Annual Environmental Report

2017 Edition

The Akita Plant

NLT Technologies, Ltd.

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Message from the President

Based on a keen awareness of our natural environment, NLT Technologies strives to achieve earth-friendly production methods.

NLT's corporate slogan remains "to create an affluent society friendly to people, through innovation of new display markets". To this end, my goal as president of NLT Technologies is to continue our corporate quest to nurture our relationships and communications with our global customers as we strive to develop new display solutions that meet the stringent and evolving requirements of the markets they serve. We intend to remain our customers' supplier of choice for their industrial display needs.

We proactively and consistently address environmental issues as a cornerstone of our corporate social responsibility (CSR) activities. In 2016, as part of environmental initiatives in the sphere of product development, we advanced the development of products for use in medical devices using SFT2 technology that helps reduce display power consumption. In the production sphere, we made investments in energy conservation, generating results through sustained progress on cutting plant power consumption.

- Contributing to the development of an energy-onserving society by developing applications for LCD displays with low environmental impact, such as low energy consumption and light weight.
- Creating environmentally sensitive products in various ways, including green procurement and compliance with RoHS directives.
- Continuing initiatives to reduce the environmental impact of manufacturing activities at our plants.

We intend to continue contributing to the development of a sustainable society by appropriately directing the knowledge and experience of all our employees.
We welcome frank comments and opinions from our stakeholders to help guide our future actions in the area of environmental management.

Deshu Yu, President
NLT Technologies, Ltd.

Company Overview

Name: NLT Technologies, Ltd.

Address: Shin-Kawasaki Mitsui Building West Tower 28F

1-1-2, Kashimada, Saiwai-Ku, Kawasaki, Kanagawa, Japan

Established: April 1, 2003

President: Deshu Yu

Capital: 4.3 billion yen

Lines of business: Research, development, design, manufacture, sale, and maintenance of color / monochrome display modules and related electronic devices

Number of employees: Approximately 600

[History]

Mar. 1989	Color LCD Development Promotion Headquarters established.
Apr. 1992	Color LCD Division established
Nov. 1993	Acquired ISO 9002 certification
Feb. 1994	Acquired ISO 9001 certification
Jul. 1997	Acquired ISO 14001 certification
Apr. 2003	NEC LCD Technologies, Ltd. established as independent company
Apr. 2007	NEC Akita and NEC Kagoshima were merged into NEC LCD Technologies
Dec. 2009	Production consolidated at Akita Plant
Jul. 2011	Under the joint venture with Shenzhen AVIC OPTOELECTRONICS, LTD., the company name has changed to NLT Technologies, Ltd.
Aug. 2014	Acquired ISO/TS 16949 certification

Map of NLT Technologies Business Sites

Our activities at our Kawasaki Head Office focus on research and development. We produce products for sale to our customers at our Akita Plant and at the production facilities of our parent company, Tianma Micro-Electronics Group, and other members of its group of companies.

We're deepening collaborative efforts with Tianma Micro-Electronics Group and other members of its group of companies across a broad range of spheres, including research, development, design, production, and sales.

Akita Plant

Product

Production line A1
  Starting substrate size: 370×470 mm
Production line A2
  Starting substrate size: 550×660 mm

Akita, Akita Prefecture

Kawasaki, Kanagawa Prefecture

Osaka, Osaka Prefecture

Head Office

R&D and sales

Sales Dept I (West Japan Area)

