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# Hitachi Group's Eco-efficiency

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## Eco-efficiency Award 2005

Japan Eco-efficiency Forum Chairman's Award

《Product Performance Division》

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Hitachi Ltd.  
Corporate Environmental Policy Division  
Osamu Namikawa  
December 16, 2005

**HITACHI**



# Activities for Eco-efficiency

2003.4 The news of the **joint development of the Environmental Assessment Index between Hitachi and Matsushita** was released by Hitachi.

- The Hitachi Group as a whole **established the Eco-efficiency WG** and initiated the activities.

2004.5 The function of calculating the eco-efficiency and factors **automatically** was put into effect by integrating it with the **assessment of the design for the environment**.

- Promoted the design for the environment by utilizing it for developing products. Strived to raise the awareness of the developer/designer in their environmental activities.

**Utilized it as a tool** for improving the product environmental performance.

2005.3 **Established the goal** for '10 for improving the factors.

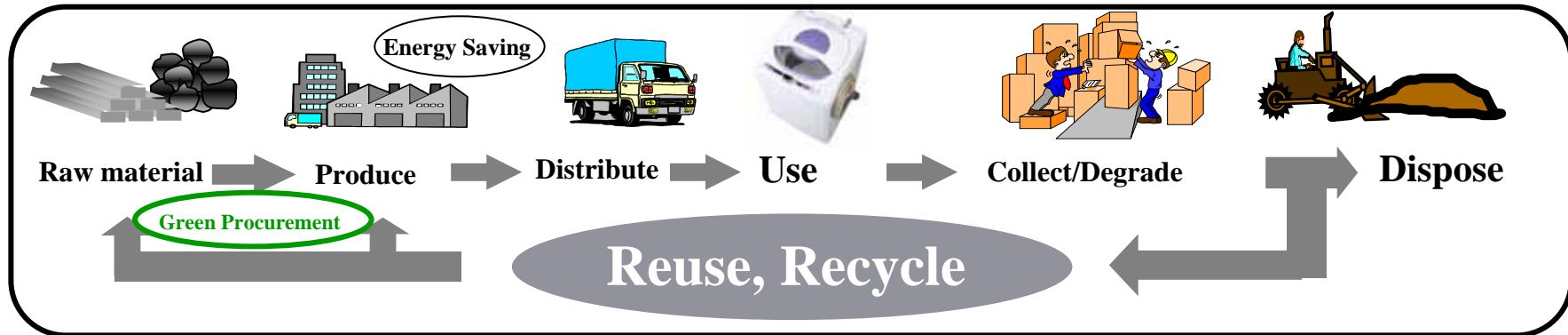
2005.10 Calculated the factor for Hitachi Group's wide range of products (**58 products**)

2005.12 **Won the Eco-efficiency Award 2005**



# Design for Environment

## Life-Cycle Awareness



## Design for Environment Assessment

### Design for Environment

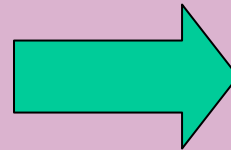


### End-point

- Reduction
- Extended operating life
- Recycling
- Degradability
- Disposability
- Environmental friendliness
- Energy saving property
- Provision of information

+

Eco-efficiency (Factor)



