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## Promotion of Global Warming Countermeasures

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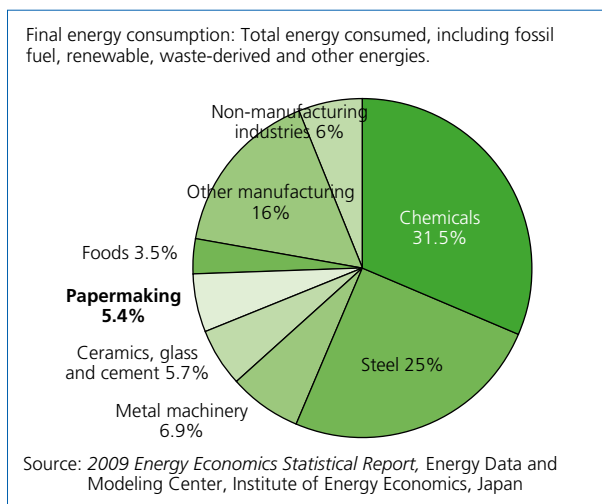
As measures to fight global warming, we will continue to promote energy conservation, transition to non-fossil fuels and efforts to reduce CO<sub>2</sub> emissions, while also proactively developing and maintaining forests that will contribute to CO<sub>2</sub> sequestration.

## We secure the energy needed to produce paper by combining fossil fuel-based, renewable and waste-derived energies.

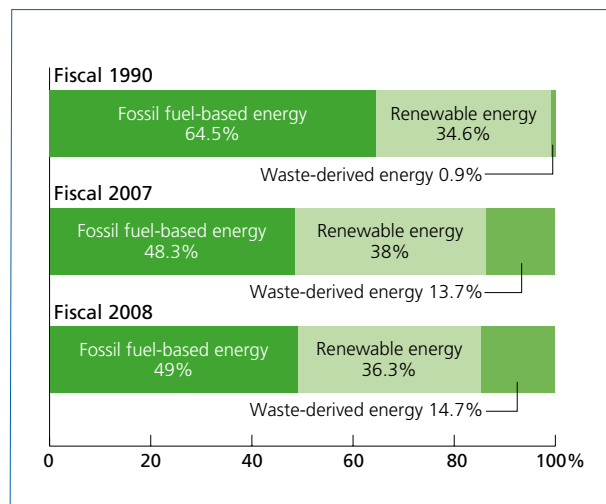
**P**apermaking is a so-called “process industry,” meaning large-scale machinery is used to supply many diverse paper types at consistent quality and quantity, and in a stable manner. Paper production consists of the pulping process, where pulp is made from wood or recovered paper; the papermaking process, in which pulp is made into paper; the coating process, in which paper is made printable, and other processes. Each process requires many machines, the operation

of which requires electricity produced in-house or purchased from power companies. Paper must also be dried during the production process, in order to remove the water contained in the raw materials. This drying also requires energy. The energy consumed by the paper industry accounts for approximately 5% of all industrial consumption (see Figure 1), making it one of the industries with the highest energy consumption.

**Figure 1 Final Energy Consumption Percentage by Industry in Japan (Fiscal 2007)**



**Figure 2 Percentage of Consumption by Energy Type, the Oji Paper Group**



### Energy used in paper production

#### Fossil fuel-based energy

Includes heavy oil C, coal and others. This also includes electricity purchased from power companies.

\***Heavy oil C:** The oil remaining after crude oil distillation, or heavy petroleum created by refinement. This oil contains many impurities.

#### Renewable energy

Includes black liquor, bark and others. Using primary wood-derived raw materials, these are produced using the renewable resource of trees.

\***Black liquor:** The non-fibrous material extracted when pulp is produced from wood raw material. It contains a great deal of organic material, and is concentrated and incinerated at the mills.

#### Waste-derived energy

Includes RPF, scrap tires, etc. This is a new energy source that makes fuel from what would have been waste materials.

\***RPF (Refuse Paper and Plastic Fuel):** Solid fuel created by mixing recovered paper that cannot be processed with waste plastic. The most prominent new energy source.