Sales
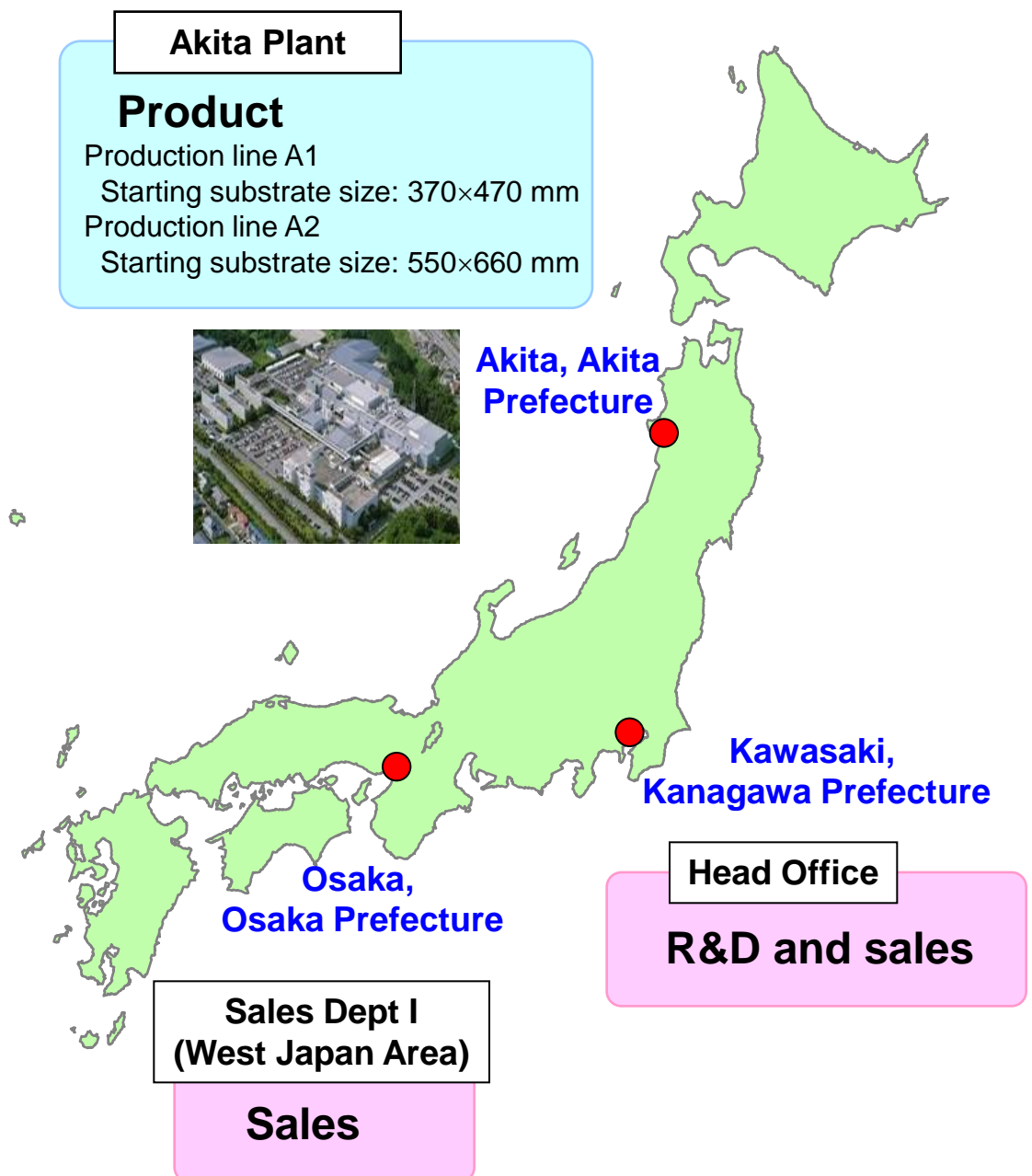
Main Products

Shown below are some of the main products. These products are characterized by energy-conserving performance achieved through low power consumption.

<Monitors>

These are used as monitor panels in high-end and professional fields: for example, as high-definition monitors for the medical and graphics applications.

<Industrial use>

These are used across a wide range of fields, including panel computers and measurement equipment and broadcasting.
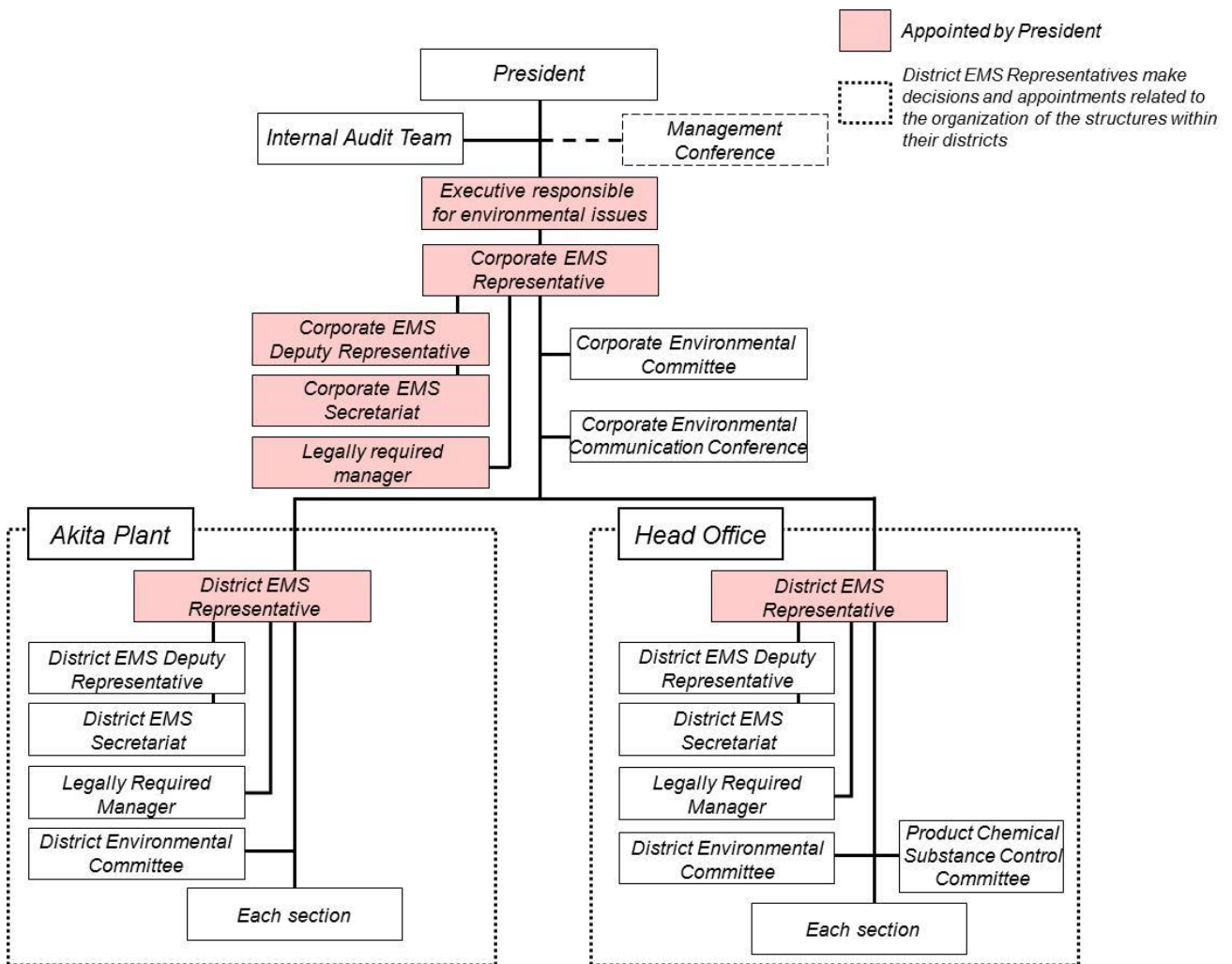
Environmental Policy

