Supporting the Kobe Steel Group, the Technical Development Group engages in basic and advanced research and works closely with development departments in the business segments, applying their wealth of technological expertise to effectively meet customers' needs. Blending technologies in the fields of materials, machinery, the environment, energy and electronics, Kobe Steel's laboratories pursue the development of truly distinctive "Only One" products and ever higher levels of manufacturing excellence.

The Technical Development Group serves as the Group's R&D base. Combining the specialized technologies of each of the laboratories, the Technical Development Group undertakes research aimed at enhancing the profitability of the business segments while pioneering new products and technologies for the future.

R&D Activities

Material Research Laboratory

The Material Research Laboratory (MRL) engages in research based upon four technological fields: refining and solidification, materials design, mechanical working, and surface control. For the materials business, MRL is working to develop new high-performance products based on material and surface design and control, and to optimize manufacturing processes. For machinery-related businesses, MRL focuses on creating differentiated products utilizing its expertise in materials. MRL also strives to develop new businesses based on high-value-added products.

Mechanical Engineering Research Laboratory

The Mechanical Engineering Research Laboratory (MERL) conducts research and development in machinery, materials, the environment, energy, and steel structures. Through the use of advanced simulation, testing, measurement, and analysis techniques in the fields of structural, strength, dynamics, acoustics, fluids, thermal, combustion, and chemical technologies, MERL works to enhance product performance, improve production processes and design, and focus on developing new products and technologies in an effort to improve product development capabilities.

Production Systems Research Laboratory

The Production Systems Research Laboratory (PSRL) actively innovates production technologies to bolster the Group's manufacturing capabilities, utilizing cutting-edge technologies for instrumentation and inspection, control, production planning, information system and signal processing. PSRL strives to further develop new product menus that have at their core the powerful technologies it has cultivated.

Electronics Research Laboratory

The core technologies of the Electronics Research Laboratory (ERL) include those related to thin-film materials, microfabrication and superconductivity. ERL plays a part in strengthening the Kobe Steel Group's business competitiveness in such growth fields as nanotechnology, the environment and energy. In addition, based on its electromagnetic design and electronic control technologies, ERL is making progress in the development of novel products in the power electronics field and making inroads into potential new businesses.

Coal & Energy Technology Department

The Coal & Energy Technology Department (CETD) is developing energy conversion technologies such as the upgrading of brown coal through dewatering and de-ashing, coal liquefaction, and the hydrocracking of heavy oil. CETD is working to find ways to effectively use the world's untapped natural resources and contribute to securing stable and diversified energy sources for Japan.

R&D-related Subsidiaries

- Kobelco Research Institute, Inc.
- Shinko Research Co., Ltd.

Recent R&D Achievements

Joining Techniques for Dissimilar Metals—Aluminum Alloy and Steel—Accelerate Automobile Weight Reduction

To improve fuel efficiency and reduce CO_2 emissions by making automobiles lighter, Kobe Steel is promoting the aluminization of various components. As aluminum panel material for hoods and doors has a significant weight-reducing effect, work is being undertaken to develop material and forming techniques to broaden the range of applications.

Using aluminum alloy in an automobile's bodywork requires that aluminum be joined to the surrounding steel. Conventionally, the joining of dissimilar metals such as aluminum alloy and steel has involved the use of mechanical joining with bolts and rivets, but this presented problems from the productivity and cost aspects.

To solve these problems, the Material Research Laboratory (MRL) has advanced the development of joining dissimilar materials using a highly productive welding process that is commonly used for vehicle assembly. Usually, when dissimilar metals such as aluminum alloy and steel are welded, sufficient strength cannot be derived from the joint due to a brittle compound layer generated at the joint itself. By using a material that eliminates the weld inhibitor in the flux, combined with welding condition innovations, the new development has achieved bonding strengths between aluminum alloy and steel on par with cases in which aluminum alloys alone have been welded together.

This area of research is at a stage that has established fundamental joining techniques, and MRL will be pushing ahead with the development necessary for its application to actual components.

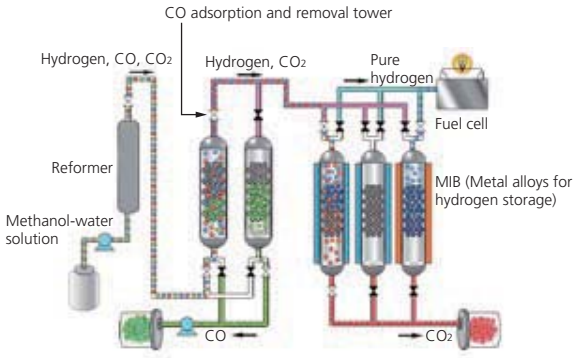
Example of aluminum alloy-steel weld

Compact Hydrogen Production/Supply Process Promotes Fuel Cell Use

Hydrogen supply infrastructure facilities are indispensable to promote the use of fuel cells, which are expected to help curb CO_2 emissions. To achieve a hydrogen-based society, it is necessary to establish a system capable of efficiently refining, storing and supplying hydrogen.