**Develop a consolidated assessment tool**



# Assessment Contents

## Assessment example (Reduction)

Concept stage

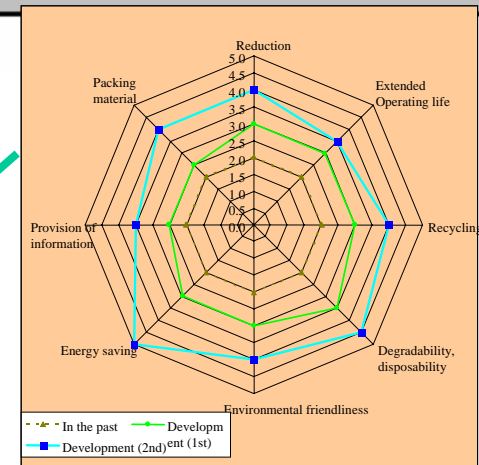
Detail design stage

1. Reduction			Assessment			Level 1	Level 2	Level 3	Level 4	Level 5	Note
No.	Item	Specific Content	Existing	Developed Product							
<b>(1) Product's reduction in size and weight</b>											
				1st	2nd						
⊕	Have the bulk or the space of the product been reduced?	Cubic meters or square meters	2	3	3	Increased	Same	Downsized by less than %	Downsized by less than %	Downsized by over %	Assess by the reduction rate of bulk or space
⊕	Has the product's mass been reduced?	Weight kg	2	3	4	Increased	Same	Lighter by less than %	Lighter by less than %	Lighter by over %	Assess by the reduction rate of weight
If adding, insert above this row. Do not delete this row unless there is an assessment item.											
<b>(2) Yield of parts and materials</b>											
⊕	Is the part's yield good?	Defective fraction (%) of parts	2	2	2	Decreased	Same			Improved	
⊕	Is the material's yield good?	Blank layout of press parts (%), gate runner weight (Kg) of plastic resin parts, etc.	2	2	3	Decreased	Same			Improved	
If adding, insert above this row. Do not delete this row unless there is an assessment item.											
<b>(3) Assessment of product's volume reduction</b>											
⊕	Reduction of the consumption of consumables and consumable parts	Weight kg	2	4	4	Increased	Same	Reduction of less than %	Reduction of less than %	Reduction of over %	Assess by the reduction rate of weight
If adding, insert above this row. Do not delete this row unless there is an assessment item.											

Average of assessment of volume reduction → **2.0** **2.8** **3.2**

Enter the rating for each item

Indicate the result for eight items in the reader chart





### Warming prevention factor (= Energy saving)

$$\text{Warming prevention efficiency} = \frac{\text{Product cycle} \times \text{Product function}}{\text{Warming gas emission in the life cycle}}$$

$$\text{Warming prevention factor} = \frac{\text{Warming prevention efficiency of assessed product}}{\text{Warming prevention efficiency of standard product}}$$

### Resource Factor (= Effective use of resources)

$$\text{Resource efficiency} = \frac{\text{Product cycle} \times \text{Product function}}{\text{worth factor of each resource} \times \text{Recourses in life cycle}}$$

$$\text{Resource Factor} = \frac{\text{Resource efficiency of assessed product}}{\text{Resource efficiency of standard product}}$$



- (1) Assessment of the **whole life cycle** of products
- (2) Assessment that **reflects the product burden data** on the manufacturing floor.
- (3) Assessment that reflects the **recycling propriety/rate** of each material
- (4) Assessment by a function that can be evaluated objectively (catalogue display, etc.)



# Calculation Method (1/4)

## Enter the basic data of products

Enter the basic data of product						
Data entry required for "11.Environment Data Sheet" on this sheet only.						
Color of cell for entry					Displayed Result	
Calculated result, reference						
	Product name	PC	Existing Model	New Model B		
No.	Item	(A)	1st Assessment (B)	B/A	2nd assessment (C)	
			(B)	C/A		
1	Product specification	(1)CPU frequency (GHz)	Pentium4 3.66G		Pentium4 3.8G	
		(2) HDD capacity (Gbyte)				
		Right column is fixed at "1"				
2	Noise (work position / Idling mode) ISO7779	[dB]		0.0%	78.5%	
3	External measurement	Width		0.0%	100.0%	
		Height		0.0%	100.0%	
		Depth		0.0%	100.0%	
4	External measurement of the packaging	Width		0.0%	100.0%	
		Height		0.0%	100.0%	
		Depth		0.0%	100.0%	
5-1	Material composition Main body	Aluminum & aluminum alloy		0.0%	100.0%	
		Copper & copper alloy		0.0%	100.0%	
		Metal	Iron & iron alloy (except stainless)		0.0%	102.6%
			Stainless		0.0%	102.1%
			Magnesium & magnesium alloy		-	-
			Other metals		-	-
			Total		0.0000	0.0%
		Plastic	ABS+PC		0.0%	102.7%
			ABS		-	-
			PC		0.0%	6000.0%
	POM		0.0%	1000.0%		
	PA		-	-		

Enter the basic data on the products

- Product material composition
- Transporting condition
- Product function, etc.

