

# NIPPON STEEL's Steel Products for Thermal Power Generation

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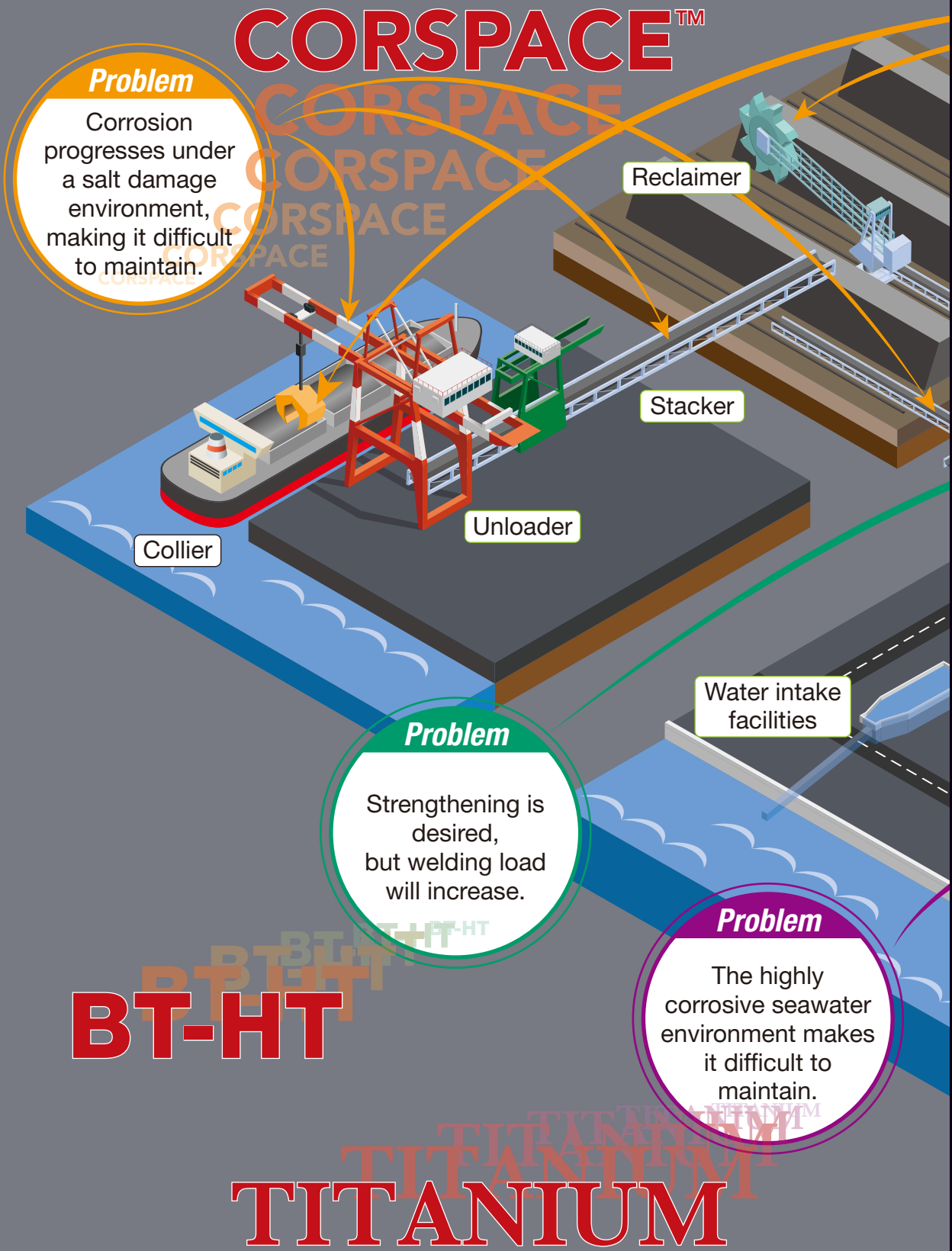
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**NIPPON STEEL**

NIPPON STEEL's top-quality steel products — provide strong support for power plants.



Thermal power generation is base load power sources that can supply a certain amount of electrical power stably and at low cost, regardless of the season, weather, time of day or night.