One of our goals as a global corporation is to help achieve a sustainable society. We are actively engaged in global environmental preservation activities in the development of our display products and production technologies. Key objectives of our environmental policy are:

1. Make continual improvements to NLT Technologies' environmental management system to enhance our environmental performance.

2. Reduce the environmental impact associated with our products and manufacturing processes as far upstream as possible to prevent pollution and protect the environment.

   i   Throughout a product's life cycles, from material procurement to disposal, NLT Technologies strives to save energy and purchase green whenever possible to provide green products, and minimize the environmental impact of our products and technologies.

   ii Endeavor to reduce the environmental impact in our manufacturing processes using measures such as energy and resource conservation and waste reduction.

3. Comply with applicable legal requirements and with other requirements to which NLT Technologies subscribes related to its environmental aspects.

Established: April 1, 2016
Deshu Yu, President
NLT Technologies, Ltd.

Environmental Management Organizational Structure

We established the environmental management organization outlined below to advance activities in accordance with our environmental management system (EMS).
The President appoints the Corporate EMS Representative, Deputy Representative, District EMS Representatives, Corporate EMS Secretariat, Chief Auditors and others. The District EMS Representatives make decisions and appointments related to the organization of these structures within their districts, establishing clear roles and responsibilities of each position through in-house rules.

Environmental Management System

We perform the following audits to accurately identify and confirm aspects of various issues, such as the state of compliance with ISO 14001 standards, environmental impact reductions, environmental conservation, and the control of chemical substances occurring in products: environmental internal audits performed by in-house audit teams; and environmental management system audits performed by third-party auditing agencies.
We share information on issues and improvements in each district to promote sustained improvements.

Certificate of Registration

Intertek

This is to certify that the environmental management system of

NLT Technologies, Ltd.

Head Office:
Shin-Kawasaki Mitsui Building West Tower 28F, 1-1-2 Kashimada,
Saiwai-Ku, Kawasaki-Shi, Kanagawa Pref., 212-0058 Japan
(See attached appendix for sites)

has been assessed and registered by Intertek as conforming to the requirements of

ISO 14001:2004

The environmental management system is applicable to the management
of the environmental aspects related to

**Research, development, design, manufacture, sale
and maintenance of color / monochrome display modules
and related electronic devices**

Certificate Number: 09642
Issue Date: 21 November 2016
Original Issue Date: 13 August 2013
Certificate Expiry Date: 21 December 2017

Authorised Signature: Kiyo Sakai – Country Manager, Business Assurance
Intertek Certification Japan Limited, 4th FL Nihonbashi-N Bldg., 1-4-2 Nihonbashi Horidome-cho, Chuo-ku, Tokyo 103-0012 JAPAN

Intertek Certification Japan Limited is a JAB accredited body under schedule of accreditation no. CM057.

In the issuance of this certificate, Intertek assumes no liability to any party other than to the Client, and then only in accordance with the agreed upon Certification Agreement. This certificate's validity is subject to the organisation maintaining their system in accordance with Intertek's requirements for systems certification. Validity may be confirmed via email at certificate.validation@intertek.com or by scanning the code to the right with a smartphone.
The certificate remains the property of Intertek, to whom it must be returned upon request.

JAB
EMS
CM057

An EMS audit at Akita Plant

Certificate Number　　　：09642
Original Issue Date　　　：13 August 2013
Certificate Expiry Date：21 December 2017

2016 Results

Summarized below are the results of CY 2016 initiatives. 2017 initiatives will be based on these results.