RPF



Scrap tires

#### Figure 2 Focus Points: Reducing the fossil fuel-based energy percentage

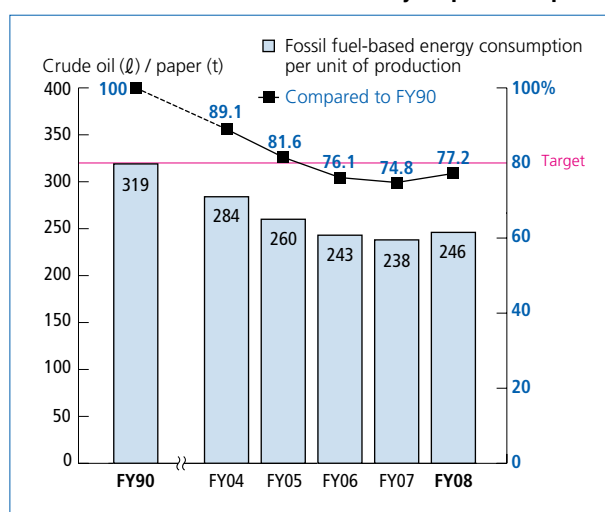
- The paper industry has long used black liquor as one of its main energy sources, contributing to a higher percentage of renewable energy.
- In recent years, the transition to waste-derived energy has accelerated, contributing to reduction of the percentage of fossil fuel-based energy to below 50%.
- In fiscal 2008, production of printing and communications papers with a high wood pulp ratio declined markedly. This resulted in a decrease in black liquor produced from wood raw material, in a correspondingly reduced percentage of renewable energy.

## Having achieved a 20% reduction in the proportion of fossil fuel-based energy, we are now working toward reducing consumption even further.

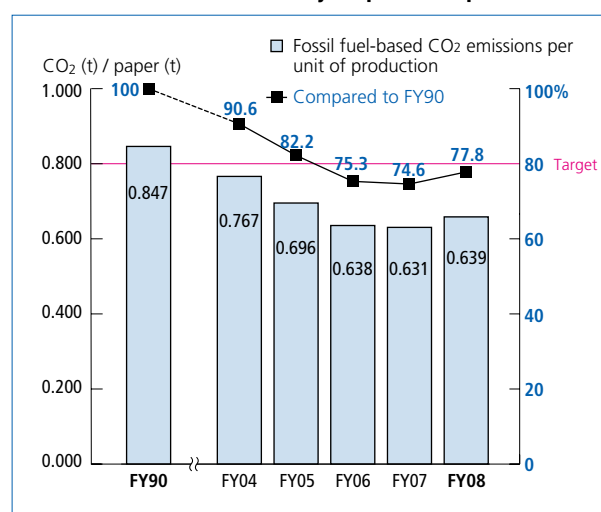
In its Environmental Action Plan 21, the Oji Paper Group set targets for the “promotion of global warming countermeasures”—a 20% reduction of fossil fuel-based energy consumption per unit of production and a 20% reduction of

fossil fuel-derived CO<sub>2</sub> emissions per unit of production by fiscal 2010, compared to fiscal 1990 levels. “Unit of production” refers to the energy (crude oil equivalent) required to produce one ton of paper.

**Figure 3 Fossil Fuel-based Energy Consumption per Unit of Production, the Oji Paper Group**



**Figure 4 Fossil Fuel-based CO<sub>2</sub> Emissions per Unit of Production, the Oji Paper Group**



Energy conservation patrol at Oji Paper's Yonago Mill. Every inch of every site is checked.

### Figures 3 and 4 Focus Points: Effects of adopting a new energy boiler

- Since fiscal 2006, we have achieved the 20% reduction target for each unit of production described in Figures 3 and 4.
- This reduction is largely the result of adopting a new energy boiler (see next page) and proactively using it with RPF, scrap tires, bark and other fuels that were once considered waste, as an alternative to fossil fuel-based energy.

### ● Issues related to global warming countermeasures

CO<sub>2</sub> is not the only greenhouse gas that contributes to global warming. There are six other types of gases as well, including methane and dinitrogen monoxide. The Oji Paper Group has achieved its goals for reduction of fossil fuel-derived CO<sub>2</sub> emissions as a global warming countermeasure. However, the Group has not yet seen comparable reductions in overall greenhouse gas emissions. This is why the Oji Paper Group is committed

to stepping up its efforts from the overall greenhouse gas perspective, and not simply CO<sub>2</sub> reduction alone. Because greenhouse gases are produced roughly in proportion to total energy consumption, reduction of total energy consumption will be more and more important going forward. Consistent reduction of total energy consumption requires dedicated improvement and a ground-up review of all production processes. At the same time, it

is also important to do everything possible each day toward energy conservation and consumption reduction. To this end the Group has strengthened its energy conservation patrols, in which multiple inspectors thoroughly check each facility for energy efficiency and possible waste. The Group will also add to its grassroots efforts, which include conserving energy used by air conditioning and lighting in each business division.

## Our new energy boilers have contributed greatly to reducing dependence on fossil energy, but many issues remain.

As surplus recovered paper became more noticeable around the year 2000, we began to consider how it could be effectively used, particularly recovered paper that is difficult to use as raw material. This led to our promotion of using RPF, a fuel made by combining paper that is hard to process with waste plastic. As shown in Figure 5, we are expanding the adoption of what we call “new energy boilers,” (or biomass power generators) which use non-fossil fuels including RPF, scrap tires and bark.

