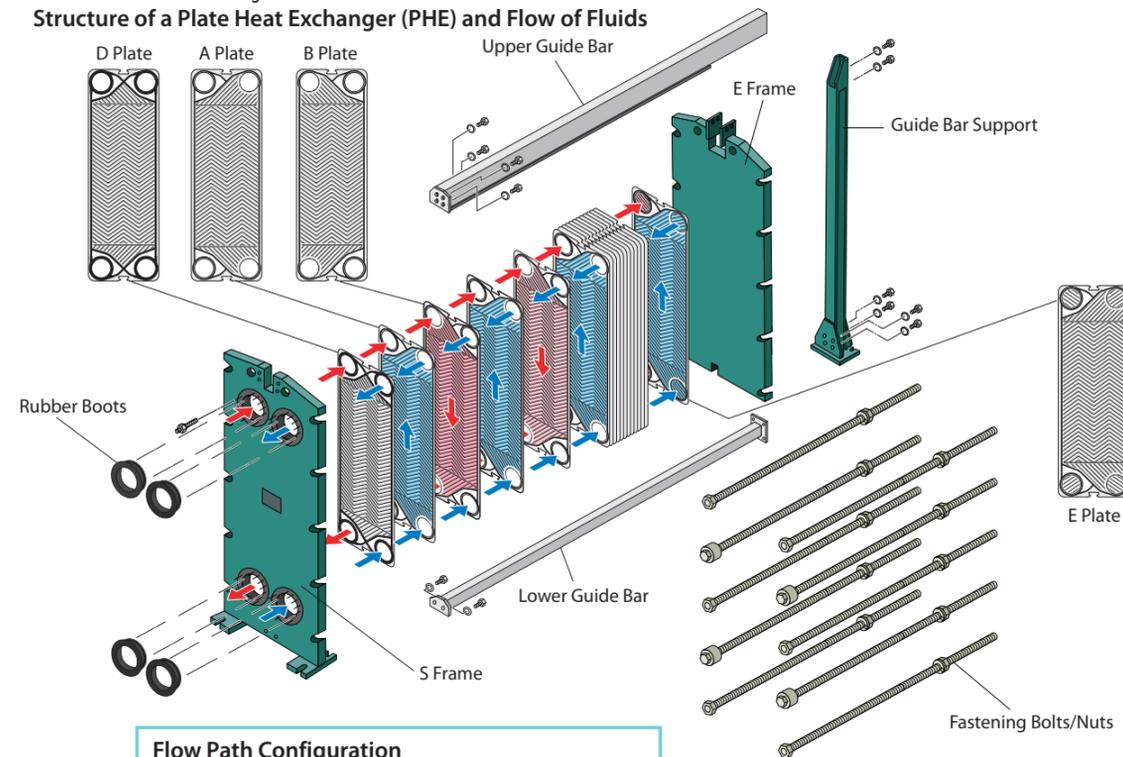
### Plate heat exchangers (PHE) plates:

- Pressed thin metal plates that have convex and concave wave patterns (herringbone patterns)
- Made of corrosion resistant materials, such as stainless steel or titanium
- Perimeter of the plates is sealed with synthetic rubber gaskets (slit in or glue on method)
- Suspended perfectly on both upper and lower guide bars
- Fastened and compressed by a fixed and moving frame

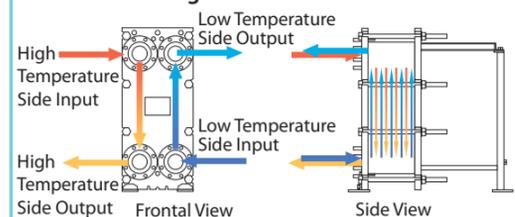
### Mechanisms:

- \* Counter current flow of high temperature fluid and low temperature fluid flowing against each plates. This phenomenon ensures heat transfer to take place.
- \* Gaskets ensure that the flowing fluids do not intermix.

### Structure of a Plate Heat Exchanger (PHE) and Flow of Fluids



### Flow Path Configuration



The fluid flows alternately through the flow path created between each plate and forms a countercurrent of the high temperature fluid and the low temperature fluid between every other plate to perform the heat exchange.

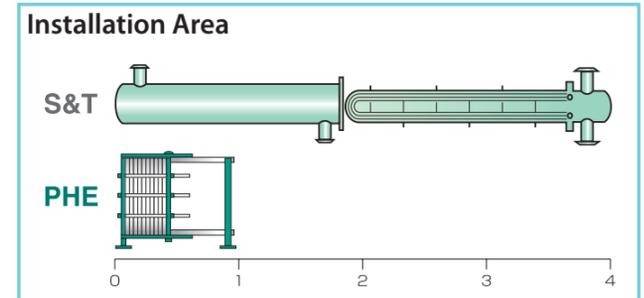
## Advantages of Plate Heat Exchangers (PHE)

### 1. High Performance

- Pressed - moulded herringbone patterns enhance heat conduction performance (heat transfer coefficient), hence able to reduce heat conduction surface area.

