



EARTHTECHNICA Co., Ltd. SEKISHOUTEN Co., Ltd.

· Research and Development to Develop Revolutionary Environmentally-friendly Energy Technologies with Immediate Effects - Development of Technologies to Recycle Flammable Wastes into Fuels (FY1998-2001)

Development of “RPF,” an Inexpensive New Fuel that Emits a Smaller Amount of CO₂ than Fossil Fuels



For production industries such as papermaking, steelmaking and cement industries, large burning facilities are indispensable. At those burning facilities, large amounts of fossil fuels are being consumed every day. However, a new fuel that can replace fossil fuels has been waited for a long time, because of the experience of resource shortages caused by the two oil crises in the 1970s, the present need to alleviate global warming, and the recent high instability of market prices of resources. One new fuel that is attracting attention as a candidate for such a new fuel is “Refuse Paper and Plastic Fuel (RPF).”

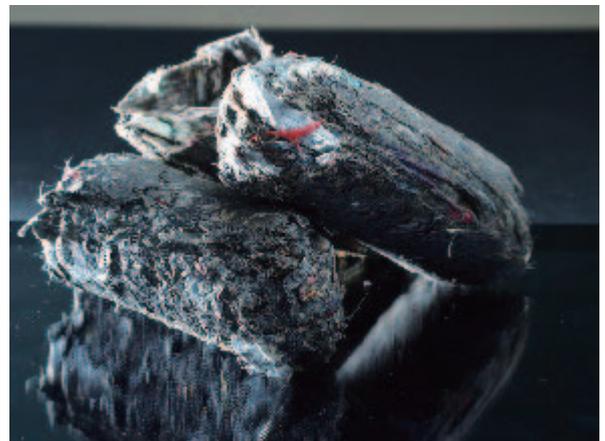
RPF is a solid fuel produced from such materials as difficult-to-recycle waste laminated paper coated with plastics and waste plastics that will not be decomposed by the action of the natural world after burial. RPF has many advantages over coal including the lower price and the lower environmental impact in terms of the amount of CO₂ emitted (the amount of CO₂ emitted by RPF is two thirds the amount of CO₂ emitted by coal for the same calorific value). For this reason, the number of companies that produce and sell RPF has exceeded 200, and RPF is taking root as a substitute for fossil fuels for industrial production. In January 2010, a JIS Standard for RPF as an industrial product was established.

The person who devised RPF is Katsushiro Seki, who is the president of SEKISHOUTEN Co., Ltd. and the current Chairman of the Japan RPF Association. From his experience of operating the resource collection company he inherited from his parents, Mr. Seki had felt that it was very important for Japan to dramatically reduce the amounts of wastes disposed of at final disposal plants and develop substitutes for fossil fuels. He had decided to develop and popularize a recycle fuel that meets both challenges at the same time, and had been striving towards that goal.

Then, the Crushing and Grinding Equipment Division of Kawasaki Heavy Industries, Ltd. recognized the importance of his undertaking, and had started working with him toward putting RPF into practical use.

During the period from FY1998 to 2001, the Division participated in the “Research and Development to Develop Revolutionary Environmentally-friendly Energy Technologies with Immediate Effects - Development of

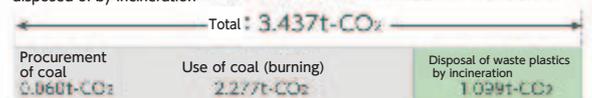
Technologies to Recycle Flammable Wastes into Fuels” project of NEDO. Under the project, the Division constructed a demonstration plant on the premises of the Yachiyo Factory of Kawasaki Heavy Industries, Ltd., conducted tests using the demonstration plant to accumulate technical data and knowledge and improved the equipment based on the obtained data and knowledge, thereby laying the foundation for the popularization of RPF. By 2012, RPF grew and became popular to the extent where an energy market with annual production of 1.1 million tons and annual sales of 23 billion yen had been formed.



