

# Challenges to Expand Eco-Products with High Functional Materials and Components

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*OVERVIEW: Hitachi Metals Group is a high-performance materials supplier for the automotive, electronics, and infrastructure industries. Our goal is to develop Eco-Products that will reduce greenhouse gas emissions of global warming at the time of product manufacture and will reduce the environmental impact at the time of product use. Global warming is a pressing subject and the expansion of Eco-Products is the basis of Hitachi Metals' business strategy to promote sustainable growth. Since fiscal 2003, we have implemented our "Road map for Eco-Products expansion," whose goal is 80% of the sales to be Eco-Products in fiscal 2010. In fiscal 2006, this sales ratio reached 69.1%, exceeding the 64% ratio targeted for that fiscal year. The target for fiscal 2008 will also likely be attained.*

## INTRODUCTION

HITACHI Metals Group through its business strategy to achieve sustainable growth is committed to environmental protection through (1) observance of environmental related laws, regulations, and industry action plans, (2) development of Eco-Products and technologies, and (3) expansion of the market for these products by adapting Hitachi's innovated "monozukuri" (manufacturing) process.

The group is a supplier of high-performance materials for automotive, electronics, and infrastructure industries. It is committed to developing Eco-Products that can reduce emissions of global warming substances at the time of product manufacture and that have energy saving, resource saving, and ease of recycling features at the time of product use. Our mid-term plan called the "Road map for Eco-Products expansion" and dating from fiscal 2003, calls for 80% of sales to be Eco-Products in fiscal 2010. The road map describes a range of activities such as new product development and environmental considerations in the manufacturing stage (see Fig. 2).

Below, we describe heat-resistant materials for the automotive industry and an amorphous alloy material for distribution transformers for industrial infrastructure as examples of materials that help to prevent global warming.

## ECO-PRODUCTS EXAMPLES

### HERCUNITE: Heat-resistant Materials for Exhaust-related Products of Automobiles

Around 2010, many countries will place very strict environmental regulation on automobiles; especially strict will be fuel consumption regulations aimed at CO<sub>2</sub> emissions reductions to prevent global warming. The governments of Japan, the USA, and the EU will likely implement a fuel consumption standards for lowering fuel consumption from 2012 to 2020 by about 30% from the present levels. Automobile makers are actively promoting not only development of conventional emission gas purification technology but also development of new fuel consumption reduction technology in order to comply with these regulations.

There are two development plans to reduce the fuel consumption of gasoline engines. One is engine downsizing and the other is development of new combustion technology. The EU is advancing the downsizing project in order to develop engines that have low fuel consumption and high engine power. To compensate for the reduction in horsepower caused by downsizing, the use of turbochargers is increasing. Moreover, with new combustion technologies based on complete combustion from "fuel cooling," exhaust gas temperatures will exceed 1,000°C. New materials that are durable against high-temperature exhaust gas are thus required for new exhaust related products.

