Feature-Ⅰ: Automotive Weight Reduction

The Automotive Industry in a Period of Change and the Material Business Development of Kobe Steel

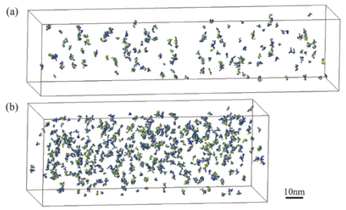

Fig.1 Mg and Si atoms found to be aggregated in an Al-Mg-Si alloy after (a) 10.8ks, (b) 360ks natural aging

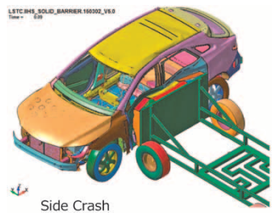

Fig.2 Simulation result of deformation of vehicle under side impact

Currently, the automotive industry is undergoing rapid changes involving electric vehicles and autonomous driving, in addition to traditional CO_2 reduction and collision safety improvement. This is being called a once in a century innovation, and various changes are expected to occur in the future. Kobe Steel will continue to contribute to the automotive industry, which is undergoing such a period of change, in areas such as steel, aluminum, copper, welding, and solutions. Also introduced in this special issue is Kobe Steel's global business development in addition to new products and technologies related to automotive materials.

Fig. 1 shows the maps of the Mg and Si atoms found, by a three-dimensional atom probe (3DAP), to be aggregated in an Al-Mg-Si alloy. The 3DAP analysis has revealed that the change of mechanical properties due to natural aging can be influenced significantly by nano-structure consisting of Mg and Si. Through such a fundamental study, the performance of the material has been improved.

Fig. 2 shows an example of the simulation results of the car body deformation upon experiencing a side crash. Ultra-high tensile strength steel and aluminum alloy were applied in various proportions to various parts of the base body consisting of steel to estimate the weight reduction effect and cost change under the assumption that the impact characteristics and rigidity of the vehicles were the same. On the basis of this, we also developed the dissimilar metal joining technology required.

Feature-Ⅱ: Iron and Steel Manufacturing Technology

Kobe Steel's State-of-the-Art Steel Production System and Supporting Technologies

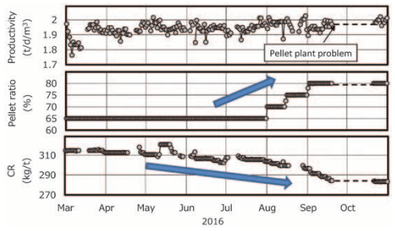

Fig.3 Transition of low coke rate operation

The environment surrounding the iron and steel industry is becoming even more severe, due above all to intensifying global competition and increasing raw material issues. Gaining customer recognition of values and keeping business competitive even in such an environment require the ability to make excellent products with high efficiency, high yield, and a low environmental impact, and to maintain a stable supply of these products. The company's production technology and "MONODZUKURI" (the art of design and manufacturing) power will be increasingly important in the effort to support this aim. This special issue introduces various new technologies that make up Kobe Steel's state-of-the-art steel production system.

Fig.3 shows the operational transition of the No.3 blast furnace at Kobe Works from March to October 2016. The No.3 blast furnace had been the only one in Japan to continue all-pellet operation and had improved the high-temperature meltdown property of iron ore by changing the charge distribution in accordance with the pellet composition and replacing lump ore with self-fluxed dolomite pellets. As a result, a low coke ratio operation of 283 kg/t has been achieved under the severe condition of a high pellet ratio (80mass%) with all raw materials being stored in an open yard.

<Cover photos>
[Feature-Ⅰ (upper)] A multi-material car body that combines ultra-high tensile strength steel sheets and aluminum alloys with conventional steel is considered to be a realistic solution for the car body design, balancing weight reduction and cost reduction. The figure in the middle of the cover shows in green the area where the conventional body parts made of steel sheets (lower figure) have been replaced with aluminum alloy. The upper figure shows the area replaced with ultra-high tensile strength steel in rose pink. Article discusses the weight reduction effect and economic efficiency under various ratios of ultra-high tensile strength steel and aluminum alloy in a car body.
[Feature-Ⅱ (lower)] The photos on the front cover have been designed on the basis of the No.6 continuous bloom caster, which is the largest equipment that was introduced with the integration of the upper stream process in 2017, in addition to the equipment landscape of blast furnaces and converters that symbolize Kobe Steel's production system. As exemplified here, most of the company's facilities for producing steel products are large and dynamic in scale. Hopefully, however, this special issue will convey the fac that the manufacturing process they follow is supported by numerous advanced and sophisticated control technologies and quality-related technologies.

KOBELCO

HEAD OFFICES

Kobe Head Office
2-4, Wakinohama-Kaigandori 2-chome, Chuo-ku, Kobe, Hyogo, 651-8585, Japan
Tel +81-78-261-5111/Fax +81-78-261-4123

Tokyo Head Office
ON Building, 9-12, Kita-Shinagawa 5-chome, Shinagawa-ku, Tokyo, 141-8688, Japan
Tel +81-3-5739-6000/Fax +81-3-5739-6903

Kobe Steel USA Inc. (U.S. headquarters)
19575 Victor Parkway, Suite 200, Livonia, MI 48152, U.S.A.
Tel +1-734-462-7757/Fax +1-734-462-7758

Kobelco (China) Holding Co., Ltd. (China headquarters, investment company)
Room 3701, Hong Kong New World Tower, No.300 Middle Huai Hai Zhong Road, Luwan District, Shanghai, 200021, People's Republic of China
Tel +86-21-6415-4977/Fax +86-21-6415-9409