◆Assessment◆   ○: Achieved △: Achieved at rate of 80% or higher ×: Achieved at rate of under 80%

Items	Targets	Results	Assessment
Maintaining a 100% green procurement rate	100%	100%	○
Maintaining 100% compliance with RoHS	100%	100%	○
Reduction in energy-derived CO_2 emissions	126.0 kg-CO_2/m^2 or less*	142.1 kg-CO_2 /m^2	△
Reduction of chemical substances	6.7 kg/m^2 or less*	7.0 kg/m^2	△
Reduction in waste emissions	2.9 kg/m^2 or less*	3.3 kg/m^2	△

Environmentally Friendly Products

■ DEVELOPMENT OF SUPER HIGH DENSITY 30-INCH DIAGONAL TFT LCD WITH SFT2 TECHNOLOGY

NLT Technologies, Ltd. has developed a prototype of a new 30-inch wide format LCD, with resolution of 3280 x 2048 pixels (6 mega pixels, or 6MP).

This is the first 30-inch screen size developed by NLT. The 6MP 30-inch display delivers superior high density image quality making it possible to display twice the amount of information on a single display as compared to NLT's conventional 21.3-inch 3 mega pixel display. The 30-inch 6MP display is well suited for medical diagnostic applications because more graphic data and images are displayed more efficiently.

The new product incorporates NLT's Super Fine TFT 2 (SFT2) technology which improves contrast ratio approximately 30% compared to NLT's conventional 21.3-inch displays. SFT2 is NLT's proprietary new version of its Super Fine TFT technology, comparable to In-Plane Switching. SFT2 significantly improves the aperture ratio compared to conventional TFT via a newly developed pixel structure, resulting in both high density and excellent display performance yielding wide viewing angles, wide color gamut, and high transmissivity, while keeping power consumption low.

◆Figure: Comparison of aperture ratio

| SFT2 Technology | Conventional Technology |
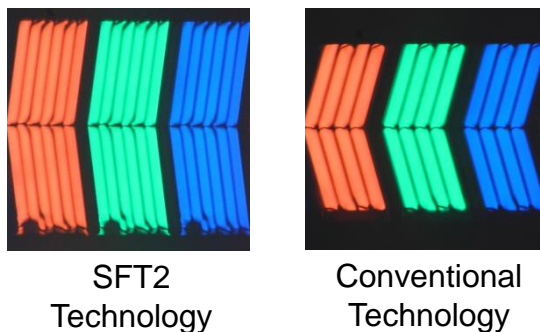
Chemical Substances Contained in Products System (1)

■ Green Procurement

We do our part to further green procurement, in this way helping to establish a recycling society. We do this by expanding markets for green products, promoting the development of environmentally sensitive products, and raising awareness among designers and developers. Green procurement prioritizes the purchase of materials with low environmental impact. We have established green-procurement requirements for parts and materials and a green certification program for suppliers who meet these requirements. Since 2005, we have maintained a green procurement rate of 100%. In 2017, we continue to make 100% of our purchases from green certified suppliers.

Essential Condition for Green Procurement of Parts and Materials	
Category	**Items to Be Checked**
Approach Environmental management	Establishment of environmental management system
	Non-use of substances banned from manufacturing Process
	Establishment of system for examination of chemical Substance content
Products	Non-use of substances banned from products

■ Restrictions on the Purchase of Substances Prohibited from Use in Products

In addition to green procurement, we provided a list of environmental substances restricted by NLT Technologies. These restrictions also include chemical substances prohibited by specific customers and other individually designated chemical substances. Copies of these restrictions are distributed to suppliers of parts and materials under the title *Common Specification of Green Procurement*. We ask suppliers to assess the chemical substances found in parts and materials delivered to us, based on design diagrams and the *Common Specification of Green Procurement*.

The data collected in this way is registered into an internal database and shared for use in selecting parts and materials at the design stage, as well as for product assessment. Procurement restrictions also apply to chemical substances occurring in shipping and packaging materials, for which similar surveying, data registration, and materials selection are conducted.

■ Our products are RoHS compliant

The European Union (EU) issued a RoHS Directive,[1] taking effect from July 1, 2006, that restricts the use of certain hazardous substances. As a result, electrical and electronic equipment containing any of the six target substances (lead, mercury, cadmium, hexavalent chromium, PBB[2] and PBDE[3]) is restricted from the EU market.
Out of concern for the environment, NLT Technologies began reducing the use of hazardous substances in our LCD modules prior to the RoHS directive. We have eliminated the six substances targeted in the RoHS directives as well as other substances we have identified as potentially hazardous, so that our products are now RoHS compliant.

The RoHS Directive underwent major revisions in July 2011. The updated RoHS Directive (RoHS II) went into effect in January 2013.

In June 2015, the *Official Journal of the European Union* also announced that the number of restricted substances would grow from six to ten substances and that the addition of restrictions on four phthalates[4] would enter into effect on July 22, 2019.[5] We remain committed to meeting all RoHS II requirements, including restrictions on phthalic acids.

