

# Toward a Sustainable Future

Hyundai Heavy Industries | 2013 Environmental Report



Hyundai Heavy Industries  
hopes that we can lead  
by example and help  
create a better future for  
every one



## Contents

### Introduction

---

4 CEO'S Message

---

5 Company Overview

---

### Environmental Management

---

9 Vision & Strategies

---

10 Environmental Management System

---

13 Emergency Response System

---

14 Environmental Investment

---

15 Environmental Performance Evaluation

---

### Environmental Performance

---

18 Climate Change

---

21 Air Emissions

---

23 Waste Management

---

25 Water Quality

---

26 Chemical Management

---

27 Soil Management

---

28 Environmentally - Friendly Products

---

### Stakeholder Partnership

---

33 Voluntary Agreements

---

34 Environmental Conservation Activities

---

35 Environmental Quality of Community

---



**Lee Jai-seong**  
**President & CEO**

## **Message from Management**

Hyundai Heavy Industries Co. Ltd. (HHI), as a global leader in heavy industries, has made continuous efforts to minimize pollution and maximize resources and energy conservation to provide a higher quality of life and a sustainable future.

HHI also accomplishes the company's social responsibility through actively responding to more diversifying environmental issues, including climate change.

HHI promotes clean production processes by minimizing emissions during manufacturing processes. Especially, HHI positively participates in renewable energy business that takes the lead on green industry.

HHI has also focused on the development of environmental technologies for eco-friendly products such as eco-friendly ships, high efficiency engines and eco-friendly construction equipment.

This report demonstrates HHI's environmental performances in keeping with our 'Green Growth' policy according to various environmental management strategies.

We hope this report helps stakeholder's better understand HHI's environmental management.

HHI recognizes that the environment is a key factor in global competitiveness and we promise to build a sustainable future through continuous improvement of environmental performance.

In the years to come, HHI has been a global leader in 'Low-carbon and Green Growth'.

# Company Overview



· Head office , Ulsan shipyard and plant



· Offshore yard



· Eumseong Solar cell-producing Plant



· Gunsan Shipyard

---

Company

CEO

Work force

Land area

Establishment Date

Address

HYUNDAI HEAVY INDUSTRIES

President &CEO Lee Jai-seong

Number of employees- 26,000

Workplaces Capacity-9,300,000m<sup>2</sup>

1972. 3. 23

1000 Baneojinsunhwan-doro, Dong-Gu, Ulsan, Korea 682-792



## Business divisions

Division	Major Products
Shipbuilding Division	Containerships, LNG Carriers, LPG Carriers, VLCCs Drillships, Chemical Tankers, Bulk Carriers
Offshore & Engineering Division	FPSOs, FPU, TPLs, Fixed Platforms Pipelines & Subsea Facilities
Industrial Plant & Engineering Division	Combined-Cycle Power Plants, Thermal Power Plants Co-Generation Power Plants
Engine & Machinery Division	Diesel Engines, HiMSEN Engines, Propellers, Diesel Power Plant, Industrial Robots, Crankshafts
Electro Electric Systems Division	Transformers, Circuit Breakers, Switchgears GIS, Power Electronics and Control Systems
Green Energy Division	Solar Power System, Wind Turbine System Tidal Current Generation
Construction Equipment Division	Excavators, Wheel Loaders, Forklifts Skid Steer Loaders

## Sales

Division	Sales (unit: billion won)	Portion
Shipbuilding Division	9,766	39.0%
Offshore & Engineering Division	4,373	17.5%
Industrial Plant & Engineering Division	1,480	5.9%
Engine & Machinery Division	2,967	11.8%
Electro Electric Systems Division	2,843	11.3%
Green Energy Division	344	1.4%
Construction Equipment Division	3,120	12.5%
Others	162	0.6%
<b>Total</b>	<b>25,055</b>	<b>100%</b>



## Company History

- 2012** Developed FLNG model  
Recorded 100 million gross tonnage in ships  
Developed world's First Gas Engine package
- 2011** Established Asan Nanum Foundation  
Completed a new 4,000 unit capacity industrial robot Factory  
Established Hyundai Energy & Resources
- 2010** Developed Earth-Friendly HiMSEN Gas Engine  
Completed Gunsan Shipyard and Wind Turbine Factory  
Acquired Hyundai Oilbank Co., Ltd
- 2009** Launched Korea's first hybrid ship  
Delivered the first ship equipped with a ballast water treatment system  
Received the President's Award for Labor Relations Grand Prix of 2009
- 2008** Awarded "The Best Industrial Relations Company"  
Completion of Solar Module & Cell Factory in Eumseong  
Organ donation campaign (participants: 15,315 participants)
- 2007** Production of the world's most powerful marine diesel engine  
Received Korea's Top-Class enterprise award for the fifth consecutive year
- 2006** Delivered 1,800 ton class submarine, "Son Wonil"  
Received Korea's Top-Class Enterprise Award for the fourth consecutive year
- 2005** Secured newbuilding order for ultra – large 10,000TEU containerships  
Awarded \$7 Billion Export Tower Award
- 2004** Crankshaft selected as a "World-Class product"  
World's largest propeller(106.3 ton) produced
- 2003** Excavator selected as a "World-Class Product"  
Advanced health care center completed
- 2001** Acquired OHSAS-18001 certificate
- 1997** Acquired ISO-14001 certificate

Hyundai Heavy Industries  
always thinks environment  
and practices action first.