In recent years, an increasing number of thermal power plants have striven to improve efficiency (seeking higher temperature) while addressing environmental concerns. Steel products wanted by these thermal power plants are of an extremely high standard, without exception. We have a wide range of leading-edge steel products that embody the NIPPON STEEL Group's technologies, withstand high temperature and high pressure, and contribute to high-efficiency power generation.



**S-TEN™**

**ABBREX™**

**NSHYPER BEAM™**

**Hat-shaped Steel Sheet Pile**

Hat-type and H-shape Combined High Stiffness Steel Sheet Pile

NIPPON STEEL's top-quality steel products — provide strong support for power plants.

**Problem**  
Corrosion progresses under a salt damage environment, making it difficult to maintain.

**Problem**  
Wear is severe due to impacts subjected during transportation and loading of coal.

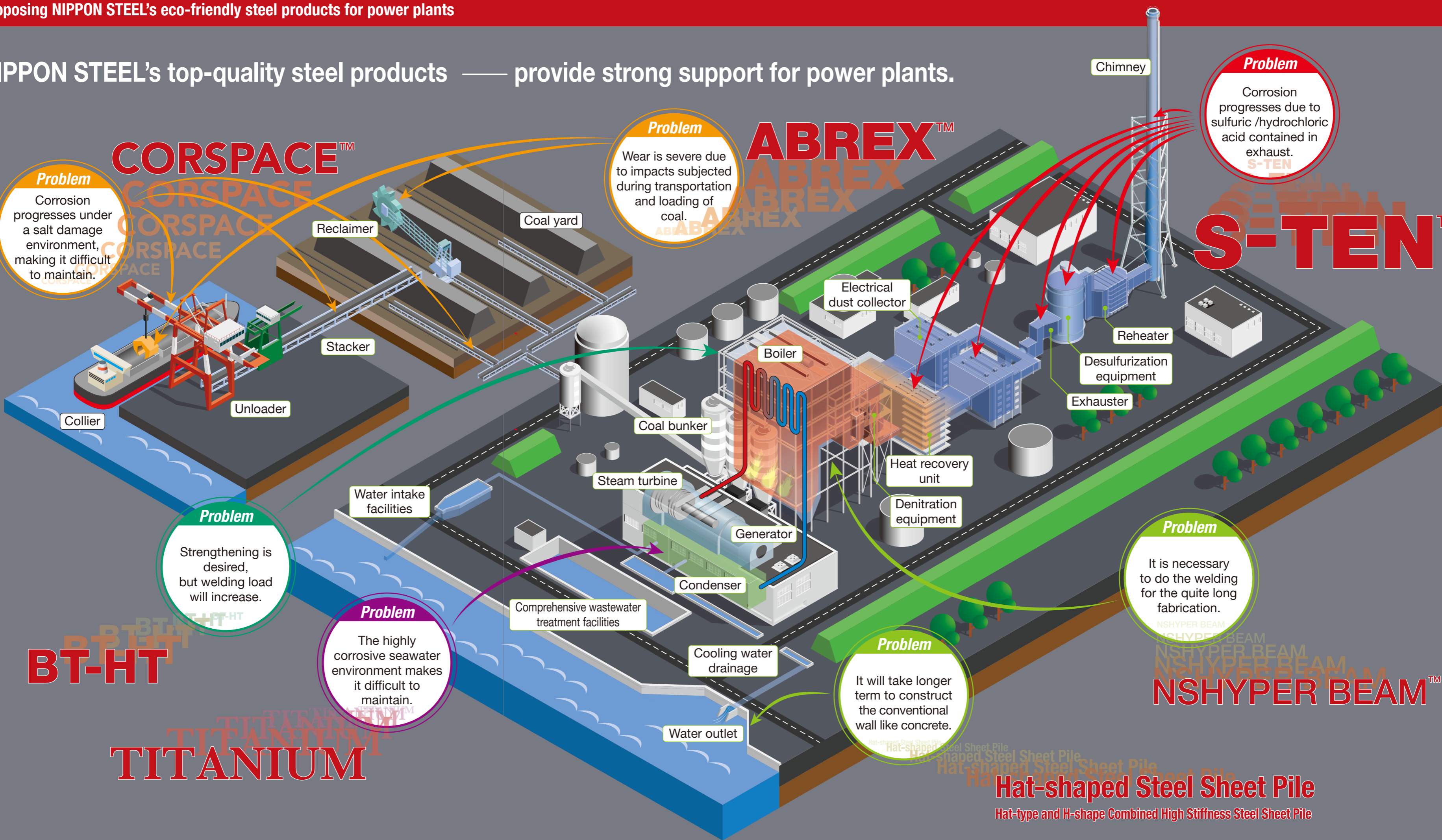
**Problem**  
Corrosion progresses due to sulfuric /hydrochloric acid contained in exhaust.