Now

Lead | Mercury
Hexavalent chromium
Polybrominated biphenyls (PBB) | Polybrominated diphenyl ethers (PBDE)
Maximum density tolerance: 1,000 ppm
Cadmium
Maximum density tolerance: 100 ppm

Starting July 22, 2019

Lead | Mercury
Hexavalent chromium
PBB | PBDE
DEHP | DBP
BBP | DIBP
Cadmium
Maximum density tolerance: 100 ppm
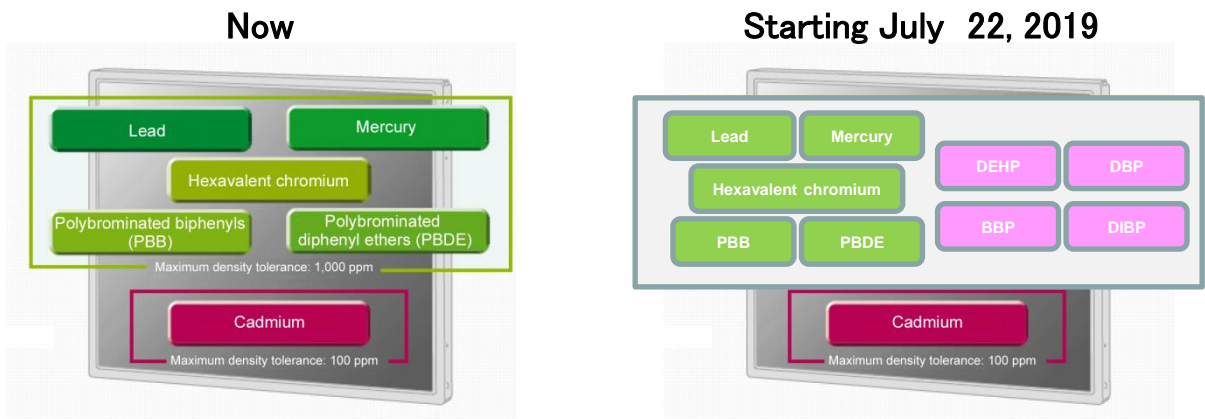
*1 RoHS: The Restriction Of The Use Of Certain Hazardous Substances
    In Electrical And Electronic Equipment
*2 PBB: Poly brominated biphenyl
*3 PBDE: Poly brominated diphenyl ether
*4 Four phthalates
   DEHP: Bis（2-ethylhexyl）phthalate
   DBP: Dibutyl phthalate
   BBP: Butyl benzyl phthalate
   DIBP: Diisobutyl phthalate
*5 The restriction shall not apply to monitoring and control instruments placed on the market
   before 22 July 2021.

Chemical Substances Contained in Products System (3)

■ Compliance with chemical substances restriction (REACH regulations)

In place from June 1, 2007, the EU REACH[1] regulations require the registration, evaluation, and authorization of all chemical substances entering the EU, based on factors such as volumes imported or produced.

For molded products containing substances of very high concern (SVHC[2]) and SVHC candidates in concentrations of 0.1% or more, a system must be in place throughout the supply chain to communicate information such as substance names, volumes included, and information enabling safe use.

To comply with REACH regulations, we are currently developing a management system that incorporates BOM[3] management of the parts and materials used in products, surveys of the chemical ingredients used therein, and processing of the data collected.

[1] REACH: Registration, Evaluation, Authorization and Restriction of Chemicals
[2] SVHC: Substances of Very High Concern
[3] BOM: Bill of Materials

■ Joint Efforts with Suppliers

As required by various measures such as the European Union's RoHS directive, specifically designated harmful chemical substances occurring in products must be controlled. Each company in the supply chain must implement efforts to ensure proper control of the chemical substances found in various products.

As part of these efforts, we have developed an evaluation tool that promotes the proactive control of chemical substances occurring in products among the suppliers themselves. To ensure PMR[4] assessments, we distribute supplier assessment check forms to our suppliers. These forms are used to control various chemical substances occurring in products. Alongside spot inspections by NLT Technologies, such efforts improve supplier control systems by enabling supplier self-assessments.

[4] PMR: Process Management Review

Environmental Impact Mass Balance

The diagram below shows the resource volumes used in and the wastewater, carbon dioxide, and waste generated at the Akita Plant in CY 2016.
In 2017, we will continue to strive to promote effective resource use; to promote energy conservation initiatives; and to reduce resource use and emissions still further.

Production processes, chemical substances
742 t

Electricity
76,515 MWh

High-pressure gases (Nitrogen, oxygen, etc.)
19,996 t

City gas
4,701 km^3

Akita Plant

Industrial water
962 km^3

CO_2 emissions
65,020 t-CO_2

Industrial waste
1,335 t

Process wastewater
962 km^3

Sale
137 t

General waste
23 t

Recycling rate: 100%

Preventing Global Warming (Promoting Energy Conservation)

Recognizing global warming as an important environmental issue, we promote a wide range of efforts to reduce carbon-dioxide emissions, including reductions in energy used by plants, turning off lights when not needed, and using air-conditioning system in energy conservation mode at our offices.

◆Adopting cooling-water waste-heat recycling system◆ (from January 2017)

By recycling the cooling water used in cleanroom air-conditioning to preheat external air, this system helps reduce use of both the steam (produced using city gas) used to heat external air and the electricity used to produce cooling water.

Refrigeration system

Reducing cooling water temperatures cuts the electricity consumed by refrigeration systems.