**Environmental Management**

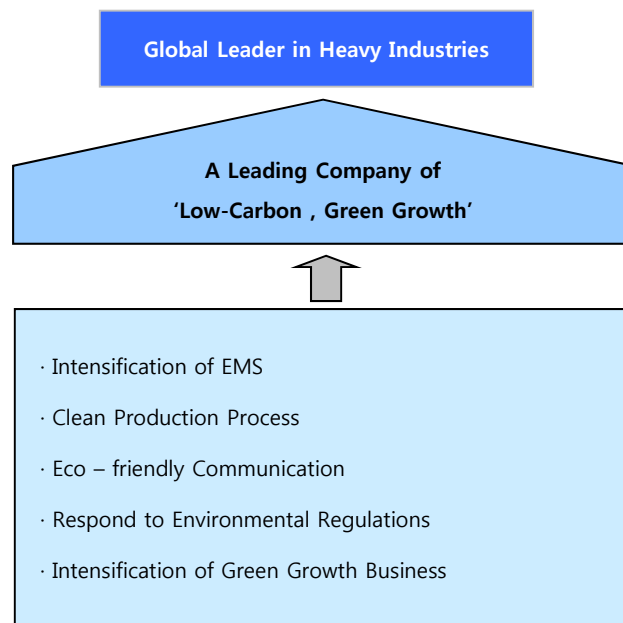


# Vision & Strategies

HHI, as a global leader in heavy industries, practices environmental management and promotes sustainability through the 'Low-Carbon, Green Growth' policy.

Subsequently, HHI positively drives forward environmental management as below.

## ◇ Environmental Vision



## ◇ Environmental Strategy

Strategy	Action Plan
Intensification of EMS	<ul style="list-style-type: none"> <li>· Build systematic inspection system</li> <li>· Establishment of environmental information system</li> <li>· Strengthen environmental education</li> </ul>
Respond to Environmental regulations	<ul style="list-style-type: none"> <li>· Respond to climate change convention</li> <li>· Respond to global environmental regulations</li> <li>· Respond to Korean environmental regulations</li> </ul>
Clean Production Process	<ul style="list-style-type: none"> <li>· Reduce material and energy use</li> <li>· Adoption of resource recycling system</li> <li>· Operate pollution control facilities</li> <li>· Reduce use of hazardous materials</li> </ul>
Eco-friendly Communication	<ul style="list-style-type: none"> <li>· Participate in environmental preservation activities and campaigns</li> <li>· Participate in Voluntary agreements</li> <li>· Disseminate environmental reports</li> </ul>
Intensification of Green Growth business	<ul style="list-style-type: none"> <li>· Eco-products development</li> <li>· Enlarge renewable energy business</li> </ul>



# Environmental Management System

Since 1995, HHI has an environmental management system that meets ISO 14001 standards. Three levels of environmental management standards have been formulated: a manual, procedures and sub-procedures.

We have obtained ISO-14001 certification which guarantees the clarity and objectivity of the EMS (Environmental Management System) from the certifying authority (DNV-QA) in 1997.

After receiving OHSAS-18001 certification, HHI currently operates HSE (Health, Safety and Environment) management systems as part of an integrated environmental and safety/health management system.

Korea government introduced 'Green Management System' certification for diffusion of 'low-carbon green growth' in 2011.

So we have obtained GMS(Green Management System, KS I 7001, 7002) certification from the certifying authority in 2012. This helps improvement of HHI's environmental management level.

- ※ Green management : The term "green management" means management through which an enterprise fulfills its social and ethical responsibilities by saving and using resources and energy efficiently and by minimizing the emission of greenhouse gases and the occurrence of environmental pollution in its business activities.



• ISO-14001 Certificate DNV-QA



• OHSAS-18001 Certificate DNV-QA



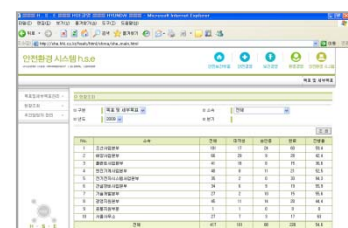
• KS I 7001, 7002 Certificate DNV-QA

# Environmental Management System

## ◇ HSE Policy

Hyundai Heavy Industries Co., Ltd. (HHI) will become a world-class heavy industries company by recognizing the environment, health and safety as integral to our success. We at HHI hereby declare to sustain our performance and development of HSE policies as follows:

- ▷ Positioning of Corporate Identity as Eco-friendly Company
  - Continuous development of environmental pollution prevention and conservation technologies
  - Observance of domestic and international laws, conventions and regulations
- ▷ Achievement of Accident-free Workplace
  - Promotion of safe practice programs to prevent accidents
  - Strict observance of work standards and regulations
- ▷ Promotion of Employee Health
  - Active campaign of health programs against diseases
  - Continuous improvements to create healthy and safe working environment

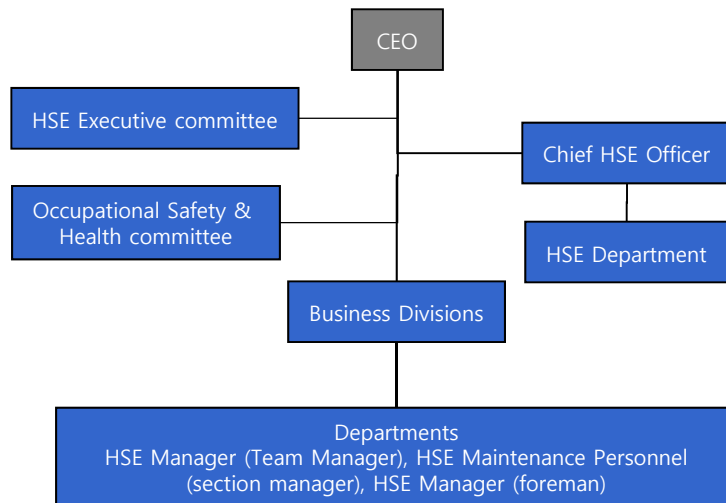


• HSE Management System Homepage

## ■ HSE system organization

For efficient, systematic HSE management, our HSE organization consists of HSE Executive Committee and Occupational Safety & Health Committee, both under the supervision of the Chief Executive Officer connected each business divisions.

The HSE Department manages HSE management system and supports each business division under the charge of the Chief HSE Officer.



## ■ Environmental Education

HHI provides environmental education programs to raise the environmental awareness of employees and to foster responsibility with regard to the environment. To minimize problems for and streamline the operation of pollution control facilities, a specific environmental education program has been initiated for pollution control facility operators.

We promote employee's accessibility to the latest environmental information and training materials through the company's internal webpage. Especially, HHI offers cyber course about climate change and greenhouse gas for employee.

Environmental engineers keep up-to-date about internal and external environmental policies through professional environmental education, seminars and workshops.

