

Efforts at JFE R&D /Research on Next-Generation Clean Energy

JFE Holdings				
JFE Steel	JFE Engineering	Kawasaki Microelectronics	JFE Urban Development	JFE R&D

“Low-Sludge Biological Water Treatment System” for Reducing Excess Sludge

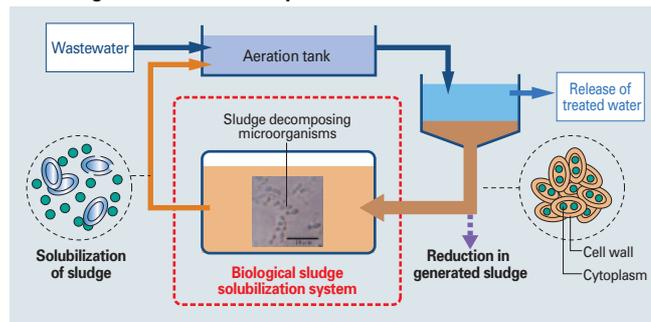
JFE R&D is carrying out research and development on a low-maintenance, low-cost “Low-sludge Biological Water Treatment System” at the Tsugawa-machi Water Purification Center (Niigata Pref.) as an economical technology for reducing excess sludge treatment in medium- and small-scale public sewerage treatment plants and has substantially reduced sludge generation in full-scale experiments.

By nature, sludge contains large numbers of various microorganisms. JFE R&D began research on these microorganisms in 1999 and, based on DNA analysis, identified 11 kinds with

high solubilization capacities in 2002.

Microorganisms with high solubilization capacities (sludge solubilization bacteria) decompose organic matter in the sludge into low molecular substances in the biological reaction tank, and the solubilized sludge component is completely decomposed into CO₂ in the sewerage treatment plant, greatly reducing sludge generation. This reduces excess sludge generation, making it possible to reduce the scale of sewerage plant equipment such as dehydrators, and thus greatly reducing total con-

Low-sludge Water Treatment System



struction costs and maintenance/operation costs.

This system is applicable not only to medium- and small-scale public sewerage treatment plants, but also to extremely small wastewater treatment plants such as rural sewerage treatment facilities, as well as to private-sector wastewater treatment facilities.

Research on Next-Generation Clean Energy

● Research for Practical Application of DME Production/Application Technologies

The JFE Group was among the first to recognize the superiority of DME (dimethyl ether) and began research on a direct synthesis technology for DME in 1989. At present, with support from METI's Agency for Natural Resources and Energy, the JFE Group is engaged in “Development of Technology for Environmental Load Reducing Fuel Conversion” jointly with partner companies. In 2003, the JFE Group constructed a 100 ton/day DME direct synthesis pilot plant (Shiranuka-cho, Hokkaido), which is the world's largest

operational plant, and conducted a successful test run of the pilot plant in January 2004. In the next three years, repeated test runs and pilot-scale experiments will be carried out as part of R&D for establishing a low-cost, commercial scale (approx. 3000 tons/day) production technology.

In addition, JFE Engineering, together with two other companies, is involved in a “Programs for the Development of Machinery Using DME Fuels” for METI's Agency for Natural Resources and Energy, aiming at practical application of a revolutionary distributed power generating system which will substantially reduce emissions of environ-

mental pollutants such as particulate matter (PM), nitrogen oxides (NO_x), and sulfur oxides (SO_x), while maintaining at least the same performance as conventional diesel power generating systems, by using DME in large diesel systems.



Pilot-scale DME direct synthesis plant (100 t/d; Shiranuka-cho, Hokkaido)

● Research for Practical Application of High-efficiency Fuel Cell Power Generation: “SOFC”

Fuel cells, which convert the chemical energy of fuels directly to electricity, are a next-generation power generating system which offers one solution to global warming and other environmental problems. In comparison with internal combustion engine systems, fuel cells have higher generating efficiency and discharge virtually no NO_x or SO_x.

The solid oxide fuel cell (SOFC) is the lead-

ing candidate for fixed generating equipment, as it has the highest generating efficiency among fuel cells and excellent durability.

JFE Engineering was quick to notice the superiority of SOFC and began R&D in 1987. In 1992, the company began joint development with Siemens Westinghouse Power Corporation (SWPC) in the United States, which is the world leader in technical development of SOFC. In 2003, JFE Engineering also began pilot-scale research aimed at early practical application of a 5 kW CHP system

as an SOFC generating system for households and small businesses with Fuel Cell Technologies, Ltd. of Canada, and is also studying practical application of a 125 kW CHP system with a target date of 2006-2007.

Current research includes a combination technology using an SOFC generating system and DME or bio-gas fuel.



SOFC generating system