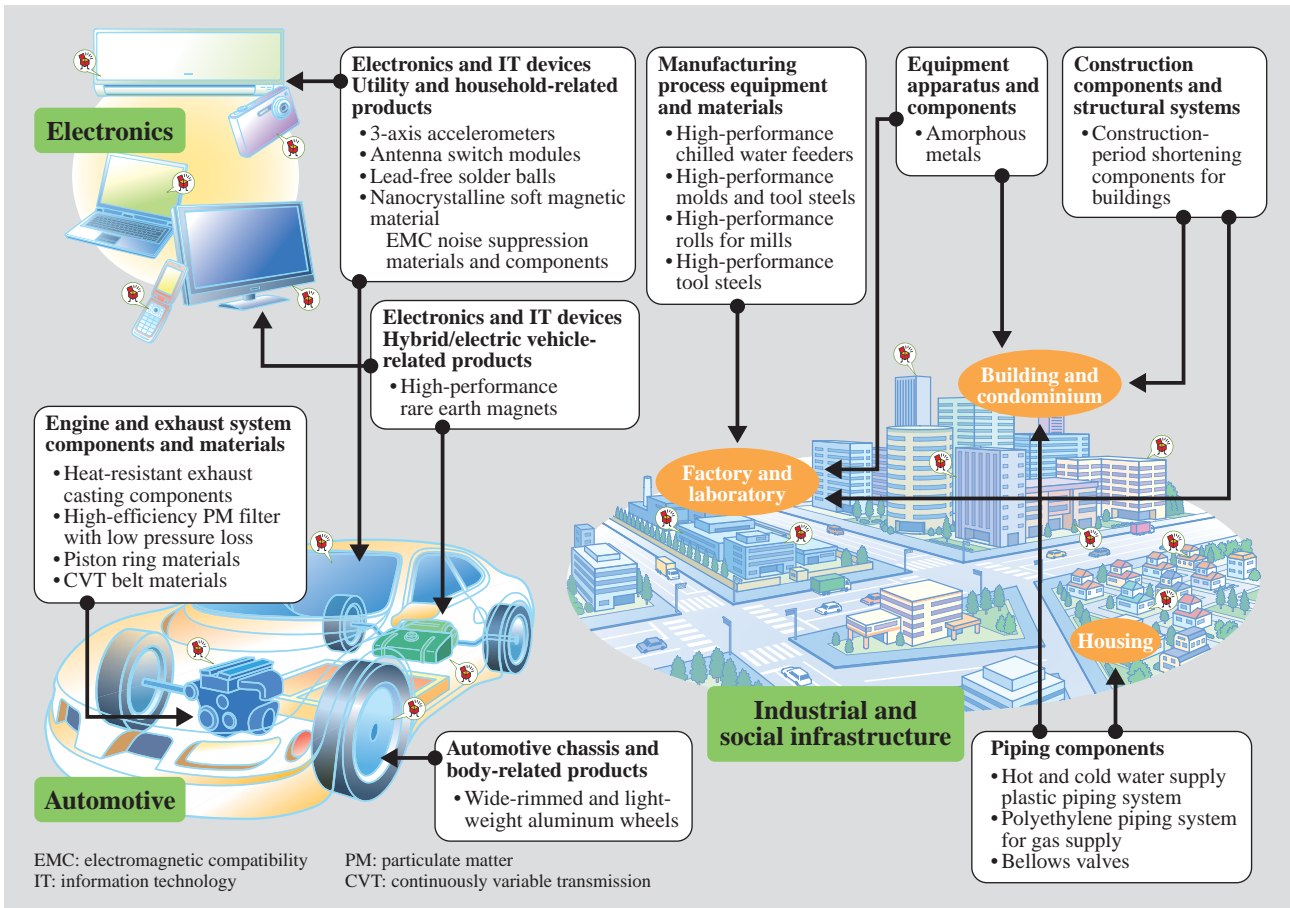


Fig. 1—Examples of Eco-Products of the Hitachi Metals Group.

Among products with low environmental impact in the manufacturing stage, products with low environmental impact at the time of use, and products which contribute to the environment, Eco-Products have high design assessments. The Eco-Products design assessment has eight items: (1) materials, (2) toxicity, (3) energy consumption and resources used in manufacture, (4) emissions in manufacture, (5) energy and resources consumed in use, (6) emissions during use, (7) disposal requirements, and (8) information service.

		Fiscal 2006	Fiscal 2007	Fiscal 2008	– Fiscal 2010
Target		• Sales ratio of Eco-Products			2010
		Target: 64%	Target: 68%	Target: 72%	Target: 80%
Expansion of Eco-Products Measures	<b>Development of new products for the global environment</b>	• Corresponding to automobile emission control		• Corresponding to RoHS and energy saving in electronics field	
		• Development of new environmentally friendly products designed for conserving resources, saving energy, cutting emissions, and eliminating toxic substances			
		• Active use of assessment for environmentally compatible design		• Sales support by using environmentally compatible POP	
	<b>Efforts during manufacturing stage</b>	• Shifting to products that save resources, shorten processes, and cut energy consumption			
	<b>Act according to strategy formulation for Eco-Products</b>				
	• Establish and operate integrated EMS		• Establish and operate environmental CSR Monozukuri (manufacturing)		

Fig. 2—Road Map for Eco-Products Expansion. The new-product-development stage evaluates the environmental impact in the manufacturing and usage stage.

RoHS: restriction of the use of certain hazardous substances in electrical and electronic equipment  
POP: point of purchase  
EMS: environmental management system  
CSR: corporate social responsibility

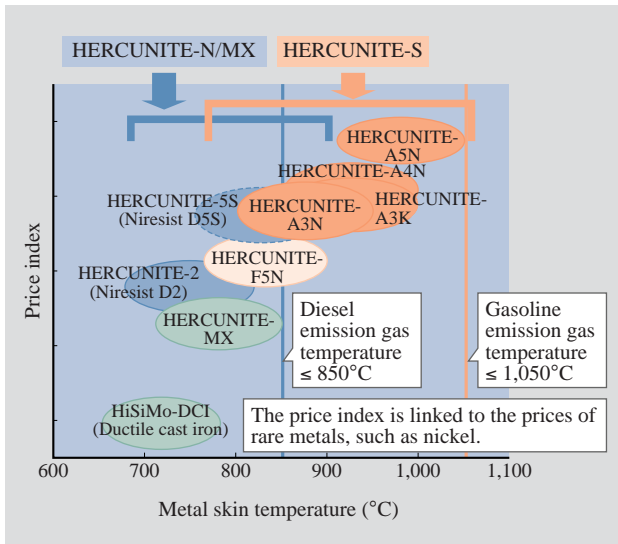


Fig. 3—Heat-resistant Materials of the HERCUNITE Series. Heat-resistant materials for exhaust-related products are shown. Heat-resistant materials are serialized (cast iron and steel casting) for diesel and gasoline engines.