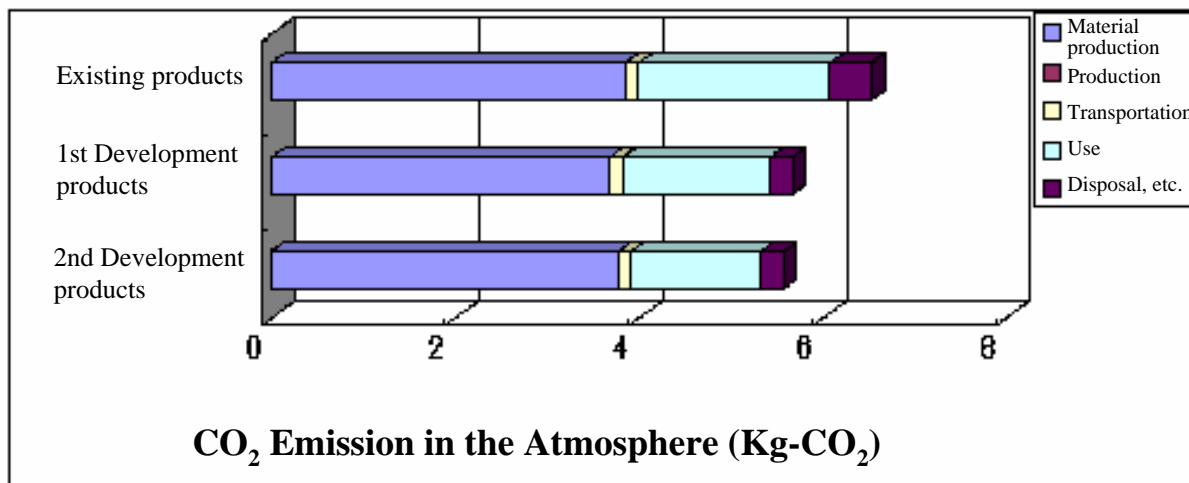
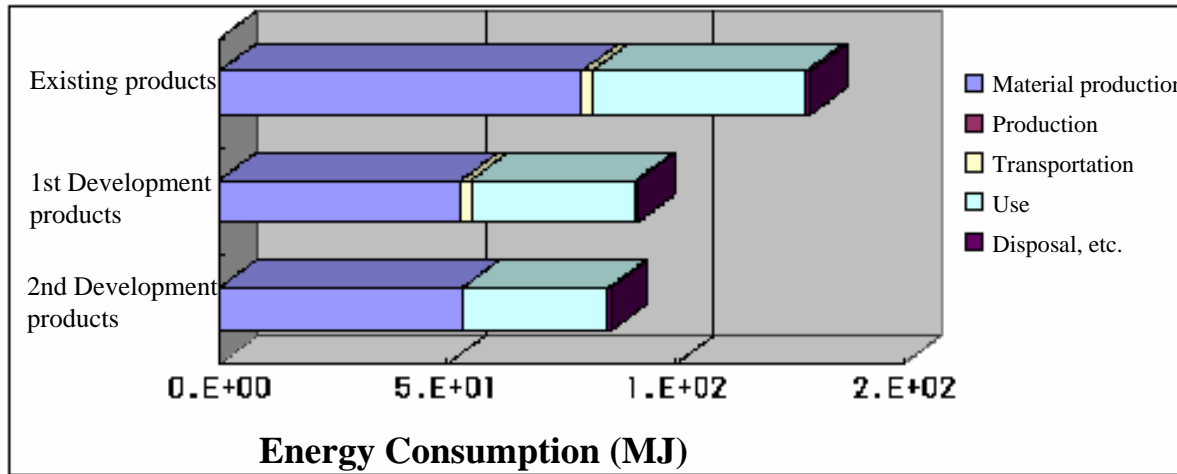
## Selection criteria of product function

- Reflects the concept of the development
- Requested by the customer
- Can be assessed objectively
- Indicated in catalogue, etc.



# Calculation Method (2/4)

Display the Results of “Energy Consumption” and “CO<sub>2</sub> Emission”



Automatically assess the energy consumption and CO<sub>2</sub> emission in a life cycle



# Calculation Method (3/4)

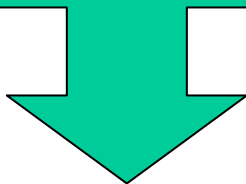
## Results of Global Warming Prevention Factor

### ◆ Greenhouse Gas Emission Calculation Results Unit: (kg/Unit)

Life Cycle Stage		Product	Standard	Assessment
		Production Year	1998	2004
		Model name	Existing model	2nd assessment
Make	Material production		4	4
	Production		0	0
Transport	Transportation		0	0
Use	Use (Electricity, water)		2	1
Return	Collect/Recycle)		0	0
<b>Total</b>	<b>Whole life cycle</b>		<b>7</b>	<b>6</b>