**Problem**  
Strengthening is desired, but welding load will increase.

**Problem**  
The highly corrosive seawater environment makes it difficult to maintain.

**Problem**  
It is necessary to do the welding for the quite long fabrication.

**Problem**  
It will take longer term to construct the conventional wall like concrete.



**CORSPACE™**

**ABREX™**

**S-TEN™**

**BT-HT**

**TITANIUM**

**NSHYPER BEAM™**

**Hat-shaped Steel Sheet Pile**

Hat-type and H-shape Combined High Stiffness Steel Sheet Pile

## When corrosion progresses due to sulfuric/hydrochloric acid in exhaust

# S-TEN™

Product HP QR code



Sulfuric Acid and Hydrochloric Acid Dew-point Corrosion-resistant Steel

### Application effects

- Excellent performance under a (sulfuric acid) corrosion resistant environment of coal-/heavy oil-fired power generation plant
- Longer life and more economical than stainless steel ⇒ **Eco-friendly steel products with low life cycle costs**
- Same mechanical properties and weldability as ordinary steel ⇒ **Conforms to SM400A and SM490A**
- Broad product lineup <Steel sheets, Steel plates, Steel pipes, Welding materials>
- Proven records/achievements particularly in smoke exhaustion systems

### Broad product lineup <Steel plates, Steel sheets, Steel pipes, Welding materials>



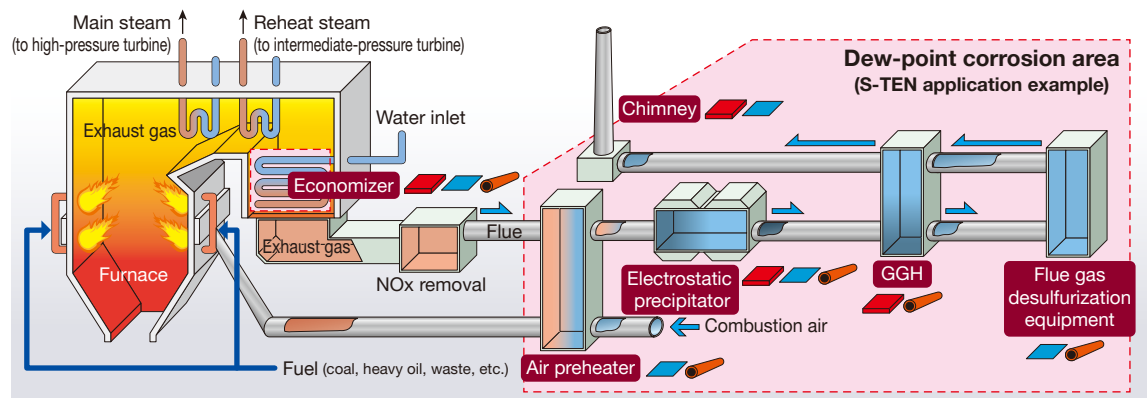
### Achievements

- Extensive supply records** — As a pioneer in developing sulfuric acid dew-point corrosion resistant steels, we have **supplied these products for over 50 years**.
  - We have **supplied over 100,000 tons of these products** in the past, which are used in various facilities.
- Wealth of knowledge** — We conducted exposure tests under various environments. Based on these test results, we can offer optimal proposals.
- Major awards received** — The Ichimura Prize in Industry for Excellent Achievement (FY2006)
  - Nikkei Excellent Products and Services Award (FY2003)

