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Nippon Yakin Kogyo Co., Ltd.  
Kobe Steel, Ltd.

## **Diffusion Bonded Compact Heat Exchanger (DCHE) receives ISSF New Application Award**

Nippon Yakin Kogyo Co., Ltd. has received the Silver Award in the Awards for the Best New Applications featuring New Technology from the International Stainless Steel Forum (ISSF) for the use of its stainless steel in Kobe Steel's Diffusion Bonded Compact Heat Exchanger (DCHE). Nippon Yakin Kogyo supplied the stainless steel, which Kobe Steel used to manufacture the DCHE.

The ISSF presented the award to Nippon Yakin Kogyo at a ceremony held last month at its 21st Annual Conference held in Tokyo. This was the second time that Nippon Yakin Kogyo received an award from the ISSF and the first time for Kobe Steel to be named in the award.

The DCHE is a heat exchanger that is mainly used in hydrogen refueling stations. Kobe Steel developed the DCHE in 2012, drawing on over 50 years of experience with heat exchangers. Stainless steel, a modified SUS316L, is adopted owing to its strength and resistance to hydrogen embrittlement.

The DCHE consists of stainless steel plates that are etched with minute flow passages of 1 to 2 millimeters in size. The plates are stacked, and diffusion bonding enables a large heat transfer area per unit volume of at least 1000 m<sup>2</sup>/m<sup>3</sup>, about five times more than conventional shell and tube heat exchangers. The DCHE is also compact, only 1/100th the size of conventional heat exchangers, and has a high pressure resistance of up to 100 Mpa.

Hydrogen refueling stations are infrastructure facilities for fuel cell vehicles (FCV), which are growing in popularity. Heat exchangers are used in hydrogen refueling stations to cool the hydrogen to the target temperature. They are attached to hydrogen compressors, pre-coolers, and dispensers. Shell and tube heat exchangers have been used in the past, but have many joints and take up much space. Customers have been seeking heat exchangers that can be installed at a lower cost and with a smaller footprint.

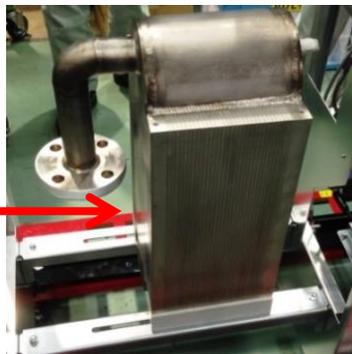
Since 2013 when the DCHE was first used in a hydrogen refueling station in Japan, Kobe Steel has supplied over 100 units for this application. Expanding sales of the DCHE, Kobe Steel aims to gain a 50 percent share of the market for heat exchangers for hydrogen refueling stations.

### About the International Stainless Steel Forum

The International Stainless Steel Forum (ISSF) is an association founded in 1996 for the international stainless steel industry. The ISSF consists of 32 stainless steel manufacturers and 25 related organizations from 25 countries. The Awards for Excellence in New Applications for stainless steel, which began in 2015, are given in two categories: The Award for the Best New Application featuring New Technology and the Award for the Best New Application featuring New Market Development. This is the second time that the Awards have been presented.



Diffusion Bonded Compact Heat Exchanger (DCHE)



A DCHE is installed inside a hydrogen dispenser. This unit is at the comprehensive test center for hydrogen compressors in Kobe Steel's Takasago Works in Japan.