• CO<sub>2</sub> emissions  
• Resource usage  
• Product functional value

Automatic calculation



Warming prevention factor

Resource Factor

### ◆ Global Warming Prevention Calculation Contents

Produce life cycle (Established usage years)			8
Production function	Pixel count [Pixel]	1.10E+06	1.02E+06
	Body volume [l/cc]	7.15E-04	1.20E-03
	Recorded time [Min]	6.00E+01	6.00E+01
Greenhouse gas emission in a life cycle per single product function [kg/single function]		6.5	5.6

Global Warming Prevention Rate	5.78E+04	1.06E+05
<b>Global Warming Prevention Factor</b>		<b>1.8</b>



# Calculation Method (4/4)

## Display the Results of Resource Factor

### ◆ Resource Efficiency Rate Calculation

		Standard product	Assessed product
Product Life Cycle (Established usage years)		8	
Product function	Pixel count	1.10E+06	1.02E+06
	Body volume	7.15E-04	1.20E-03
	Recorded time	6.00E+01	6.00E+01
Resource worth factor		1.0	1.0
Resources to be used anew (kg)		1.1	0.7
Resources to be disposed of (kg)		0.9	0.5
Resources in life cycle per single product function (kg)		2.0	1.2

### ◆ Resource factor calculation result

Resource efficiency rate	1.86E+05	4.82E+05
<b>Resource factor</b>	<b>2.6</b>	



# Calculation Example (1/2)

Hitachi Group  
Eco-efficiency Calculation Result Sheet (Factor X)

Product name

Machine-room-less Elevator

## Product description

An elevator that has adapted a universal design, which makes it easy for more people to use it naturally without stress.

## Development concept

The weight has been reduced by the energy efficient machine-room-less design to reduce environmental burden.

Standard Product / Assessed Product



Produced in 2005  
Standard Elevator [Urban Ace]

## Product overview

Item	Product	Standard Product	Assessed product
Production year		2000	2005
Model name		UAR-9-2S60 ( With trunk, 5-floors )	
Product life cycle *1(Established usage years)		17	
Product function	(Effective volume ratio x specific power of gravity)	7.7	11.4
	Effective volume ratio *2	0.73	0.74
	Specific power of gravity *3	10.6	15.4
Product weight (t)		4.33	4.21
Energy consumption (kWh/year) *4		1170	1170

\*1 According to Table 1 by the [Ordinance on service life of depreciable asset].  
 \*2 Effective volume ratio: Ratio of stroke volume against the whole volume.  
 Stroke volume: Plane area of shaft (1.55x2.35) x stroke 12.75  
 Whole area: Plane area of shaft x (stroke + overhead + pit) + plane area of machine room x machine room height = (1.55x2.35)x(3.20+12.75+A)+0  
 A: Depth of pit: 2000 product 1.55, 2005 product 1.25  
 \*3 Specific gravity: Ratio of hoist weight against rated output  
 Specific gravity: 3.7 (kW)/B(1)  
 B: Hoist weight: 2000 product 0.35, 2005 product 0.24  
 \*4 According to energy consumption calculation method.  
 $E=[0.18xP1xT1xN1/2000+P2xT2]x365$  (kWh/year)  
 P1: Energy consumption rating 3.7 (kW)  
 T1: Operating time 8 (Hour/Day)  
 N1: Number of starts 900 (Times/Day)  
 P2: Stand-by energy consumption 0.05 (kW)  
 T2: Stand-by time 16 (Hours/Day)