The parts makers have the following ways to supply the products that meet the needs of such automobile makers and turbocharger makers.

- (1) Develop heat-resistant materials that have durability against high exhaust gas temperatures.
- (2) Create the optimal shape design to maximize the original materials' characteristics and mass-production technology.

Casting with a heat-resistant material is suitable for exhaust-related products such as turbocharger housings and turbochargers with integrated exhaust manifolds (referred to as integrated manifold, hereafter) for downsized engines because it has flexibility in designing shapes.

Hitachi Metals Group has developed the "HERCUNITE" series of heat-resistant materials for exhaust-related products and has put this series in practical use (see Fig. 3). These materials have outstanding anti-oxidation, anti-thermal deformation and anti-heat crack characteristics in each application temperature range up to 1,050°C.

On the other hand, the rapid optimal design system that meets the customer's requirements in a short period is developed based on design and evaluation know-how about exhaust-related products. The development period of such products has typically been more than half a year. The system can reduce this time to a little as three months.

Hitachi Metals' reduced pressure assisted casting



Fig. 4—Integrated Manifold Supplied to BorgWarner Turbo & Emissions Systems.

Integrated manifold for small high-performance gasoline engines: it helps to reduce engine size and fuel consumption.

technology enables mass production of exhaust manifolds and integrated manifold made from heat-resistant steel castings with a minimum wall thickness of 2.5 mm.

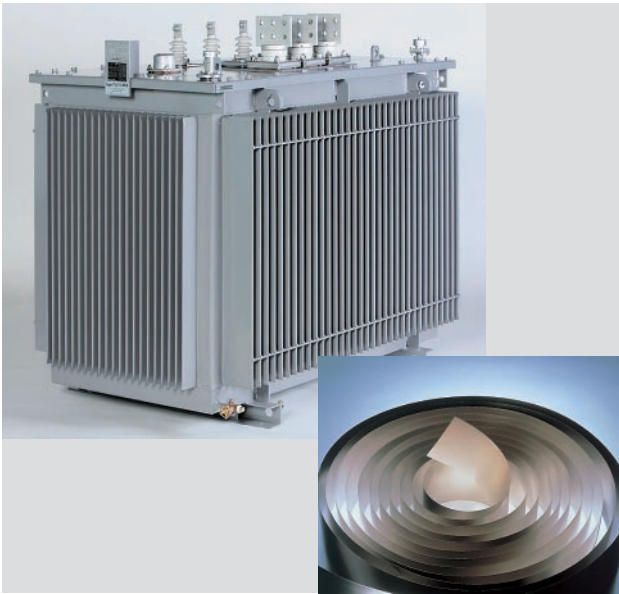
The exhaust-related products produced with these technologies weigh about 30% less and are more durable than the conventional products. Moreover, these Eco-Products contribute to both better fuel consumption and CO<sub>2</sub> emissions, and they are now used in high-performance engines of many automobiles (see Fig. 4).

#### Metglas 2605SA1: an Amorphous Alloy Material for Transformers

A transformer that has an iron core made of amorphous alloy has high efficiency and low core loss. It helps to reduce GHG (greenhouse gas) by reducing what is called "no-load loss" (or standby power requirement). It is said that no-load loss generated from an amorphous alloy core is one third to one fifth that of a conventional grain-oriented electrical steel core (see Fig. 5).

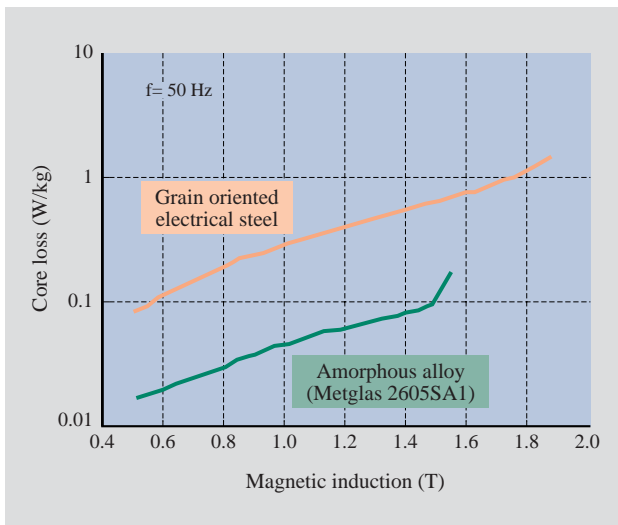
The Metglas 2605SA1 amorphous alloy strip made by Hitachi Metals Group is a transformer iron core with extremely low core loss compared with grain-oriented electrical steel (see Fig. 6).

