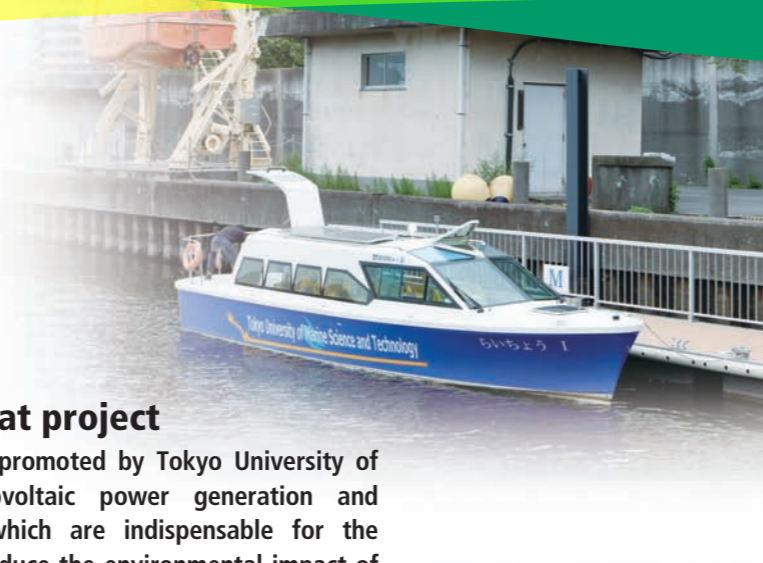


Tackling Global Warming at Sea

Participation in a battery-powered boat project

ULVAC participated in a battery-powered boat project promoted by Tokyo University of Marine Science and Technology, developing photovoltaic power generation and quick-charging systems for battery-powered boats, which are indispensable for the widespread use of such boats. Battery-powered boats reduce the environmental impact of traffic at sea. We asked the university professor leading this project, Professor Takamasa, to share with us the background and goals of the project as well as his expectations for ULVAC.



Battery-Powered Boat Project

Q: First, would you tell us about the developmental background of battery-powered boats?

Most boats used today run on diesel. This is why boats generate noise, vibrations, and odors, and this causes adverse environmental impact on the quality of air and water because of the exhaust gas. In fact, many boats are less friendly to the environment than public transportation or cars.

Given such circumstances, our collaborative industry-university project team started to develop a battery-powered boat, the "Raicho-I" ("raicho" means "thunderbird" in Japanese), with a view to its commercialization. This new boat is equipped with a secondary battery and motor instead of the conventional combination of a fuel tank and engine.

Social Issues Solved by Battery-Powered Boats

Q: How do you think widespread use of battery-powered boats will change society?

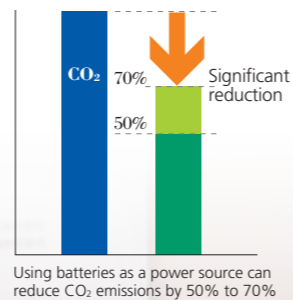
The Raicho-I is the world's first boat to be powered by a lithium-ion battery that has a rapid charging system. Conventional battery-powered boats use lead batteries that

weigh 10 times as much as lithium-ion batteries. Lithium-ion batteries, in addition to helping reduce the weight of boats, can be charged to approximately 80% of their full charge capacities within 30 minutes. Compared to boats of the same class equipped with diesel engines, operating a battery-powered boat costs roughly half (one-sixth if nighttime power is used) and emits 50% to 70% less CO₂.

Since these new boats run on electricity, they can contribute to society's shift from being reliant on gasoline and other fossil fuels to becoming a low-carbon society.

Also, if people see boats as an environmentally friendly means of transportation, this may promote marine leisure activities and even cause changes to the future of marine traffic and fisheries.

For example, kombu (kelp) cultivation is vulnerable to water pollution caused by the gas and oil discharged from boats. Thus battery-powered boats will contribute to the conservation of the marine ecosystem.



Japan is surrounded by the ocean and has many rivers. This technology is just what Japan needs.



Tomoji Takamasa
PhD in Engineering, Professor, and Dean,
Graduate School of Marine Science and
Technology,
Tokyo University of Marine Science and
Technology

The Future of Battery-Powered Boats

Q: What do you want to achieve with battery-powered boats? And what are your expectations for ULVAC?

Japan is surrounded by the ocean and has many rivers and isolated islands. For this reason, I strongly believe that Japan truly needs battery-powered boats. Such boats will not only reduce the load on the environment, they will also serve as an important means of transportation in the manner of cars and airplanes, thereby greatly contributing to reductions in traffic jams and accidents as well as the growth of new industries.

I also want to realize the "eco-friendly fishing ports" (ports that aim to prevent global warming by reducing CO₂ emissions from fishery activities as well as to reduce fishery costs by saving energy) being promoted by the Ministry of Agriculture, Forestry and Fisheries. By increasing the number of battery-powered fishing boats and deploying more battery charging infrastructure, such fishing ports will soon move closer to realization. To this end, we are testing

battery-powered boats in fisheries. These efforts will help protect the fishing industry, which is among Japan's most important industries.

Of course, still many challenges remain to be overcome. We won't be able to do this alone. It is only by cooperating with companies that have excellent technology, such as ULVAC, that we will be able to create new value.

I hope that as our partner for making a difference in the world, ULVAC will enhance its technological strengths through this joint research and development as well as our experiment- and verification-related activities.



Battery-Powered Boats and ULVAC's Technology

In 2010, ULVAC completed a photovoltaic electric vehicle quick-charging system (a PV/EV charging system). This technology enabled our participation in the battery-powered boat project. During the project, we challenged ourselves to develop the motor and drive unit of the "Raicho-S." As EV motors are connected to transmissions, they must be high-speed, low-torque motors in order to generate power. For boats not designed for frequent stop-start operations, ULVAC developed drive units featuring low-speed, high-torque motors capable of being directly connected to propellers (rather than through reduction gears,

which causes power loss). Our technology helped realize this simple propulsion system. In addition to quick chargers and motor inverters, ULVAC has also developed power semiconductors and power generation/storage systems that use natural energy, such as solar and wind power, which are essential for controlling such quick chargers and motor inverters. ULVAC will continue to offer technologies that contribute to society.



Quick-charging system for battery-powered boats



Progress in battery-powered boats contributes to conserving the global environment. To this end, I'm determined to meet any requests.

ULVAC successfully developed the motor inverters, thereby playing an important role in the battery-powered boat project. For this project, we needed to develop truly unprecedented low-speed, high-torque boat motors in just half a year. Despite the difficulty of such a task, we were able to meet the deadline in cooperation with our research divisions and overseas group companies.

Though the motor inverter installed on the "Raicho-S" is still a prototype, we are pushing forward to commercialize it: we have not only visited China many times to procure reliable parts and components, but we are also verifying such materials internally. We are confident that these steady efforts will lead to the cost reductions necessary to realize mass production of battery-powered boats.

In addition to commercializing the motor inverters for battery-powered boats, we are aiming to install photovoltaic quick-charging systems at fishing ports. To this end, we will offer various technologies by combining the technological strengths of our group companies.



Koji Shibayama, Senior Manager, Components Division



Water jet



"Raicho-S"