Cooling water outlet | Cooling water inlet

Steam boiler

Heating steam

Humidifying steam

Preheating external air cuts use of city gas.

External air

FAN | DP | T

Air handling unit

Treated air to Cleanroom

Cooling coil

Cooling-water waste-heat coil

Preheating external air using cooling-water waste heat
Cooling water using external air

◆Deploying high-efficiency air compressors◆ (from March 2016)

We're cutting our electrical consumption by upgrading from air compressors in use for 23 years (650 kW, 6,000 m^3/h) to the latest in high-efficiency air compressors (560 kW, 6,216 m^3/h).

◆Free-cooling system adopted◆ (from January 2014)

Taking advantage of Akita's northern climate, this system conserves electricity for producing cold water for air-conditioning use. This is done by passing water cooled in a cooling tower by outdoor air through a heat exchanger (or a refrigeration unit in summer and between seasons).
(This is an application of a similar system first adopted in 2010.)

Cooling tower

Cooling water pump

Heat exchanger

Refrigeration unit

Chilled water pump

Header (S) | Header (R)

Load

Controlling Chemical Substances

Various chemical substances are used in processes related to manufacturing and processing wastewater and exhaust gas emitted 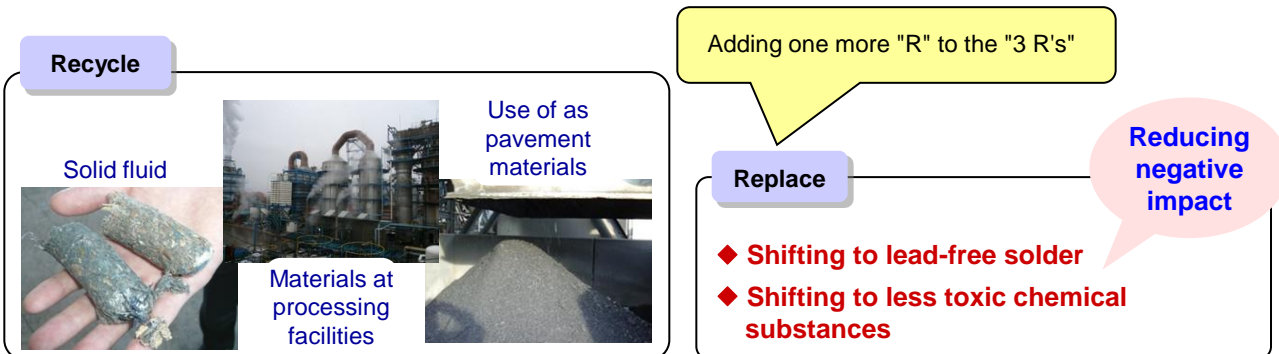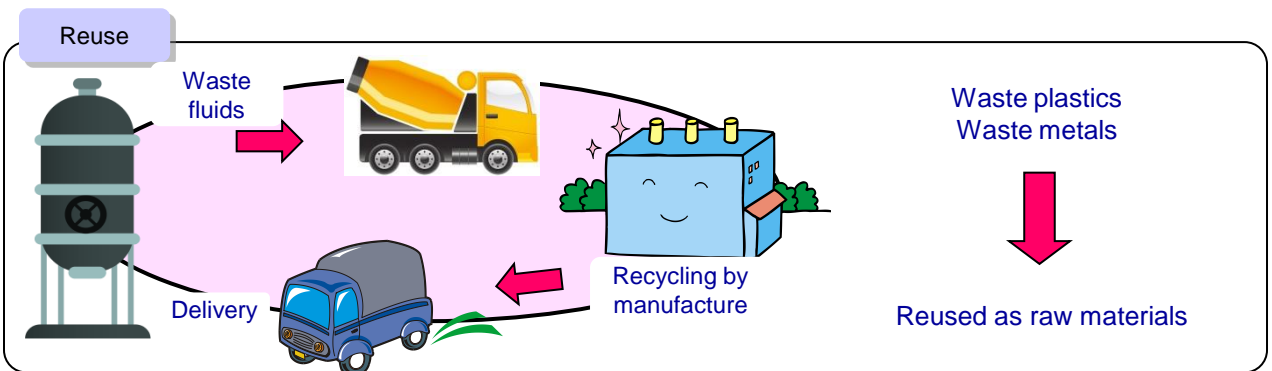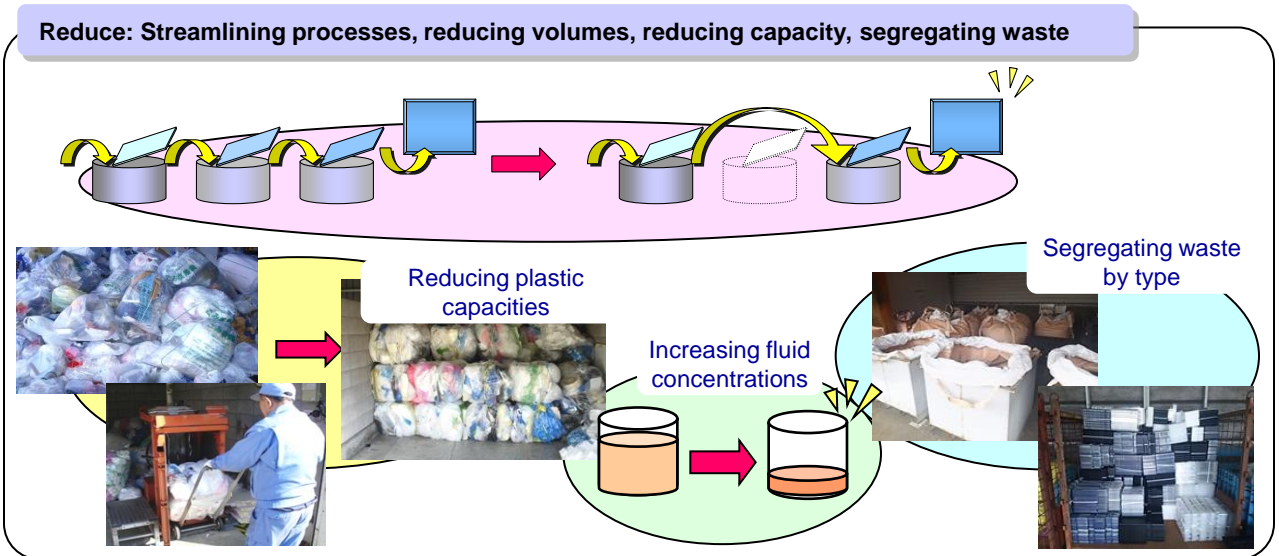from manufacturing processes. For purposes of monitoring environmental impact and control over handling safety, we maintain a control structure of chemical substances, reduce the volumes of materials used, and promote the transition to substances with lower levels of toxicity and environmental impact.