New techniques from the education and workshops are then applied to performance of environmental works.



• Environmental education



• Cyber education about environment

## ■ Environmental Audits

HHI performs internal environmental audits every year to identify potential environmental risks, and to inspect the relevance and validity of environmental management systems according to ISO 14001 certification.

In 2012, HHI carried out internal environmental audits system in all departments at all the year round. And HHI would take corrective measures about nonconformities in relevant year.

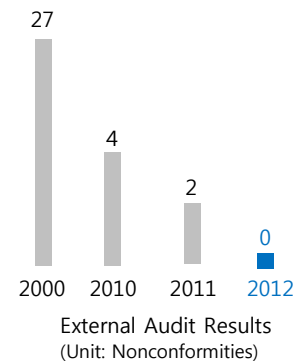
To maintain ISO 14001 certification and objective evaluation of EMS (Environmental Management System), HHI undergoes periodic audits or renewal audits from a certifying authority every year.

As for External Periodic Audits, 82 departments were inspected in 2012. Number of nonconformity is zero as a result of the audit. And observations were recommended to take corrective measures in trial year.

The number of nonconformity in 2012 showed a 100% decrease from the base year of 2000. These improvements are due to effective implementation of the HSE management system and the full cooperation of employees.



• Internal environmental audits



# Emergency Response System

To prevent environmental pollution, HHI regularly carries out inspection activities in the shipyards.

HHI also regularly carries out environmental emergency response training to ensure a prompt response in case of an environmental emergency.

Through regular training, each department builds hands-on experience in responding to different environmental emergency situations.

We use employee feedback to discover weak points and problems in the training scenarios, and improve them accordingly.

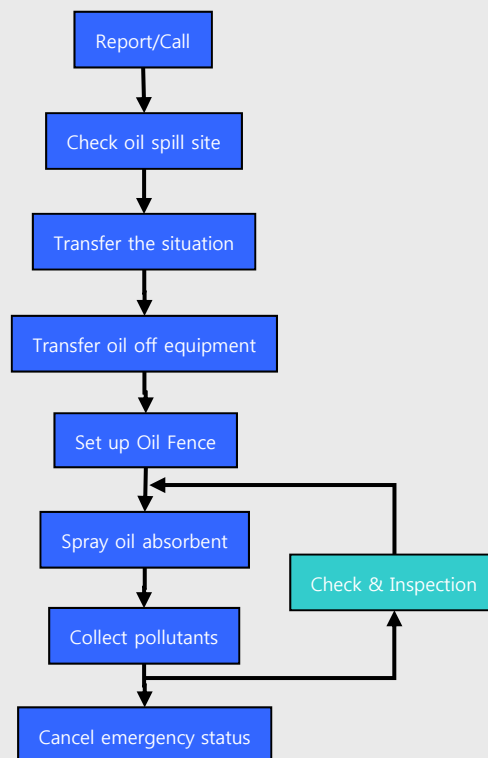
Due to our location, preventing pollution to the sea has always been a top priority. We have strict rules about the operation of offshore facilities and ships.

We have strict guidelines for the proper disposal of oil, hazardous chemicals, and waste.



• Environmental emergency response training

◇ Emergency measures of oil spill flow chart



# Environmental Investment

HHI continually invests in clean production processes that minimize emissions of pollutants.

Investments include costs for air and water protection, treating waste materials and installing pollution prevention facilities and addressing demands from the government and other stakeholders concerning the environment.

For environmental management system efficiency, these investments are classified into four categories: pollution prevention, environmental burden reduction, environmental risk management and social cost.

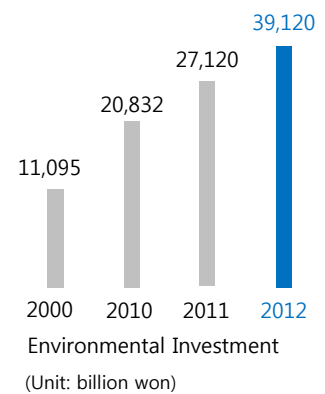
In 2012 total environmental investment from HHI reached 39.1 billion won.

Environmental investment has increased this year. To reduce emissions, a large investment was conducted as install of new pollution prevention facilities (Bag-Filter., A/C Tower, Wastewater treatment facility etc).

We continually take the lead in the protection of the environment through sustained environmental investment.



• New Facility



# Environmental Performance Evaluation

HHI uses EPE (Environmental Performance Evaluation) method to continually improve environmental performance and make objective inspection standards. According to ISO-14031 and GRI table, environmental performance indicators were selected to measure HHI's environmental performance. Each indicator was applied as a barometer of evaluation and weight.

## ◇ Environmental Performance Evaluation

Categories	Subcategories	Number of Indicators
Management Performance	EMS and Conformity	9
	Organization Management	4
	Environmental Cost	4
	Stakeholders Relationship	5
Operational Performance	Resource and Energy Consumption	7
	Air Emission	4
	Wastewater Discharge	6
Environmental Condition	Waste Generation	3
	Atmosphere Air Quality	4
	Inshore Seawater Quality	3

The average EPE (Environmental Performance Evaluation) results of 2012 show an improvement of 44% over the base year of 2000.

To measure environmental management performance, 22 performance indicators were created across 4 categories:

- 1) EMS (Environmental Management System) and Conformity,
- 2) Organization management,
- 3) Environmental investment,
- 4) Stakeholders relationships.

Performance in the "EMS and Conformity" category in 2012 was 39% higher than in the base year of 2000. Performance in "Organization Management" in 2012 was 31% higher than in the base year of 2000.

To measure environmental operational performance, 20 performance indicators were created across 4 categories:

- 1) Resource and energy use,
- 2) Air emission management,
- 3) Wastewater management,
- 4) Waste management.



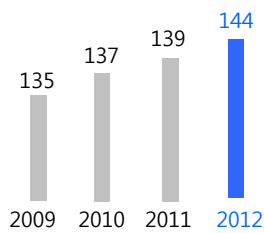
To evaluate operational performance quantitatively, operational indicators were derived from the total amount of steel used per year with consideration of the characteristics of the heavy industries.