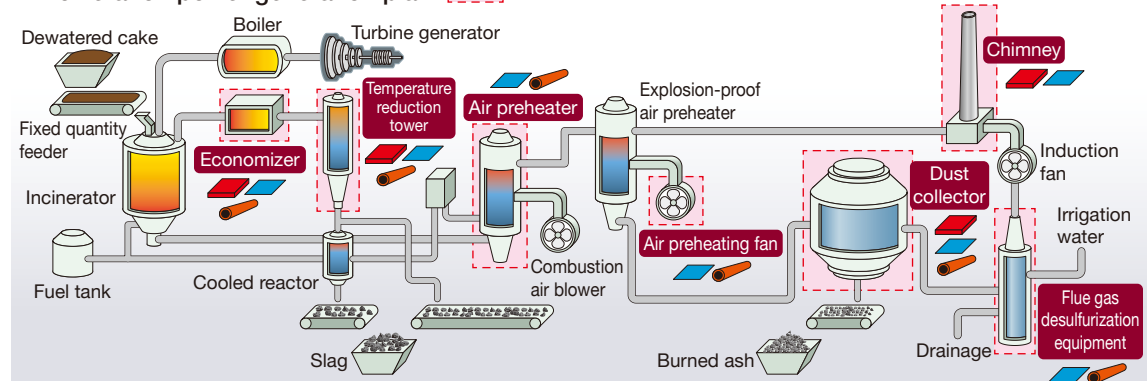
### S-TEN application sites

Effective in the sections of smoke exhaustion systems, waste incineration power generation plants, flues, etc., through which untreated gas passes.

#### S-TEN application near a furnace



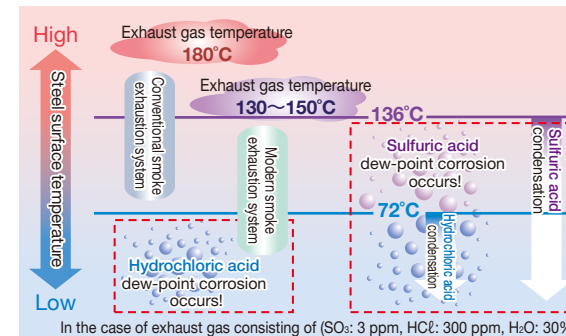
#### S-TEN application in a waste incineration power generation plant



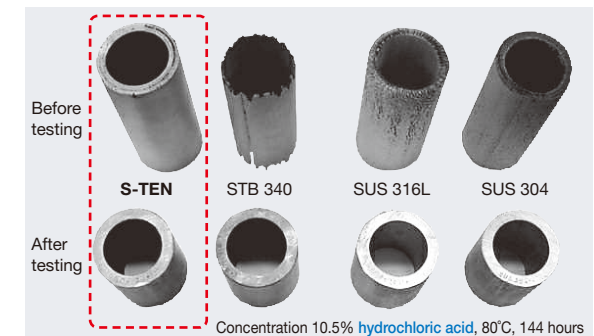
### Characteristic and advantages

- Corrosion resistance is
- **about 6 times and about 7 times better than ordinary steel and stainless steel, respectively, under a sulfuric acid corrosive environment**
  - **about 11 times and about 4 times better than ordinary steel and stainless steel, respectively, under a hydrochloric acid corrosive environment.**

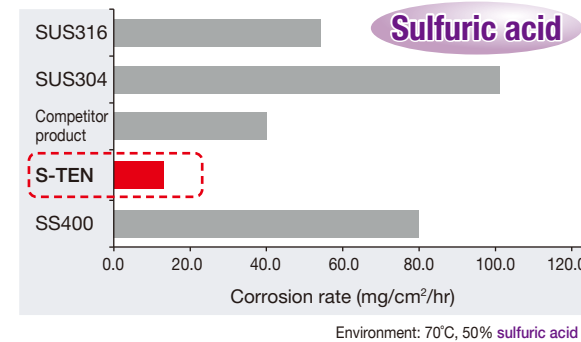
#### Conceptual diagram of S-TEN application