In fact, replacement of older transformers with efficient ones (including amorphous transformers) in Japan may save approximately 9,400,000 MT CO<sub>2</sub> equivalent/annum (trial calculation of our company based on reference<sup>(1)</sup>, etc.), and this corresponds to



*Fig. 5—An Amorphous Alloy Strip and an Amorphous Transformer.*

*The amorphous alloy strip (Metglas 2605SA1) is used as an iron core material of a transformer. (Photograph by Hitachi Industrial Equipment Systems Co., Ltd.)*



*Fig. 6—Core Loss of Metglas 2605SA1 and Grain-oriented Electrical Steel.*

*Compared with grain-oriented electrical steel, Metglas 2605SA1 reduces core loss from one third to one fifth.*

approximately 0.8% of the total amount of GHG emissions in Japan in recent years.

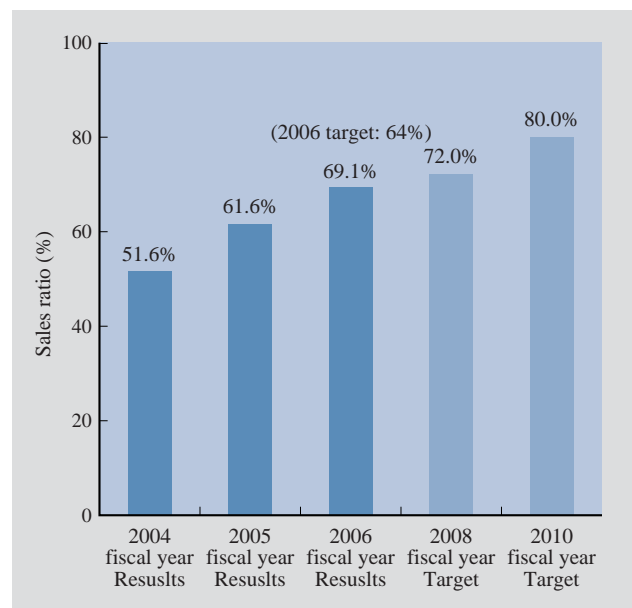
The Hitachi Metals Group saw the energy field as a promising industry and acquired the Metglas section of the Honeywell International Inc. in 2003 in order to strengthen its amorphous alloy business. The present

production capability is about 50,000 t/annum at two factories, one in Yasugi in Japan, and the other Metglas in the USA, and they cover the whole world market as a substantial only-one supplier.

Amorphous transformers were put in practical use in the USA in the 1980s, and they began to be used in Japan in the 90s. Recently, countries such as China and India, which have had rapid economic growth and are groping for ways of sustainable development, have shown interest in amorphous transformers for not only their environmental compatibility but also for their electric power efficiency. Since 2006, the demand from these countries has grown rapidly, and their market scale now exceeds that of Japan. In the USA, the standard on distribution transformer efficiency was revised and the new standard is to be applied from January 2010. It has legal force like the top runner system of Japan. As efficiency requirements are likely to become even stricter in the future, demand for amorphous transformers will likely grow.

Moreover, the United Nations is promoting a small-scale CDM (Clean Development Mechanism) methodology<sup>(2)</sup> to reduce GHG by deploying high efficiency electricity distribution networks, and CDM methodology for installation of energy efficient transformers in a power distribution grid with amorphous alloy proposed by Hitachi Industrial Equipment Systems Co., Ltd<sup>(3)</sup> has been approved.

We will continue to promote efficient usage of



*Fig. 7—Sales Ratio of the Eco-Products of the Hitachi Metals Group.*

*The goal is to have 80% of sales ratio in fiscal year 2010 to be Eco-Products.*



electrical energy and work to reduce global warming through the development of new applications.

## CONCLUSIONS

We described some of the Eco-Products made from Hitachi Metals' high functional materials and components for automobiles and industrial infrastructure. In particular, we focused on materials for exhaust systems of automobiles and an amorphous alloy material for distribution transformers as products that help to prevent global warming.

Hitachi Metals Group decides its business strategy by considering environmental aspects of each product and is striving for expanded use of Eco-Products. In fiscal 2006, 69.1% of its sales were of Eco-Products while the target was 64%. Its target of 80% will likely be achieved in fiscal 2010 (see Fig. 7).

Our goal is to expand the range of uses and effectiveness of high-performance Eco-Products through creation of new products and businesses that can sustain the environment and achieve sustainable growth.

## REFERENCES

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