PRTR: Abbreviation for Pollutant Release and Transfer Register; used to control environmental pollutant input and output.

Chemical substances (chemicals, gases)

PRTR (input/output) control

Assessment of the feasibility of adopting new chemical substances
(advance meeting to review environmental/ safety repercussions)
• Advance confirmation of issues such as conditions and behavior, volumes used, methods deployed, and applicable laws and regulations

Exhaust gas, wastewater

Reducing environmental impact
• Reducing volumes of chemical substances used
• Transitioning to other chemicals
• Halting use of chemical substances
• Recycling, reuse

Periodic analysis and measurement
(compliance with exhaust restrictions)

Controlling daily handling
• Locking storerooms
• Managing trends in volumes of chemical substances used

Occupational health and safety controls
• Work environment measurements
• MSDS education, review

MSDS: Abbreviation for Material Safety Data Sheet. These documents provide information, including the characteristics and toxicity of various chemical substances.

Waste Control

The Akita Plant continues to recycle all generated waste and to implement zero-emissions efforts through waste segregation and the "three Rs" (reduce, reuse, recycle). To ensure all waste is disposed of properly, waste processing is contracted out to licensed, specialized waste processing firms. Final processing is confirmed using manifests. In addition, waste-processing facilities are periodically subjected to on-site inspections.

Reduce: Streamlining processes, reducing volumes, reducing capacity, segregating waste

Reducing plastic capacities

Increasing fluid concentrations

Segregating waste by type

Reuse

Waste fluids

Delivery

Recycling by manufacture

Waste plastics
Waste metals

Reused as raw materials

Recycle

Solid fluid

Use of as pavement materials

Materials at processing facilities

Adding one more "R" to the "3 R's"

Replace

Reducing negative impact

◆ **Shifting to lead-free solder**
◆ **Shifting to less toxic chemical substances**

Legal Compliance

We confirm legal compliance in various ways, including internal environmental audits, and environmental compliance audits. No notable problems emerged in CY 2016.

Results of analysis and measurement at the Akita Plant (2016)

<Wastewater measurements in mg/l (excluding pH)>

Subject	Item	Value established jointly by the company and Akita city	Self-imposed standard value	Measured value (average)
Industrial wastewater	Hydrogen ion density (pH)	6.0 to 8.5	6.2 to 8.3	7.5
	Biochemical oxygen demand (BOD)	25	20	2.6
	Chemical oxygen demand (COD)	25	20	3.2
	Suspended substances (SS)	30	15	1.7
	Nonvolatile oil (normal hexane) content	10	1	< 1
	Chrome content	1	0.05	< 0.05
	Hexavalent chromium compounds	0.1	0.05	< 0.05
	Fluorine content	8	6	2.0
	Phosphor content	To be measured	4	1.23
	Nitrogen content	To be measured	60	7.0

<Soot and smoke measurements>

Subject	Item	Value established jointly by the company and Akita city	Self-imposed standard value	Measured value (average)
Cogeneration	Sulfur oxide (SOx)	K = 5	K = 0.5	K = 0.12
	Nitrogen oxide (NOx)	130 ppm	120 ppm	60 ppm
	Soot particles	0.1 g/m^3N	0.015 g/m^3N	< 0.02 g/m^3N
Once-through boiler	Sulfur oxide (SOx)	K = 5	K = 0.5	K < 0.1
	Nitrogen oxide (NOx)	150 ppm	120 ppm	30 ppm
	Soot particles	0.15 g/m^3N	0.12 g/m^3N	< 0.01 g/m^3N
Smoke-tube boiler	Sulfur oxide (SOx)	K = 5	K = 0.5	K < 0.1
	Nitrogen oxide (NOx)	150 ppm	120 ppm	84 ppm
	Soot particles	0.15 g/m^3N	0.12 g/m^3N	< 0.01 g/m^3N

