

Research and Development



Seeking to enhance core competence in its business divisions and create new value for its customers, KHI emphasizes a Group-wide approach to R&D that is based on integrated efforts by business divisions and the Corporate Technology Division to promote new product and business development and to engage in development activities aimed at, for example, sharper product competitiveness and higher quality and productivity.

In addition, under the ROIC management strategy, we will strive as one to raise the cohesive power of the Group and improve corporate value by pursuing technology-driven synergies extending beyond divisional walls and efficiently promoting new product and business development.

Social Trends and Market Needs >>>

- Motorcycle engine fitted with supercharger
- New rolling stock bogie efWING
- FLNG/FPSO marine boiler*
- Robot systems for global production
- Hydraulic, variable-speed system for construction machinery
- Commuter train for North American market
- Large, offshore service vessel
- High-efficiency gas turbine
- Large, high-efficiency gas engine

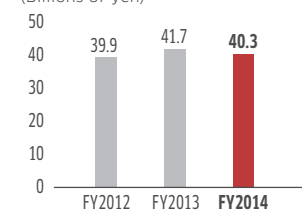
Technology and Product Development Looking Ahead to a More Distant Future

In our pursuit of enhanced core competence in existing businesses, we are making progress in the development of new products, including an offshore service vessel for marine resource development, a commuter train for the North American market, FLNG/FPSO marine boilers*, high-output gas engines for power generation, and a motorcycle engine fitted with a supercharger. In addition, we aim to quickly cultivate and strengthen technology for the future to underpin the creation of new value for customers, and toward this end we are delving into technology to integrate electrical and mechanical systems and innovative production technology designed to achieve efficient production of civilian aircraft and large aircraft engines. We are also looking ahead to the eventual realization of a society that benefits from energy supplied by hydrogen and are directing efforts into the development of hydrogen-related technology and products.

These activities reflect a corporate perspective that goes beyond tomorrow to a more distant point in time and guides us on an enduring quest to achieve a well-balanced R&D program.

R&D Costs

(Billions of yen)

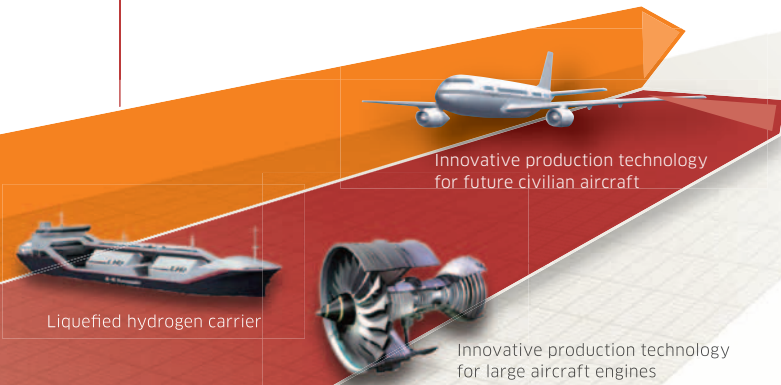


Developing Hydrogen-Based Technology with an Eye to Wider Future Demand

At present, hydrogen is primarily used as an industrial gas. But society is on the verge of consuming hydrogen, a clean energy, in large quantity, buoyed by such demand-boosting factors as the upcoming market debut in Japan of fuel cell vehicles in fiscal 2015 and discussion over the possibility of using hydrogen as a source of electricity during the 2020 Summer Olympics in Tokyo. Anticipating these social trends and market needs, we began working on related R&D

several years ago to facilitate the safe and large-volume supply and use of hydrogen.

Our efforts include the construction of liquefied hydrogen carriers, which will be needed to transport hydrogen in bulk, as well as the technology for efficient liquefaction of hydrogen. Other efforts depend on core technology, from hydrogen production, including gas turbines compatible with hydrogen fuel, to hydrogen infrastructure products associated with transport, storage, and use. We will accelerate the introduction of products, in succession, that are well-matched to evolving hydrogen-linked businesses.



Liquefied hydrogen carrier

Innovative production technology for future civilian aircraft

Innovative production technology for large aircraft engines

Hydrogen Road

Production



Transportation & Storage



Uses



Liquefied Hydrogen Carrier



Hydrogen for use as an energy source will require handling in bulk. At the transport stage, a key question is how to carry the load more efficiently. Hydrogen, in its liquefied state, is extremely compact, taking up just one-eight-hundredth the volume of gas. The liquefied form is therefore the most optimal for transport and storage.

We are now in the process of developing the world's first liquefied hydrogen carrier. Last year, we were the first to receive certification from Nippon Kaiji Kyokai (ClassNK)–Japan's ship classification society—for an on-board liquefied hydrogen containment system. This recognition substantiates leading-edge technologies applied to LNG carriers, which have earned high marks from customers over many years, as well as liquefied hydrogen tanks with the largest capacity available in Japan.

Hydrogen Gas Turbines



As a pioneer in industrial-use power-generation equipment, KHI is working to make its gas turbine and gas engine power-generation equipment compatible with hydrogen gas. In the field of gas turbines, we set a new world mark for efficiency and outstanding environmental performance with our proprietary supplemental burner system, a technology that facilitates the burning of a hydrogen gas and natural gas mixture in a combustor.

KHI has leveraged this technology with the recent launch of the L30A—a superhigh-efficiency gas turbine in the 30MW class.