### 2. Lightweight and Compact

- Compressed thin heat transferring plates
- Limited fluid capacity
- Smaller heat transferring surface area
- This realizes reduction in installation space, making installation and maintenance easier



### 3. Quick Start - Up

- Limited fluid capacity per unit allows quick operation start up, and also possible to correspond to changes in operating conditions with high precision.

### 4. Excellent Maintainability

- Assembly and disassembly are made convenient by simply removing the fastening bolts
- Maintenance are thereby made easy, even for visual inspections and cleaning

### 5. Easy Modification of Capabilities

- Flexibility in modifying the heat transferring surface area by simply increasing or decreasing the number of plates



# ALUMITE PROCESSES

## ■ Plate heat exchangers for alumite process

HISAKA Plate Heat Exchangers (PHE) are made out of materials which are high in corrosion resistance, which is especially important when electrolyzing and oxidizing aluminium with anodes are involved.

HISAKA PHE are used for controlling the tanks fluids temperature in the alumite process summarized below:

### ● Standard Alumite Processes

Process	De-greasing of Material	Rinse	Etching	Rinse	De-smutting	Rinse	Alumite Treatment	Rinse	Electrolytic Coloring	Rinse	Sealing Treatment
Purpose	Heating of the aqueous alkali solution (de-greasing solution) to remove dirt from the aluminium material		Heating of the etching solution used in the process of dissolving the aluminium material with an acid. This is also to create surface texture to the aluminium		Heating of the sulfuric acid solution used to remove the impurities on the aluminium surface Minute amount of Si, Mg, Fe, Cu and etc (found in the aluminium) contributed to the grayish black color of the aluminium surface		Cool down alumite treatment solutions Precised alumite treatment solution at low temperature is needed to enhance the oxidization process on the aluminium surface		Dye immersion to add in color by allowing the dye to soak into the fine holes of the aluminium		The oxidized film is then boiled in high temperature pressurized steam (or in boiling water) to seal up the fine hole on the film in order to improve corrosion resistance, weather resistance and staining resistance.
Material *)	Plate : SUS304, SUS316 Gasket : EPDM		Plate : SUS304, SUS316 Gasket : EPDM		Plate : SUS304, SUS316 Gasket : EPDM		<ul style="list-style-type: none"> <li>●Sulfuric Acid Concentration of 15% or less (when steam is not used) Plate: SUS315J1 Gasket: EPDM</li> <li>●Sulfuric Acid Concentration of 15% or less (when steam is used) Plate: Carpenter 20 or equivalent product Gasket: EPDM</li> <li>●Sulfuric Acid Concentration of 30% or less Plate: Carpenter 20 or equivalent product Gasket: EPDM</li> <li>●Sulfuric Acid Plate: SUS304, SUS316 Gasket: EPDM</li> </ul>				

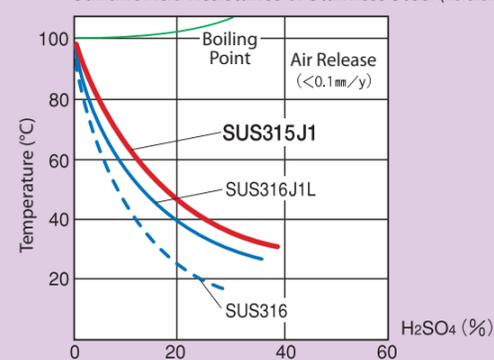
### About SUS315J1

In cases when there are concerns about the corrosiveness of alumite solutions in the alumite process, the use of SUS315J1 is increasing for the plate material in consideration or corrosion resistance.

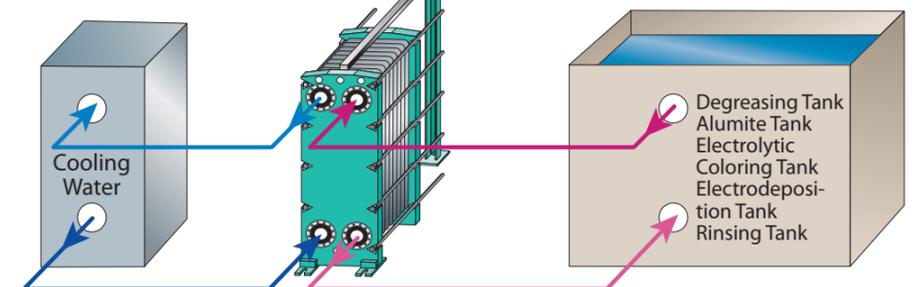
#### Chemical Components of SUS315J1

Components	C	Si	Mn	P	S
%	0.080 or less	0.05~2.50	2.00 or less	0.045 or less	0.030 or less
Components	Ni	Cr	Mo	Cu	
%	8.50~11.50	17.00~20.50	0.50~1.50	0.50~3.50	

Sulfuric Acid Resistance of Stainless Steel (Reference)



### Example of Application



\*) A commonly used material. The material will differ depending on operating requirements.