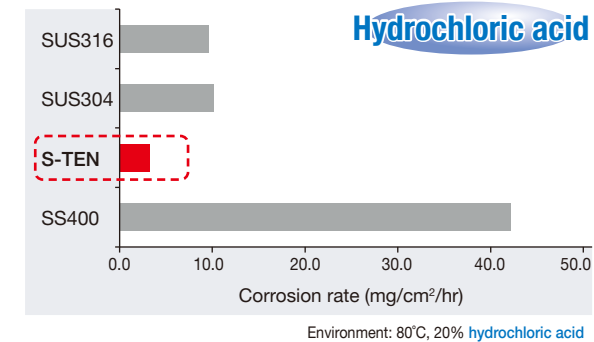
#### Compare with corrosion of other products



#### Compare corrosion rate - sulfuric acid immersion test results



#### Compare corrosion rate - hydrochloric acid immersion test results

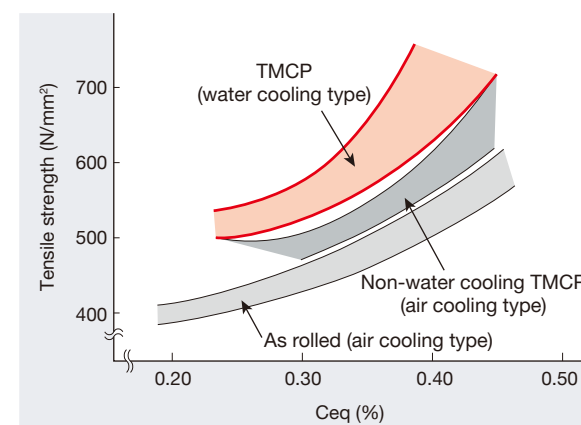


## To meet the needs for high strength and weldability of steel products

# BT-HT

High-tensile steel plate for building structure

- High-tensile steel with excellent weldability.
- Improved tensile strength to realize thinner plates and reduce the amount of steel materials used.



Relationship between Ceq and strength by the conventional manufacturing method and TMCP method (plate thickness 20 - 30mm)



Boiler building

- TMCP (Thermo-Mechanical Control Process) manufacturing enables manufacturing of steel plates with superior weldability, using a low carbon equivalent value.
- It improves efficiency in constructing structures and ensures safety/reliability.
- In addition to plants, it has been used in the Tokyo Skytree and various other buildings.

When corrosion progresses under a salt damage environment, it makes it difficult to maintain

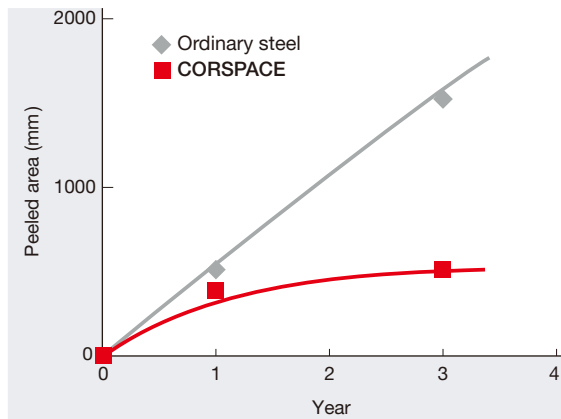
# CORSPACE™

Product HP QR code



Corrosion Resistance Steel for Repainting Cycle Extension

It provides excellent corrosion resistance in a coastal salt damage environment. It can also cut LCC by extending the painting cycle and reducing the amount of paint used.



Exposure test results



Unloader

- CORSPACE can reduce the maintenance load by extending the painting cycle and cut costs by using a smaller amount of paint.
- As the above exposure test results show, corrosion resistance is excellent, and the peeled area can be substantially smaller than ordinary steel.
- It has been used in an unloader (in photograph) and boiler building of a thermal power plant.

When wear is severe due to impacts subjected during transportation and loading of coal, iron ore, etc.

