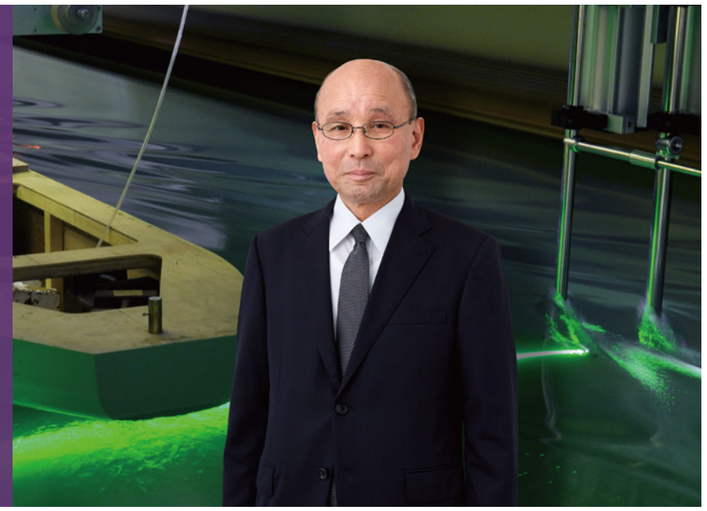
Research & Development

Developing the technology that enhances our business competitiveness in collaboration with operational headquarters.



Managing Executive Officer
General Manager of Research & Development Headquarters

Nobuo Doi

The Research & Development Headquarters uses close partnerships with each headquarters to develop the technology that will enhance product competitiveness and serve as the foundation for future business expansion.

Analysis Technology Field

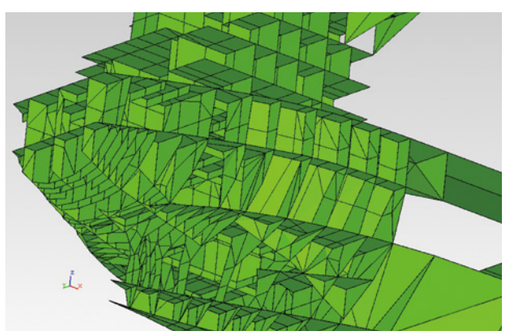
The importance of analysis technology is growing due to its invaluable role in product design and development in terms of evaluating performance and reliability improvements, cost reductions, and trouble prevention. Equally, product environment and safety requirements are increasing. To meet these requirements, MES is working to enhance the analysis technologies related to structure, vibration, noise, thermo-fluid, etc.

Action

Enhancing Noise Prediction Technology

Applying to the Development and Design of Ships Compliant with Noise Regulations

The International Maritime Organization (IMO) has instituted a noise regulation code that limits the crew noise exposure to below a certain level. MES is conducting R&D aimed at increasing the accuracy of ship noise prediction technology that will enable us to comply with such noise regulations from the ship development and design phase. Analyzing noise on a vessel requires the technology to analyze the vibrations that pass through the ship's internal structure and data related to vibration sources, noise sources, and the inner materials that emit sound. We conducted vibration analysis using the statistical energy analysis (SEA) method. Data related to vibration sources, noise sources, and noise-emitting inner materials was based on actual ship measurement data and inner material acoustic property data accumulated through our vast years of shipbuilding experience. The result of these R&D efforts was, using the Handy-max bulk carrier as an example, prediction accuracy that is comparable to actual ship measurement results over nearly all sections of the carrier. This success resulted in the development of a noise prediction system for commercial use. R&D was conducted in collaboration with Akishima Laboratories (Mitsui Zosen) Inc.