In collaboration with the University of Tsukuba, the Mechanical Engineering Research Laboratory (MERL) developed a compact hydrogen production and storage process—the carbon monoxide (CO) selective adsorbent and metal hydride intermediate buffer (COA-MIB) process—which features excellent start and stop characteristics and is highly responsive to load fluctuations. Applying CO separation and adsorption agents developed for use in the concentration and recovery of CO generated from steelmaking plant by-product gases at steelworks, the CO that seeps out when hydrogen is produced from natural gas is completely removed. Hydrogen of high purity can then be produced, stored and supplied by using hydrogen storage alloys. This process, which does not require a large-scale hydrogen supply network to be constructed, can supply pure hydrogen for fuel cells at a highly efficient hydrogen recovery rate of more than 85%, based on a daily start and stop (DSS) operation basis.

Giving added impetus to this development, MERL will promote its application in compact hydrogen stations and solar cells as a measure against voltage fluctuations in the natural energy field.



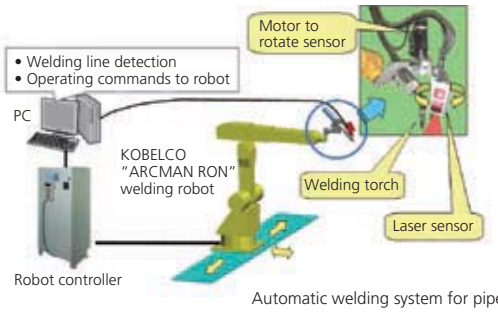
Simplified ow diagram of COA-MIB process

Automatic Welding System for Crane Booms

Jointly developed by Production Systems Research Laboratory (PSRL), Kobelco Cranes Co., Ltd. and the Welding Systems Department of the Welding Business, an automatic welding system for steel-pipe crane booms has been in operation at Kobelco Cranes' Okubo Plant since November 2007.

Previously, the pipe booms of Kobelco Cranes' mainstay products, lattice-boom crawler cranes, were welded manually by well-experienced technicians. In automatic welding, work that is subjected to the heat of welding will warp. As the welding position changes from time to time, it is essential for robotic welding to make real-time corrections to those constantly changing positions. In addition, welding lines in pipe-to-pipe welding are three-dimensional, saddle-shaped curves, in which the shapes of welding grooves keep changing all the time. Conventionally, no means had been available to measure and correct for those changes.

In order to resolve these issues, by utilizing a laser sensor for arc welding we developed capabilities with regard to: (1) saddle-shaped welding line detection; (2) highly reliable tracking for welding lines with small curvatures; and (3) saddle-type programming data generation. The integration of these capabilities with the pipe welding process expertise of Kobelco Cranes brought to fruition an automatic welding system for steel-pipe booms. Through its commercialization and by providing trouble-free service on sites, this system has brought quality welding to new heights.



Automatic welding system for pipe booms

Intellectual Property Activities

Intellectual Property Management at the Product and Technology Level

Strategic intellectual property activities are essential to the Kobe Steel Group's goal of creating and expanding its range of distinctive, Only One products. The importance of intellectual property has gained recognition with the recent enactment of the Intellectual Property Basic Act. At the same time, a three-pronged strategy covering business, R&D and intellectual property has been advocated amid calls for a response to the increasing problems of imitations in Asia and higher incidence of technological leakage from companies.

With its avowed commitment to intellectual property management at the product and technology levels, the Group is making headway with: (1) the promotion of intellectual property management; (2) strengthening its global response; and (3) improving cooperation in the area of intellectual property throughout the Group. Most importantly, with regard to intellectual property management for individual products and technologies, we are moving forward on utilizing a new intellectual property management system.

Overview of Fiscal 2009

In fiscal 2009, Kobe Steel received nearly 560 new patents in Japan, primarily to protect Only One products, which now gives the Company approximately 3,700 total patents. Moreover, as a result of the globalization of its business, Kobe Steel is strengthening its acquisition of new patents overseas, especially in Asia, which now account for almost 37% of the total number of patent applications.