Especially important is performance in the “Air Emission Management” and “Wastewater Discharge” category in 2012 was 79% higher than in the base year of 2000.

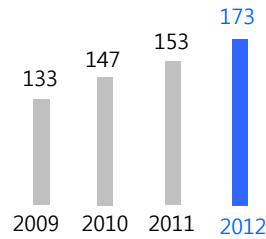
Performance in the “Waste Treatment” category in 2011 was 13% higher than in the base year of 2000.

To evaluate environmental conditions, 7 environmental condition indicators were used. Inshore seawater quality and local atmosphere air quality were the main categories evaluated.

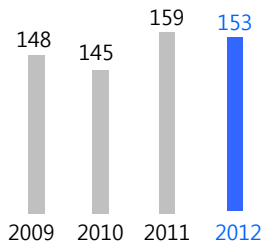
We will continually monitor the environmental quality of the local area, and continue our efforts to improve environmental conditions.



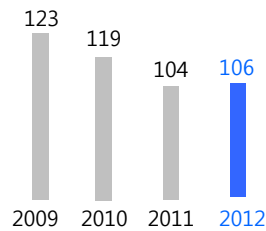
Average EPE Results  
(Unit: increase or decrease compared to 100 points at the base year)



Management Performance results of EPE  
(Unit: increase or decrease compared to 100 points at the base year)



Operational Performance results of EPE  
(Unit: increase or decrease compared to 100 points at the base year)



Environmental Condition results of EPE  
(Unit: increase or decrease compared to 100 points at the base year)

Hyundai Heavy Industries  
always efforts to minimize  
our environmental traces  
during business

**Environmental Performances**

# Climate Change

Climate change is the most important environmental issue facing business and the public today. In response to global warming, the world is stepping up efforts to reduce greenhouse gas emissions.

Industrialized nations have introduced and are likely to tighten regulations to control greenhouse gas emissions. Such measures include CO<sub>2</sub> caps, CO<sub>2</sub> taxes, and CO<sub>2</sub> labeling.

Global climate change trends indicate that Korea is an important greenhouse gas emissions country.

In Korea, the basic law for "low-carbon, green growth" was passed in April 2010. It includes mandatory reporting of greenhouse gas emissions in the workplace and emissions reduction targets. And government intend to phase in the greenhouse gas emission trading system in 2015

## ■ HHI's Response

For these reasons, HHI recognizes the growing need to take action and to prepare countermeasures for climate change as a global leader in heavy industries.

HHI analyzes potential greenhouse gas reduction levels and establish reduction target. Reduction target of 2013 is to reduce greenhouse gas emission 3% less than BAU in 2013.

Shipbuilding is still our core business, and greenhouse gas emissions from ships have become a global issue.

The best way to curb greenhouse gas emissions from ships is to reduce their reliance on fossil fuels.

HHI conducts R&D to come up with ways to boost fuel efficiency, such as optimization of hull form, eco-friendly propulsion systems, high efficiency engines and high efficiency propellers.

Moreover, HHI recognizes climate change is an opportunity, not a crisis, and will continue to invest in renewable energy business (solar power, wind power, tidal current power business) as an eco-friendly business.

We will continue to reduce greenhouse gas emissions through improved manufacturing processes and reduction of energy use.

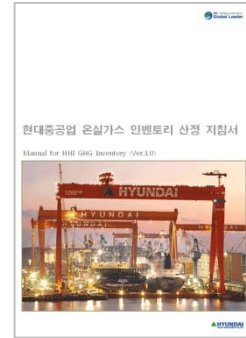


## ■ Greenhouse Gas Inventory

HHI's greenhouse gas(GHG) emissions amounted to 973,419 tCO2e in 2012.

This GHG inventory boundary is all workplaces of HHI (Head office, Ulsan shipyard and plant, Gunsan shipyard, Eumseong solar cell-producing plant, Seoul office, Hyundai hotel, etc: total 28 workplaces).

The main sources of emissions are electricity use and heating facilities. Electricity accounts for 58 percent of total GHG emissions, and stationary combustion accounts 25 percent of total GHG emissions. Reduction of fuel consumption about ship testing, HHI's greenhouse gas emissions were decreased by 4.3% compared to last year. (Fuel consumption of ship testing 40% less than in last year)

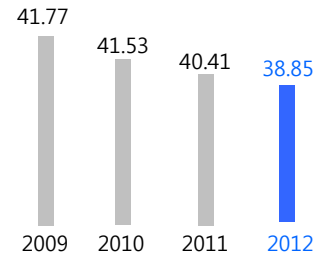


• HHI GHG Inventory Guideline (Ver 1.0)

※ Greenhouse Gas Inventory: a statistical system that checks how much greenhouse gases a company emits

◇ Greenhouse Gas Emissions (All of workplaces in HHI, Unit: tCO2e/yr)

	2009	2010	2011	2012
Emissions	883,131	930,539	1,016,944	973,419



Greenhouse Gas Emissions Basic Unit  
(All of workplaces in HHI)  
(Unit: tCO2e/Sales[billion won])

◇ The Third Party Verification of Greenhouse Gas Inventory

HHI calculates greenhouse gas emissions based on the feasibility, completeness, consistency, transparency and accuracy. And we voluntarily performed third party verification to enhance credibility of the inventory.

According to international standards, HHI obtained a statement validating our greenhouse gas inventory data for the period 2007-2012 by Korean Standards Association .



• Statement about Verification of Greenhouse Gas Inventory

- Verification Organization : Korean Standards Association
- Scope of Verification : 2007 - 2012 Greenhouse Gas Inventory,  
All of workplaces in HHI (28 workplaces)
- Standard and Guide of Verification  
Emission reporting obligation of Korea guidelines,  
KS Q ISO 14064-1,  
IPCC Guidelines (2006)

## ■ Realization of Green Factory

HHI set up photovoltaic power generators and wind turbines at its domestic production sites nationwide to establish a Green Factory.

HHI fully installed and began operating photovoltaic power generators and wind turbine at its four plants and office, including its shipyard in Ulsan, totaling 6,269 kilowatts (KW) in output capacity.