**Figure 5 Adoption of New Energy Boilers, the Oji Paper Group**

Amount of evaporation: Amount of steam produced per hour. The more steam is produced, the larger the scale of the boiler.

Start of operation	Mill	Location	Main fuel	Amount of evaporation (t/h)
April 2004	Tomakomai Mill, Oji Paper	Hokkaido Pref.	RPF, scrap tires	260
May 2004	Oita Mill, Oji Paperboard	Oita Pref.	RPF, scrap tires	200
June 2005	Yonago Mill, Oji Paper	Tottori Pref.	RPF, scrap tires	250
May 2006	Nichinan Mill, Oji Paper	Miyazaki Pref.	Scrap tires, wood	130
November 2006	Tokai Mill's Shibakawa Facility, Oji Specialty Paper	Shizuoka Pref.	Wood, RPF	7
October 2007	Kasugai Mill, Oji Paper	Aichi Pref.	RPF, scrap tires, wood	140
December 2008	Tomakomai Mill, Oji Paper	Tokushima Pref.	Waste plastic, RPF, wood	300
December 2008	Nikko Mill, Oji Paperboard	Tochigi Pref.	RPF, wood	70



New energy boiler at Oji Paper's Yonago Mill

### ■ Advantages of new energy boilers

1. They enable a drastic reduction in CO<sub>2</sub> emissions originating from fossil-fuel (some mills may be able to achieve a reduction of 50% or more)
2. They allow valuable, effective use as fuel of what were once mere waste materials
3. They can burn multiple fuels simultaneously

### ■ Issues relating to new energy boilers

#### 1. Fuel procurement

Mills are located in rural areas, but the recovered paper and waste plastic that comprise RPF are produced mostly in urban areas, resulting in losses in geographical efficiency due to the need for shipping. Quantities are also limited. In recent years, other paper companies have installed new energy boilers to meet their fossil energy reduction goals, but are now having trouble with stable fuel procurement due to RPF quantity, quality and price problems.

#### Solution

We have established Oji Eco Materials Co., Ltd., allowing us to efficiently procure fuel as an entire group, instead of as separate mills.

#### 2. Boiler operation

Because new energy boilers use multiple fuels that each have different characteristics (including quantity of heat generated), they require great care to be operated with stability. Also, the waste materials used for fuel can cause all manner of trouble, as they contain wire and other non-burnable materials, as well as chlorine and other chemicals which can lead to boiler corrosion. This means that each day, we have to pay close attention to fuel characteristics while performing inspections and maintenance.

#### Solution

Each mill which has adopted new energy boilers gathers to exchange technology and skills for stable operation.

#### 3. Combustion ash processing

New energy boilers produce large quantities of combustion ash. Currently, effective uses of this ash include cement raw material, road sub-base material and soil improvement material, but are ultimately limited, leaving us unable to use all that is produced. Combustion ash can also contain heavy metals such as lead, meaning that it must be preprocessed to remove toxins before being used, which means higher costs.

#### Solution

We plan to develop new detoxification technologies and ash uses through coordination between the Group headquarters and mills.

## Oji Philosophy

**Just as we have done before, we will continue to promote non-fossil energy by making a multitude of progressive efforts.**

The method of extracting cellulose and hemicellulose fibers from wood to produce pulp has become common throughout the paper industry. It may appear to be wasteful that only 50% of pulp fibers can be extracted from wood; however, the true value of this method lies in the fact that the liquid which remains—called black liquor—can be collected and used right at the mill as an energy source. Indeed, this method is an unparalleled, superior technology that uses virtually all of the wood material.

Unlike fossil fuel resources, wood raw material is renewable with proper management. Being an industry that consumes large amounts of energy, the paper industry has been quite progressive in that it has never relied completely on fossil energy. With that record, the paper industry has promoted the use of new energy boilers in order to achieve further progress in eliminating fossil energy dependence. New energy boilers differ from normal combustion boilers because they are equipped with systems to incinerate materials that are usually difficult to burn. This innovation has enabled the use as fuels of what were once mere waste materials, such as scrap tires and bark. We also believe that the most prominent waste-derived fuel, RPF, is an innovative combination of difficult-to-process recovered paper—which was previously unusable waste—and waste plastic that allows a system in which we can completely utilize recovered paper resources.

However, the fact remains that because it is a new system, there are still many problems that we have yet

to ascertain. Going forward, the move away from fossil energy will only grow more pronounced, and new energy boilers will continue to be necessary. Therefore, we are keenly aware that we cannot avoid the various problems associated with this technology. We are strongly committed to solving each problem through cooperation as an entire corporate group, never leaving work sites on their own as we team up to tackle energy and related waste issues together.



Wires contained in scrap tires. These often cause operational trouble, such as clogged pipes.