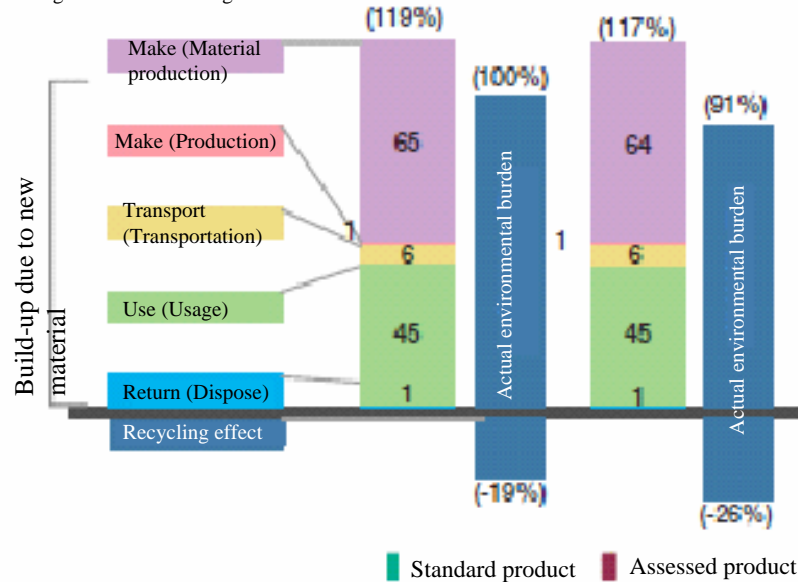


# Calculation Example (2/2)

## Assessment results of global warming prevention factor

### Results of warming gas emission calculation (rate against standard products)

Reason for reduction:  
Environmental burden has been reduced in the material production stage as a result of weight reduction



Results of global warming prevention factor calculation	18,200	16,500
Warming gas emission in a life cycle per single function (kg/Single function)		

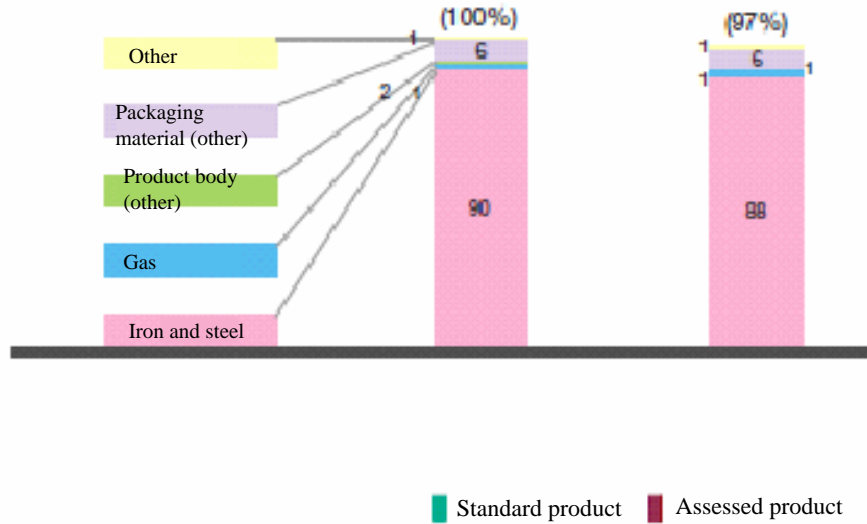
Warming prevention rate	0.72	1.18
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Warming prevention factor	1.6
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## Results of resource factor assessment

### Results of the calculation of resources used (Ratio against standard products)

Reason for reduction:  
Tried to reduce the weight of the hoist



Results of resource factor calculation	3,530	2,840
Resources in life cycle per single function (kg/Single function)		

Resource efficiency	3.71	6.83
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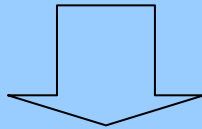
Resource factor	1.8
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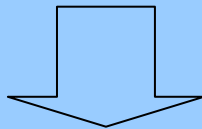


# Policy and Challenges of Utilization

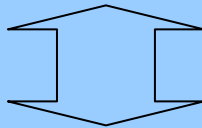
Carry out factor assessment before trial production



Feedback the assessment results to products



Reduce greenhouse gas emission and resource input



Compare with standard models

Utilize widely as a design tool within Hitachi Group

When the factor is disclosed....

Prompts comparison of values...

Prompts comparison with other companies...

Future challenges to consider



# Summary

## [Results of Activities]

- Tried to improve environmental image by publicizing the **activities** to improve eco-efficiency **outside the company**.
- Tried to **raise the designers' awareness of environmental activities** by applying eco-efficiency widely in product design.

## [Plan for Activities]

- The goal for FY2010 is to improve the resource factor by 70% and the global warming prevention factor by 50% for FY2000 products (consumer products).
- **Set up and work towards a higher voluntary goal** for some product sectors.

## [Future Resolutions]

- **Continue with the activities** of spreading eco-efficiency widely and deeply.
- **Reflect the factor results** calculated during development of **relevant or ensuring products**, and further promote environmentally conscious designs.
- Publicize the design's environmental friendliness in an easy to understand way using graphs.
- From the existing eco-efficiency of product units, **summarize the social infrastructure products that Hitachi Group handles extensively**, and assess them in eco-efficiency terms.



# Eco-efficiency Booklet

**HITACHI**  
Inspire the Next



**31 products listed**

**Distributed at the Hitachi Booth**

**We look forward to seeing you.**



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Thank you for your attention