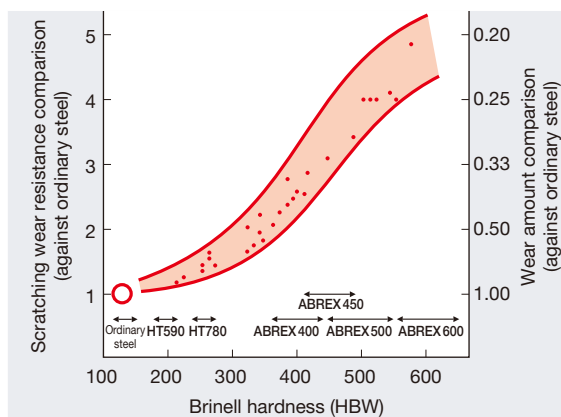
# ABREX™

Product HP QR code



Abrasion Resistant Steel Plate

It is resistant to abrasion caused during transportation and loading of coal. It can reduce the weight and prolong the life of equipment. It can also cut running costs of repairing or exchanging components.



Scratching wear performance of ABREX



Reclaimer

- ABREX is very hard steel and highly abrasion resistant, and realizes a structure with 3 to 5 times longer life and lighter weight than ordinary steel.
- With its excellent workability and weldability, it is widely used throughout the world as a corrosion resistant component of construction machines and various types of other industrial machinery.

When the highly corrosive seawater environment makes it difficult to maintain

# TITANIUM

High corrosion resistance, light weight, high specific strength

It is comparable to platinum in seawater. It is vital to condensers and plate-type heat exchangers of coastal power plants.



Plate-type heat exchanger



Condenser

We have steel plates and steel sheets available for welded pipes and tube plates of condensers and multitubular auxiliary heat exchangers. We also have steel sheets for plate-type auxiliary heat exchangers. We offer a wide production range from thin sheets to thick plates to meet various needs.

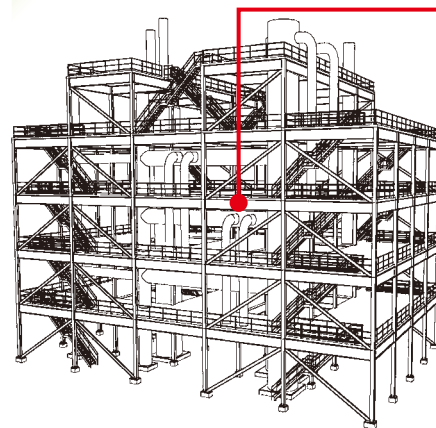
Catalog QR code



When fabrication work lengthens due to welding

# NSHYPER BEAM™

Catalog QR code



NSHYPER BEAM™ is our original Rolled H-shapes having large sizes and wider size availabilities. By using it as an alternative for Built-up H-shapes, you can reduce costs and shorten fabrication processes because there is no need of welding.

- Maximum size: D:1000mm x W:400mm
- Number of sizes: 609 (S355JR, J0, J2, K2)



When construction work is difficult due to narrow land and hard ground

## Hat-shaped Steel Sheet Pile

## Hat-type and H-shape Combined High Stiffness Steel Sheet Pile

Catalog QR code

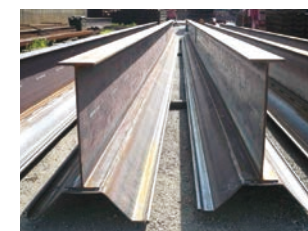


High rigidity enables construction of thinner wall structures with outstanding water-shielding performance, space saving, low noise, and low vibration construction is possible.



Hat-shaped Steel Sheet Pile

- Large sectional area of the Hat-type sheet pile realizes superior drivability.
- No reduction is required in sectional properties to consider the possible lack of shear force transmission at the interlocks, which is true for U-type steel sheet piles.
- Amount of steel per unit wall can be reduced, resulting in improved total cost.



Hat-type and H-shape combined high stiffness steel sheet pile

- It is easy to fabricate with intermittent fillet welding which can be carried out at the site or the nearby yard or shop.
- It possible to use low-cost H-shape up to 50 to 70% of weight as well as avoiding use of expensive connectors to connect a sheet pile and a section.
- An ordinary vibratory hammer is directly applicable for driving.

There are various other products available, including **9%Cr**, **SA516**, and **SB480**.