HHI sells electricity generated by the company's photovoltaic power generators and wind turbine, except the one at its Ulsan shipyard, to the Korea Electric Power Corporation(KEPCO). The electricity from Ulsan shipyard will be used to power daily energy consumption, including computes and lighting at the office.

HHI will set up additional photovoltaic power generators at our plants and offices to gradually raise the share of renewable energy in our power consumption.

### ◇ Renewable energy facilities in HHI



• Photovoltaic power generator in Ulsan shipyard



• Photovoltaic power generator in Eumseong Factory



• 1.65MW wind turbine in the Ulsan shipyard

	Site	Operating Facility
Wind turbine	Shipyard in Ulsan	1.65MW wind turbine
	Factory in Gunsan	2MW wind turbine
Photovoltaic power generators	Shipyard in Ulsan	65KW photovoltaic power generator
	Factory in Eumseong	530KW photovoltaic power test site
		715KW photovoltaic power generator
	Factory in Seonam	498KW photovoltaic power generator
Factory in Gunsan	811KW photovoltaic power generator	

# Air Emissions

## ■ Air Pollutants

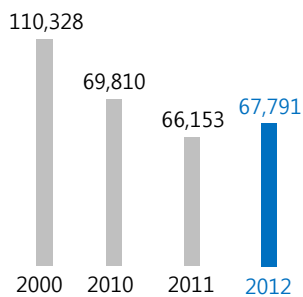
Air pollutants from HHI consist mainly of dust from blasting plant, material processing plant and volatile organic compounds (VOCs) generated when painting ships, engines, construction equipment, etc.

To protect air quality and reduce air pollutants, HHI uses optimal air pollution control equipment. Moreover, we have set our own environmental air emissions standards, which are 50% stricter than the legal requirements.

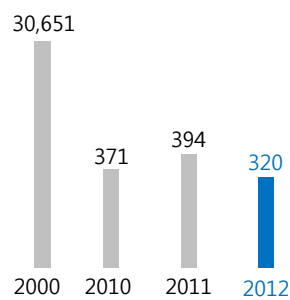
Especially, SOx emissions have largely decreased because fuel of heating facilities was changed from heavy oil to LNG.

And to reduce VOCs emissions, HHI conducts to installing RTO, using eco-friendly paints, improvement of painting process and building new painting shop.

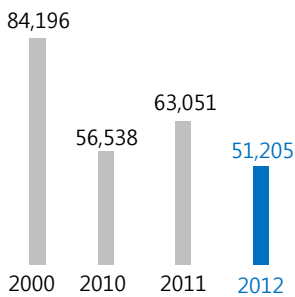
But growth of production output, HHI's dust emissions were increased by 2.5% compared to previous year.



Dust Emission  
(Ulsan shipyard and plant, Unit: : Kg/yr)



SOx Emission  
(Ulsan shipyard and plant, Unit: : Kg/yr)



NOx Emission  
(Ulsan shipyard and plant, Unit: : Kg/yr)

## ■ Air Pollution Control Equipment



HHI operates 255 air pollution control units in its all yards and plants. Air pollution control equipment includes Bag-Filters, Scrubbers, A/C Towers, RTOs, Electric precipitators and SCRs.

158 Bag-Filters and 75 A/C Towers account for most of the air pollution control equipment.

We regularly check the equipment to optimize operations, replacing unsatisfactorily operating equipment on a regular basis.



### ※ RTO Facility

HHI operates 6 RTO (Regenerative Thermal Oxidizer) facilities to remove THC.

An RTO facility is a device used to incinerate (around 800°C) VOCs. This facility's VOCs removal efficiency is greater than 99 percent, therefore THC emissions have decreased dramatically.

The facilities heat combustion reuse rate of more than 95 percent also decrease fuel consumption.



• Air pollution control equipments

# Waste Management

HHI minimizes waste generation through promoting the efficient use of raw materials and the reuse or recycling of waste.

Various wastes and hazardous materials that are generated from the manufacturing process are being legally treated through a strict management system.

To reduce the level of wastes, HHI will continue to reduce resource use and improve waste recycling.

HHI's waste amounts in 2012 have decreased by 2% compared to previous year. Especially waste paint and combustible waste were decreased by 6%.

## ■ Waste treatment method

HHI has established an eco-friendly separate collection system at waste generation places. We carry out a primary separate collection in the product process and secondary separate collection in the resource recycling shop.

Separated wastes are treated at in-house facilities or by waste treatment and recycling contractors.

In-house treatment method is incineration in HHI's own incineration plant, and inspections of wastes treatment and recycling contractors' facilities are carried out to prevent illegal waste treatment.

Wastes are being managed based on the recognition that they are also resources. So HHI recycles 100 percent of recyclable wastes (metal scraps, waste oil, waste paints, sands, papers etc) through separate collection.

### ◇ Waste Manifest System

HHI monitors every stage from waste generation to final waste disposal, in real-time via the 'Waste Manifest System'. This ensures that all waste is lawfully and transparently disposed.

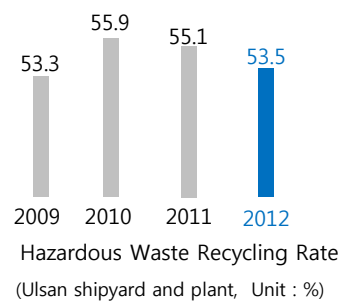
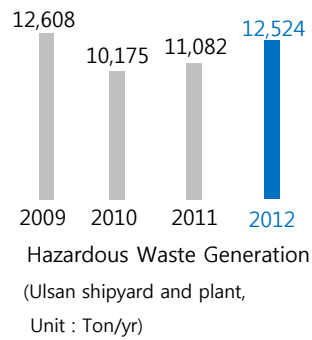
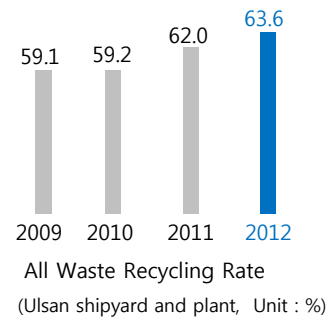
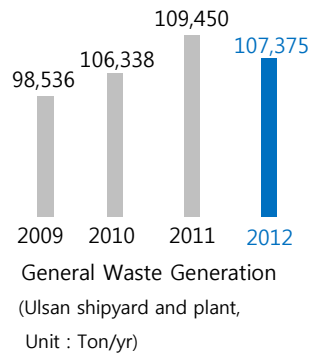
© Waste treatment method (2012)

	Recycling	Incineration	Landfill
Rate	53.5%	38.2%	8.3%



• Waste Treatment and Storage Facility





### ■ Waste Incineration Plant



• Waste Incineration Plant

HHI has operated a waste incineration plant since 1996.

