

High expectation from customers


In 2000 EBARA received inquiry about large pumps used for petrochemical plants in Qatar in the Middle East. In those days, seawater pumps were commonly made of ductile Ni-resist cast iron, which was and still is vulnerable to stress corrosion cracks caused by the hot and salty seawater in the region.

The customer trusted that EBARA shall have abundant expertise to manufacture pumps that stay reliable and durable as long as the customer expects under the harsh operating environment of the Middle East.

Choice of Duplex Stainless Steel (DSS^{*1})

EBARA has conducted tireless joint research with the Saline Water Conversion Corporation (SWCC) in Saudi Arabia seeking new materials resistant against corrosion in seawater. Finally we have come to conclusion that DSS, which has excellent hardness and corrosion

resistance, was one of the ideal materials for our objective.

The findings of this joint research led EBARA to determine the specifications of DSS. After that EBARA kept on developing materials with the cooperation of material vendors in Japan. 

2008 CSR Topic 1

EBARA's expertise of development and production ("monozukuri") — challenging the difficulty and consequently achieving the aim

— Story of the development of the Fabricated Duplex Stainless Steel (DSS) Pumps —

Clearing various hurdles

We have come to conclude from technical, producing and costing points of view that the whole structure of pumps shall be made of welded DSS plates. It was a fresh attempt to select welding structure for large seawater pumps because we used to understand that welded plates were weak and vulnerable to corrosion. Taking

advantage of the welding technology obtained through the development of atomic-energy related products, EBARA came up with a unique DSS welding method that could overcome the weakness of welding structure. When it was common to select cast iron to manufacture vital components such as suction bell^{*2}

and discharge bowl^{*3}, EBARA chose to manufacture them by fabricated welding structure with the then most updated hydrodynamic technology achieved through the joint research with the University of London.



Impeller mounting

Key Word

- *1 [DSS] Material durable against seawater corrosion and highly resistant against pitting corrosion and crevice corrosion compared with the conventional stainless steel. While DSS retains superb hardness, it is heat-sensitive and requires advanced welding technology.
- *2 [Suction bell] Part of the pump casing at suction side of the impeller. It has a unique shape, occasionally called a trumpet-shaped suction tube, to achieve smooth water-flow into the impeller.
- *3 [Discharge bowl] Part of the pump casing at discharge side of the impeller. It guides the water-flow from the impeller toward the shaft with the guide vanes. It is called a discharge bowl because of its round shape.
- *4 [Immersion test] A test piece made of various materials is immersed in the sea identical to the environment where the pumps are to be installed. The piece is picked up after a certain period of immersion and to be evaluated the progress of corrosion of each material.

Symbol of EBARA's *monozukuri*

Finally the first unit of the Fabricated DSS Vertical Pump was manufactured in 2002. EBARA could meet the customer's high-level demand with this large seawater pump of significantly more light-weight and had a much higher corrosion resistance than cast iron pumps and with the much less maintenance and management costs in terms of life cycle of the equipment. Up to this moment, approximately 160 pumps of this type have been manufactured and been used in oil and gas plants, desalination plants and power generation plants around the world. This model is among the flagship products in EBARA's fluid machinery and systems business.

It was a breakthrough brought about by a combination of the close cooperation and collaboration between and among EBARA, the relevant parties and the material vendors. The Fabricated DSS Pump is an achievement symbolizing the basic concept of EBARA's "*monozukuri*".



Cooling seawater pumps for petrochemical plants (diameter: 2000 mm)

The sea in the Middle East is characterized by the high water temperature and salinity. There were various kinds of harsh conditions for pumps used in such environment such as casting restrictions, casting defects, corrosion and weight. They demanded EBARA new series of pumps overcoming these difficulties. The solution chosen by EBARA, who has been uncompromisingly pursuing to manufacture high-quality products that sustain high quality and endure long period of service, was to make the entire pump casing with stainless steel plates. EBARA tackled and cleared hurdles in the material research and the development of manufacturing technology, which finally resulted in the completion of the Fabricated DSS Vertical Pump. This pump, which is now one of EBARA's core products, is symbolizing EBARA's value attached to "*monozukuri*" along with the collaboration with suppliers, research institutions, and other parties to ensure customers' satisfaction.



Unexpected incident during work in extreme cold

Shigeji Tsukahara
Ebara Qingdao Co., Ltd. (EQC)

Although Qingdao is located at similar latitude to that of Mito, Ibaraki Prefecture, Japan, it often hits -2 to -10 degrees C in the midwinter because it is on the continent. There is one production step called pickling close to the finishing process at EQC, an EBARA plant responsible for the welding of DSS pumps. In this process, acidic paste is applied to a part to be welded and rinsed off with tap water after a certain period. In my first winter in Qingdao, the rinse water froze immediately and a coat of ice formed before the acid was rinsed off. It was amazingly beautiful but I had no time to spare to appreciate the beauty. I boiled the water right away and successfully solved the problem. It is a good memory as I still remember vividly.



Welding of discharge bowl at EQC

Voice!

Extremely difficult immersion test in Saudi Arabia in midsummer*4

Hiroshi Yakuwa
Ebara



The immersion test in the Middle East I took over from my seniors was sometimes delayed because of the outbreak of the Gulf War and Iraq War. I thought I would never be able to conduct and complete the test under such environment, so I immersed the pallets weighing about 20 kgs at four locations under the scorching sunshine at 50 degrees C, which made me all sweaty, barely remembering the warning of working outdoors in Saudi Arabia in midsummer. One year later I returned to Saudi Arabia to find disappointedly that one of the pallets had disappeared because the ropes to secure it might have been loose. The results I obtained after such hardship are very precious to me with various feelings and memories attached still.



Immersion test at Saudi Arabian site