Kobelco (China) Holding Co., Ltd. (Guangzhou Branch)
Room 1203, #285 East Linhe Road, Tianhe District, Guangzhou City, Guangdong Province, People's Republic of China
Tel +86-20-8852-4020/Fax +86-20-8852-4253

Kobelco South East Asia Ltd. (Regional headquarters for Southeast Asia and South Asia)
17th Floor, Sathorn Thani Tower II, 92/49 North Sathorn Road, Khwaeng Silom, Khet Bangrak, Bangkok, 10500, Kingdom of Thailand
Tel +66-2-636-8971/Fax +66-2-636-8675

Kobelco Europe GmbH (Regional Headquarters for Europe and Middle East)
Luitpoldstrasse 3, 80335 Munich, Germany
Tel +49-89-5434-478-0

BRANCH OFFICES

Osaka Branch Office
Midosuji Mitsui Building, 1-3, Bingomachi 4-chome, Chuo-ku, Osaka, Osaka, 541-8536, Japan
Tel +81-6-6206-6111 / Fax +81-6-6206-6101

Nagoya Branch Office
Nagoya Prime Central Tower, 15th Floor, 27-8, Meieki 2-chome, Nishi-ku, Nagoya, Aichi, 451-0045, Japan
Tel +81-52-584-6111/Fax +81-52-584-6105

SALES OFFICES

Hokkaido Sales Office
Nippon Seimei Kitamonkan Building 4F, 1-3, Kita-Shijo Nishi 5-chome, Chuo-ku, Sapporo, Hokkaido, 060-0004, Japan
Tel +81-11-261-9331/Fax +81-11-251-2533

Tohoku Sales Office
Sendai NS Building, 2-25, Ichibancho 1-chome, Aoba-ku, Sendai, Miyagi, 980-0811, Japan
Tel +81-22-261-8811/Fax +81-22-261-0762

Hokuriku Sales Office
Urban Place, 18-7 Ushijimacho, Toyama, Toyama, 930-0858, Japan
Tel +81-76-441-4226/Fax +81-76-442-4088

Shikoku Sales Office
Takamatsu Kogin Building, 6-8, Bancho 1-chome, Takamatsu, Kagawa, 760-0017, Japan
Tel +81-87-823-7222/Fax +81-87-823-7333

Chugoku Sales Office
GRANODE Hiroshima 8th Floor, 3-5-7 Futabanosato, Higashi-ku, Hiroshima, Hiroshima, 732-0057, Japan
Tel +81-82-258-5301/Fax +81-82-258-5309

Kyushu Sales Office
Shinkansen Hakata Building, 1-1 Hakataeki Chuogai, Hakata-ku, Fukuoka, Fukuoka, 812-0012, Japan
Tel +81-92-431-2211/Fax +81-92-432-4002

Okinawa Sales Office
Naha Shintoshin Media Building-West, 3-31,Omoromachi 1-chome, Naha, Okinawa, 900-0006, Japan
Tel +81-98-866-4923/Fax +81-98-869-6185

Takasago Works (Steel Casting & Forging Plant, Takasago Steel Powder Plant, Industrial Machinery Plant, Rotating Machinery Plant, Takasago Equipment Plant)
3-1, Araicho Shinhama 2-chome, Takasago, Hyogo, 676-8670, Japan
Tel +81-79-445-7111/Fax +81-79-445-7231

Kobe Corporate Research Laboratories
5-5, Takatsukadai 1-chome, Nishi-ku, Kobe, Hyogo, 651-2271, Japan
Tel +81-78-992-5600/Fax +81-78-992-5532

Kakogawa Works
1 Kanazawacho, Kakogawa, Hyogo, 675-0137, Japan
Tel +81-79-436-1111/Fax +81-79-436-1400

Research & Development Laboratory
2222-1 Onoecho Ikeda, Kakogawa, Hyogo, 675-0023, Japan
Tel +81-79-427-5000/Fax +81-79-427-5072

Kobe Works
2 Nadahama Higashicho, Nada-ku, Kobe, Hyogo, 657-0863, Japan
Tel +81-78-882-8030/Fax +81-78-882-8290

Fujisawa Office
100-1 Miyamae, Fujisawa, Kanagawa, 251-8551, Japan
Tel +81-466-20-3111/Fax +81-466-20-3115

Ibaraki Plant
2-19 Higashi-Unobecho, Ibaraki, Osaka, 567-0879, Japan
Tel +81-72-621-2111/Fax +81-72-621-2015

Saijo Plant
6400-1 Saijocho Misonou, Higashi-Hiroshima, Hiroshima, 739-0024, Japan
Tel +81-82-423-3311/Fax +81-82-420-0038

Fukuchiyama Plant
3-36 Osadanocho, Fukuchiyama, Kyoto, 620-0853, Japan
Tel +81-773-27-2131/Fax +81-773-27-6358

Moka Plant
15 Kinugaoka, Moka, Tochigi, 321-4367, Japan
Tel +81-285-82-4111/Fax +81-285-84-0231

Chofu Works
14-1 Chofu Minatomachi, Shimonoseki, Yamaguchi, 752-0953, Japan
Tel +81-83-246-1211/Fax +81-83-246-1271

Daian Works
1100 Daiancho Umedo, Inabe, Mie, 511-0284, Japan
Tel +81-594-77-0330/Fax +81-594-77-2249

Harima Plant (Standard Compressor Plant)
41 Niijima, Harimacho, Kako-gun, Hyogo, 675-0155, Japan
Tel +81-79-436-2101/Fax +81-79-436-2199

https://www.kobelco.co.jp/technology-review/english/index.htm