Specification of Facility

- Incineration type: Stoker Type
- Incineration facility: Incinerator (200ton/day×2machines),  
Waste heat boiler (29.5ton/day×2machines)
- Air pollution control equipment: Electric precipitator, Scrubber, SCR
- Wastewater treatment plant: physical and chemical method
- Stack height: 100m

◇ Concentration of Incineration plant discharge gas (unit 1)

Item	Legal Standard	2010	2011	2012
CO	50	3.8	1.4	3.2
NOx	80	42.2	44.2	38.4
HCL	30	0.3	0.2	0.7
DUST	30	3.8	1.8	2.1

# Water Quality

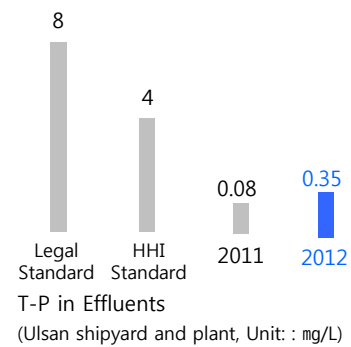
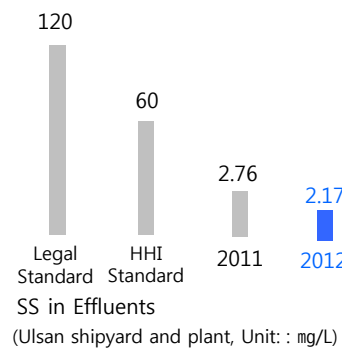
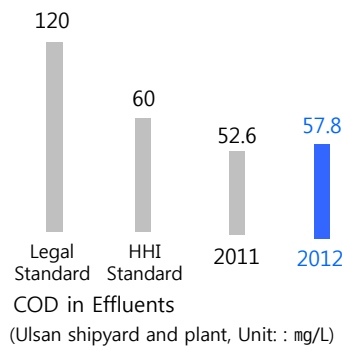
HHI treats water resource that thoroughly separates sewage from wastewater.  
 HHI treats factory wastewater in wastewater treatment facilities operated by the yard or sends factory wastewater to independent wastewater treatment companies.  
 Sewage is sent to a sewage treatment plant operated by Ulsan City.  
 HHI has also changed the focus of water resource management from “controlling-end-of-pipe” approach to a “reduction-at-the-source” approach.

## ■ Wastewater Treatment

HHI reduces wastewater through reuse and improved production processes. HHI operates two wastewater treatment facilities within the Ulsan shipyard and plant. And wastewater treatment facilities use physical and chemical method. HHI's water pollutant standards are 50% stricter than legal requirements. We also carry out water analysis twice a month to monitor effluent discharges.



• Wastewater Treatment Facility



## ■ Sewage Treatment

HHI completed construction of `Vacuum Sewage System` in 2008 for sewage generated in the shipyard.  
 Vacuum sewage system uses the QUA-VAC technique that consists of vacuum pipelines. Through this system, all sewage will be sent to the Bang-eo-jin sewage treatment plant operated by Ulsan City for processing.  
 Through this system, all sewage that generated in HHI (Ulsan shipyard and plant) doesn't discharge into the sea and river



• Vacuum Sewage System

# Chemical Management

## ■ Chemical Management

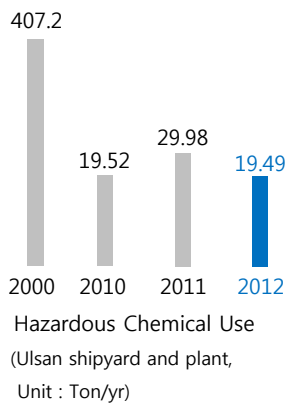
HHI strictly controls chemical use for the protection of the environment and the safety of employees.

HHI follows strict procedures with regard to chemicals from storage to use to disposal by conducting periodic inspections of all relevant facilities to prevent chemical emergencies. HHI has also prepared emergency equipment and procedures in case of a chemical emergency.

MSDSs (Material Safety Data Sheet) for the safe handling of toxic chemicals, are prepared in relevant facilities, and regular training is provided for all personnel involved in the handling of toxic chemicals.

HHI separately handles hazardous chemicals, such as cryolite, hydrogen chloride, nitric acid and sodium hydroxide.

In an effort to reduce hazardous chemical use, the amount of hazardous chemicals used was decreased compared to past performance.



# Soil Management

## ■ Soil Pollution

HHI's soil contamination facility follows strict soil pollution management procedures. 62 soil contamination management facilities are located within HHI's Ulsan shipyard and plant.

The soil contamination facility helps prevent tank leakage. HHI uses soil pollution control equipment, including corrosion inhibitors, drainage and leakage measuring instruments.

All facilities are regularly checked for soil pollution by independent organizations.