<Exhaust gas measurements>

Subject	Item	Value established jointly by the company and Akita city	Self-imposed standard value	Measured value (average)
Acid/organic exhaust gas cleaning tower	Hydrogen chloride	To be measured	10 mg/m^3N	0.40 mg/m^3N
	Hydrogen fluoride	To be measured	10 mg/m^3N	0.24 mg/m^3N
	Isopropyl alcohol	To be measured	450 ppm	0.37 ppm
	Ammonia	To be measured	3 mg/m^3N	< 0.05 mg/m^3N
Acid exhaust gas cleaning tower	Hydrogen chloride	To be measured	10 mg/m^3N	< 0.16 mg/m^3N
	Hydrogen fluoride	To be measured	10 mg/m^3N	< 0.23 mg/m^3N
	Ammonia	To be measured	3 mg/m^3N	< 0.05 mg/m^3N
Separation exhaust gas cleaning tower	Isopropyl alcohol	To be measured	450 ppm	24 ppm

Risk Management

In-house facilities are inspected and swift countermeasures taken to prevent accidents. These activities incorporate information shared on cases arising common plant accidents across Japan.

We patrol facilities involved in environment activities and undertake periodic drills to ensure appropriate response to chemical leaks and other incidents. A certification system for operators based on certain standards has been established for firms involved in supplying or transporting chemicals or collecting or transporting waste fluids. Overall schedules are meticulously confirmed and comprehensive safety warnings issued.

Before using any new equipment or chemical substances, we undertake advance assessments and development procedures to closely examine aspects such as the potential impact of chemical substances on the environment, safety, and products.

Drills in responding to environmental incidents such as chemical or gas leaks

2017 Environmental Activity Targets

Based on inputs and the results of activities in the previous year, our CY 2017 activities will have the following targets:

Items	Targets
Maintaining a 100% green procurement rate	100%
Maintaining 100% compliance with RoHS	100%
Reduction in carbon-dioxide emissions (from energy)	116.8 $kg\text{-}CO_2/m^2$ or less*
Reduction of chemical substances	6.9 kg/m^2 or less*
Reduction in Waste emissions	3.2 kg/m^2 or less*

NLT Technologies, Ltd.

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 1-1-2, Kashimada, Saiwai-Ku, Kawasaki, Kanagawa, Japan

   Contact:
    TEL: +81-44-330-9933 (main switchboard)
    E-mail：nlt-eco@nlt-technologies.com

[AKITA PLANT]
 3-1-1, Shimotsutsumi, Goshono, Akita 010-1412,Japan

Information on our environmental initiatives is also available on the Internet:
  http://www.nlt-technologies.co.jp

Thank you for taking part in this survey.

Please answer the following questions concerning your reactions to and impressions of the NLT Technologies, Ltd. Annual Environmental Report 2017 Edition.

Q1. Did you find the Annual Environmental Report clear and easy to understand?

☐ Easy to understand   ☐ Average   ☐ Hard to understand

Q2. How comprehensive was the coverage of the Annual Environmental Report?

☐ Full   ☐ Average   ☐ Insufficient

Q3. Did you find any of the subjects of this year's report particularly interesting? (Chose all answers that apply.)

☐ Message from the President   ☐ Company Overview   ☐ Map of NLT Technologies Business Sites

☐ Main Products   ☐ Environmental Policy   ☐ Environmental Management Organizational Structure

☐ Environmental Management System   ☐ 2016 Results   ☐ Environmentally Friendly Products

☐ Chemical Substances Contained in Products System   ☐ Environmental Impact Mass Balance

☐ Preventing Global Warming (Promoting Energy Conservation)   ☐ Controlling Chemical Substances

☐ Waste Control   ☐ Legal Compliance   ☐ Risk Management

☐ 2017 Targets

Q4. Can you describe your relationship to the company and your perspective as a reader of this report?

☐ Active in business transactions with NLT Technologies   ☐ Product user

☐ Government, administrative body   ☐ Environmental NGO or NPO staff

☐ Corporate environmental staff   ☐ Media   ☐ Student or educational institution affiliate

☐ Other (   )

Q5. How did you first learn about this Annual Environmental Report?

☐ NLT Technologies website   ☐ Seminar, trade show   ☐ Newspaper, magazine

☐ Other (   )

Q6. Please provide any comments below on the Annual Environmental Report overall or on NLT Technologies' initiatives.

Name	
Address	
Contact information	TEL / FAX
	e-mail
Occupation (name of employer, school, etc.)	

★ Please return this questionnaire after reviewing and consenting to the Privacy Policy. (http://www.nlt-technorogies.co.jp)

Thank you for your cooperation.