Handy-max bulk carrier noise analysis model

Materials Technology Field

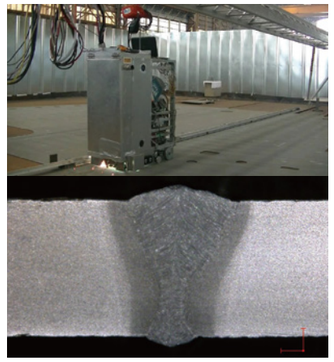
To improve product reliability, we apply our core technology for evaluating material damage, including wear, fatigue, and erosion, towards R&D that contributes to damage prevention and improved durability. We also are working to develop technology that will contribute to innovations in production and machining processes, including welding and functional surface treatment, in hopes of increasing productivity and reducing manufacturing costs.

Action

Developing Laser-Arc Hybrid Welding Technology

Applying to Shipbuilding

We used a laser-arc hybrid welding method during part of the deck panel welding process for a large-scale patrol vessel delivered to the Japan Coast Guard. This laser-arc hybrid welding method combines the advantages of both laser welding and arc welding while compensating for the shortcomings of the respective methods. We are continuing R&D into this technology due to its potential to improve both productivity and quality during the shipbuilding process.
We received approval for this welding method from relevant supervisory authorities to apply this tech to mild steel and high-tensile steel, and used this method in our panel welding process. Welded panels have a superior external finish and welding resulted in only minor deformations, confirming that this method delivers a more-than-sufficient level of quality.



Welding Conditions and View of Weld Joint

Control Technology Field

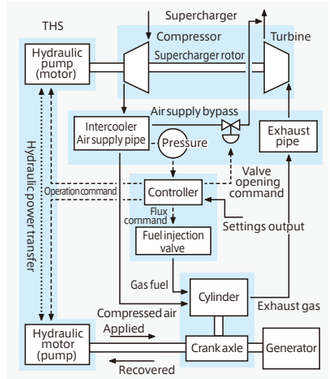
Our products must meet a diverse range of customer needs, including requirements concerning budget, automation, and environment-friendliness. This had led to the growing complexity of system to achieve desired performance parameters. To ensure the accurate design of such complex systems, we are developing technology that uses simulations to predict transient response and other factors. At MES, we are advancing the development of technology that will increase the performance of our products (container cranes, marine engine systems, plants, etc.) and enable system automation.

Action

Development of Transient Response Prediction Simulation Technology

Predicting the Responsiveness of Gas Engine Equipped with THS

Amid a growing international awareness of environment conservation, the development of CO_2, NOx, and SOx reduction technology is progressing and the need for energy conservation technology has grown as companies become more budget conscious. MES is developing environment-friendly technology in the areas of high-efficiency gas engines and related equipment. To improve gas engine fuel efficiency and improve load responsiveness, we are developing engines equipped with THS (Turbo Hydraulic System) exhaust heat recovery systems. One issue was predicting the behavior of a complex system that combined an engine with THS. To address this issue, we constructed a total engine system simulation model that assumed an engine equipped with THS to predict system behavior during times of load variation. This gave us prior indication that THS would favorably assist the supercharger and that we could expect improvements responsiveness during load variation.



Overview of THS engine system model

Process Technology Field

In the process technology field, we are applying technology developed and improved over many years toward achieving further product improvements. From environment-related technology (water drainage and exhaust gas processing, catalytic incineration, coal treatment technology, and biomass utilization technology) to our more recent work in combustion and thermo-fluid analysis technology, we collaborate with the headquarters to create technology for the next generation of product development. Recently, we are applying R&D related to hydrates towards a collaboration with the Ocean Business Promotion Department on developing technology for recovering methane hydrate as an ocean resource.

Action

Developing Biogas Plant Performance Improvement Technology

Creating a Process Applicable to a Diverse Range of Raw Materials

Biogas plants (BGP) are recycling plants that ferment various organic waste and use the resulting biogases to recover heat and electricity. The BGP operated by BETSUKAI Biogas Power Generation is Japan's largest gas power generation facility fueled by waste from livestock. MES has conducted long-term fermentation testing to confirm plant operation stability and validate the efficacy of recycled litter produced at this facility. We will continue working to optimize all BGP processes as we seek to improve profitability.

Japan's largest biogas plant