• Soil contamination facility

### ◇ Result of Soil Pollution Inspection (2012, Ulsan shipyard and plant)

#### 1) BTEX detection

Point	Standard (mg/kg)								Total of BTEX detection (mg/kg)
	Regulation 1 (low-risk)				Regulation 2 (high-risk)				
	Benzene	Toluene	Ethyl benzene	Xylene	Benzene	Toluene	Ethyl benzene	Xylene	
1	3	60	340	45	9	180	1020	135	Not Detected (Less than 0.5)
2	3	60	340	45	9	180	1020	135	Not Detected (Less than 0.5)
3	3	60	340	45	9	180	1020	135	Not Detected (Less than 0.5)
4	3	60	340	45	9	180	1020	135	Not Detected (Less than 0.5)
5	3	60	340	45	9	180	1020	135	Not Detected (Less than 0.5)
6	3	60	340	45	9	180	1020	135	Not Detected (Less than 0.5)
7	3	60	340	45	9	180	1020	135	Not Detected (Less than 0.5)
8	3	60	340	45	9	180	1020	135	Not Detected (Less than 0.5)

#### 2) TPH detection

Point	Standard (mg/kg)		Total of TPH detection (mg/kg)
	Regulation 1 (low-risk)	Regulation 2 (high-risk)	
1	2000	6000	170
2	2000	6000	144
3	2000	6000	119
4	2000	6000	54
5	2000	6000	390
6	2000	6000	135
7	2000	6000	126
8	2000	6000	146

# Environmentally Friendly Products

## ■ Renewable Energy business

The renewable energy business is closely connected with 'Low-Carbon, Green Growth'. HHI views renewable energy as an opportunity for great growth and is a driving force in green technology

### ◇ Solar power business



HHI entered the solar power business in 2005. HHI constructed solar cell-producing plant, in Eumseong, Korea, in 2008, manufacturing solar cells and photovoltaic modules.

Since then HHI additionally constructs its second solar cell-producing plant in 2009. So HHI operates Korea's largest solar power plant with annual production capacity of 600MW.

Also HHI completed Solar R&D center in Eumseong. With an investment of KRW 22.6 billion, the R&D center covers 2,815m<sup>2</sup> and has 53 solar development facilities including solar cell/module development and analysis facility.



· Eumseong Solar cell-producing Plant

HHI expects to further strengthen its competitiveness by undertaking research into structure and material of high efficiency solar cells, developing cost-effective materials, and lighter, more customized modules.

And HHI developed the copper-contact selective emitter solar cells with 19.7% conversion efficiency and passivated emitter, rear locally-diffused(PERL)cells with 20.4% conversion efficiency that were confirmed by the Fraunhofer ISE, the largest solar energy research institute in Europe.

### ◇ Wind power business



· Gunsan wind turbine producing Plant

HHI is the leading player in the manufacture of generators, transformers and circuit breakers, all core parts of wind power systems.

So HHI enters into the global wind power business. HHI completed Korea's biggest wind turbine manufacturing plant in Gunsan, South Korea in 2009. HHI invested 105.7 billion won for the 132,000m<sup>2</sup> plant. It produces 1.65MW-class wind turbines and has an annual capacity of 600MW.

Also HHI has developed 5.85MW Permanent Magnet Synchronous Generator(PMSG) for offshore wind turbines. The PMSG is the main equipment of wind turbine for converting wind energy to electricity. With improved durability and minimized use of expendables, product life of the generator is extended from 20 to 25 years.

The development of PMSG will be a catalyst for HHI enter into the 5MW and 6MW offshore wind turbine markets.

HHI plans to commercialize the generator by 2014 after finalizing field tests.

## ■ SCR Emission Reduction System

Analysts forecast the demand for the gas emission reduction system will surge in 2016 when International Maritime Organization Tier 3 emission limit regulations come into effect. Under those maritime regulations, ship built from 2016 should reduce NOx 80% less than Tier 1 level to 1.96g/Kwh and 3.4g/Kwh.

So HHI starts supply of gas emission reduction systems for ships. The eco-friendly Selective Catalytic Reduction (SCR) system can reduce NOx emissions by as much as 95% by using an HHI-developed catalyst to separate NOx into nitrogen and water.



• SCR Gas Emission Reduction System

## ■ A Ballast Water Treatment System

Ballast water is seawater used to stabilize the ship when loading/unloading cargo and to maintain optimal vessel speed. The seawater can contain bacteria, local plankton, mud, and sand from the unloading port where the ballast water has been taken in. As the ballast water is released, it can have an impact on the marine ecosystem.

According to industry studies, 5 billion tons of seawater is transferred by ballast tanks every year. The International Maritime Organization has mandated that all new ships to be delivered from 2012 must have an approved ballast water treatment system installed. Driven by international regulations, the market for ballast water treatment system is expected to grow to over USD 13 billion by 2016

### ◇ Eco – Ballast system

HHI has developed a ballast water treatment system for ships, tentatively named "Eco-Ballast".

It is the first time a ballast water treatment system has been developed in a shipyard. "Eco-Ballast" will protect the marine environment from the transfer of foreign organisms via ballast water. It is composed of two main units, the filter and the UV reactor. The filter can significantly reduce the sediment load in the ballast water. The UV reactor is specially designed for this ballast water treatment application to reduce the eco-footprint and to maximize the efficiency of the system.

The system is a chemical-free system avoiding potential harm to the ship, the ship's ballast tank coating, the crew, and the marine environment.



• Eco – Ballast System

### ◇ Hi Ballast system

The new "Hi Ballast system" is the second ballast treatment system HHI has developed. HHI received final test approval from the Korean government for eco-friendly electrolysis Hi Ballast system. "Hi ballast system" can treat seawater by filtering and sterilizing bacteria and plankton bigger than 50µm through electrolysis. The "Hi Ballast system" can sterilize 8,000m<sup>3</sup>/hr seawater, reduce power consumption, and extend the life of the ballast.



• Hi Ballast System

## ■ Eco-Friendly Engine Technique

### ◇ Eco-Friendly Marine Engine



• Eco-Friendly Marine Engine

HHI completed a type approval test of G(Green)-type eco-friendly marine engines with MAN Diesel & Turbo. The type approval test of the G(Green)-type marine engines, 7G80ME-C9.2 at 42,350 and 6G80ME-C9.2 at 36,300 bhp was attended by supervisors from 11 classification societies.

G-type engine use 7% less fuel and produce 7% less emissions than engines with the same output. G-type engine was installed on 319,000 DWT VLCC and 5,000TEU containership.

### ◇ Eco-Friendly Gas Engine



• Test run of Eco-Friendly Gas Engine  
HiMSEN H35/40GV

HHI started exporting the eco-friendly HiMSEN Gas Engine H35/40GV after completing test runs for the first time in Korea.