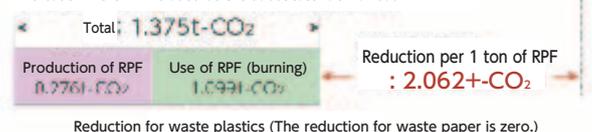
RPF, the new recycle solid fuel

CO₂ emission reductions

The case where coal is burned as the fuel using boilers and waste plastics are disposed of by incineration



The case where RPF is used as the substitute fuel for coal



CO₂ Emission Reduction Effect of RPF

Q. Why did this project start?

The "Research and Development to Develop Revolutionary Environmentally-friendly Energy Technologies with Immediate Effects" project was set up with the aim of actively promoting research and development on new environmentally-friendly energy technologies that can provide practical effects soon after their introduction, as a means to meet the challenge of "reducing greenhouse gas emissions by 6% from the greenhouse gas emissions in 1990 during the period from 2008 to 2012," which is an international agreement made as part of the Kyoto Protocol adopted at the third Conference of the Parties (COP3) to the United Nations Framework Convention on Climate Change held in December 1997. Because CO₂ emissions from the burning of foods, timber and paper made from biomass raw materials are not counted by the Intergovernmental Panel on Climate Change (IPCC) as CO₂ emissions, NEDO chose RPF, whose raw material is waste paper, and started this project as a project relating to the development of substitute energy resources for oil.

Q. What was the aim of the project?

To reduce the emission of CO₂, which is a greenhouse gas, it is important to effectively utilize waste-based energy, which is unutilized energy. To produce RPF from flammable waste and effectively utilize it as a substitute energy resource for fossil fuels, it is essential to remove the chlorine contained in waste paper and waste plastics to the extent where it does not hinder the burning and suppress the generation of dioxins during the burning. This project aimed at helping alleviate global warming and promoting recycling by establishing technologies to recycle flammable waste through the development of pretreatment and dechlorination technologies for RPF and other technologies. At the time of the start of the project, RPF produced from only waste plastics with no chlorine content had already been commercially available, but no systematic study on RPF had been conducted. With regard to technologies to dechlorinate waste plastics, several studies to develop technologies for pretreatment such as waste plastic liquefaction and injection into a blast furnace had been conducted, but a simple and effective treatment method had been sought for. Utilizing RPF, whose main raw material is waste paper, as a fuel for boilers of paper mills to replace the traditionally used coal will lead to the establishment of a material cycle in the papermaking industry. In addition, NEDO considered that, if it became possible to dechlorinate the polyvinyl chloride (PVC) mixed into plastics, which is a general waste, and utilize the plastics as a material for RPF, the amounts of wastes landfilled by local governments would be reduced, which would be socially beneficial. The project set the following fuel quality as a development goal, to ensure the development of a technology that allows a generic solid fuel which can be used as a substitute for fossil fuels for existing boilers and other facilities to be produced mainly from waste paper and waste plastics that have been collected under sorted waste collection systems of local governments.

Q. What is the role of NEDO?

At the time of the start of the project, recycling of waste paper and waste plastics had become a national task, and there was a strong voice among Japanese citizens for early establishment of practical recycling technologies. In addition, developing technologies for effective treatment of the off-gas from the burning in "thermal recycling" (utilization of wastes as fuels) to remove dioxins and other toxic substances had become an urgent task. It had been considered that dechlorinating the recycle raw materials would be an effective measure, but no technology to produce dechlorinated solid fuels had been developed at the time of the start of the project. Because it had been considered that a technology to put dechlorinated solid fuels produced by recycling wastes into practical use would be a revolutionary technology with immediate effects in the sense that it would help reduce greenhouse gas emissions the amounts of wastes landfilled by local governments, it had been considered that support by the national government was necessary. Therefore, NEDO tried to promote the efforts to put the technology into practical use by conducting the research and development project.