The engine features 'Lean Burn' technology and is regarded as eco-friendly and highly efficient by reducing parts to make the engine lighter thus saving fuel.

The new engine emits 20% less CO<sub>2</sub> than diesel engines, reduces NO<sub>x</sub> emissions by 97% to reach world's lowest level of 50 ppm, and improves engine performance by 47%.

The new gas engine runs on liquefied natural gas rather than heavy crude oil and has a maximum power output of 13,000bhp. The HiMSEN h35/40GV can be used to generate power for onshore power plants., commercial ships, and offshore facilities including drillships. Due to high oil prices and strengthening regulations on emissions, the demand for gas engine is increasing.

## ■ Eco-Friendly Construction Equipments

### ◇ 21-ton Battery-powered Excavators



• 21-ton Battery-powered Excavator

HHI announced plans to develop new 21-ton battery-powered excavators.

Under the government sponsored project to develop 21-ton battery-powered excavators, HHI plans to complete the development of the construction equipment by 2016.

The new battery-powered excavators will use 40% less fuel than other types of excavators. The new excavators are also eco-friendly in that they use electric motors to achieve zero gas emissions.

HHI's Construction Equipment Division aims to become the World No.1 electric excavator manufacturer by 2024 with 20% global market share.

For a sustainable future,  
Hyundai Heavy Industries  
has remarkably grown with  
Regional society

**Stakeholder Partnership**



# Voluntary Agreements

## ■ Voluntary VOC Reduction Agreements

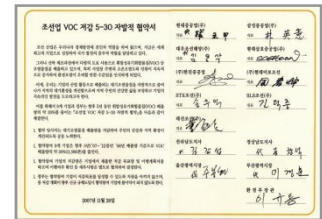
Activities associated with shipbuilding result in the release of VOCs into the atmosphere. VOCs from painting operations are the most significant emissions from our manufacturing facilities.

HHI entered into a "voluntary agreement to reduce VOCs by 5-30 percent in the shipbuilding industry" with the Ministry of Environment and 8 shipbuilding companies in November 2007.

This agreement will help create a cleaner environment and improve local resident's health. According to the voluntary agreement, HHI will invest 120 billion won to install air pollution control equipment, eco-paint development, install spray pumps, and other measures over five years from 2007.

As VOC reduction rate was 51.8% in 2011, HHI exceeded VOC reduction target of reducing VOC emissions by 30.1% by 2011.

For continuous reduction of VOCs emissions, HHI reentered into "Second voluntary agreement to Reduce VOCs in the shipbuilding industry" in 2012. Voluntary agreement period is 2012~2016 and target is reducing VOCs emissions by 15% in comparison with average VOCs emissions.



• Voluntary VOC Reduction Agreements

## ■ Greenhouse Gas Emissions Trading Scheme Pilot Project

Korea government will start greenhouse gas emission trading in 2015.

So HHI voluntarily participates in a "GHG Emissions Trading Scheme Pilot Project" for countermeasure about GHG Emissions trading.

Supervised government departments of this project are "Ministry of knowledge" and "Korea Energy Management Corporation". HHI continually participates in this project 2011 to 2012. Also HHI entered into "integrating GHG Emissions Trading Scheme Pilot Project" with "Ministry of Environment" in 2013.

Through this project, HHI will improve ability in performing about GHG emission trading and cooperate with government for improvement of GHG emission trading system.



• GHG Emissions Trading Scheme Pilot Project

■ **Climate Change response team in the shipbuilding industry**

HHI entered into a “Climate Change response team in the shipbuilding industry” in 2009, for establish countermeasures about reduction of greenhouse gas in shipbuilding industry.

“Climate Change response team in the shipbuilding industry” consists of Korea Energy Management Corporation, Ministry of knowledge economy, Korea shipbuilder’s association, Shipbuilding companies, Academic fields.

Major activities include build up management greenhouse gas inventory about shipbuilding industry, review of greenhouse gas reduction method, intensification of cooperative system about climate change, education program about climatic change convention and greenhouse gas.

HHI plans to various efforts, to become leading company on climate change.



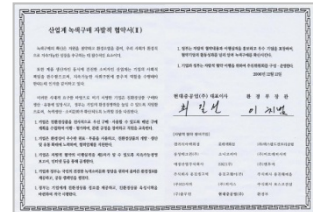
• Education of Climate Change response team

■ **Voluntary Agreement for Green Purchasing**

HHI recognizes green purchasing is important in the pursuit of environmentally sustainable growth.

Since 2006 we have implemented green purchasing management and on December 2006 HHI entered into a “voluntary agreement for green purchasing” with the Ministry of Environment.

We pledge to purchases eco-materials and eco-components to encourage the supply-side development of eco-friendly practices and growth of green industry. Our aim is to build a 100% Green Supply Chain.



• Voluntary Agreement for Green Purchasing

# Environmental Conservation Activities

As an environmentally responsible corporate citizen, HHI recognizes the importance of conservation to the continued growth of our company and the wellbeing of our community.

Over the years we have spearheaded various environmental conservation projects dealing with the protection of our forests, rivers, and coastlines.

HHI will continue to increase environmental conservation activities

## ◇ One Company, One Community Cleaning Campaign

In regards to the environment, HHI has cooperated with the government over a long time through the "One Company, One Community Cleaning Campaign". HHI is in its tenth year of cooperation with the local community.

## ◇ Voluntary Environmental Preservation Activities

Many clubs and associations exist within HHI. These clubs and associations conduct environmental conservation activities at least once a month.



• One Company, One Community Cleaning Campaign

# Environmental Quality of Community

HHI is located in Bangeojin, Ulsan, on the southeast coast of Korea, and we make efforts to protect the local environment.

HHI continually monitors the environment of our local community. Monitoring results meet the legal standards for environment. Data shows that seawater quality and local air quality has been maintained.



To prevent sea pollution, HHI has divided the adjacent sea into 20 areas of "Sea Pollution Prevention Management". We have also implemented regular emergency contingency drills and prevention activities in case of sea and air pollution emergencies

