

# Y2017

# SMIC Environmental Reporting

Semiconductor Manufacturing International Corporation

May 2018

## Assurance Statement

SMIC (Semiconductor Manufacturing International Corporation) has ensured all the data in the report is accurate and authentic; this data has also been certified by the following third parties, which have no conflict of interest in this matter. The data showed in the report involves SMIC Shanghai, Beijing, Tianjin and Shenzhen plants:

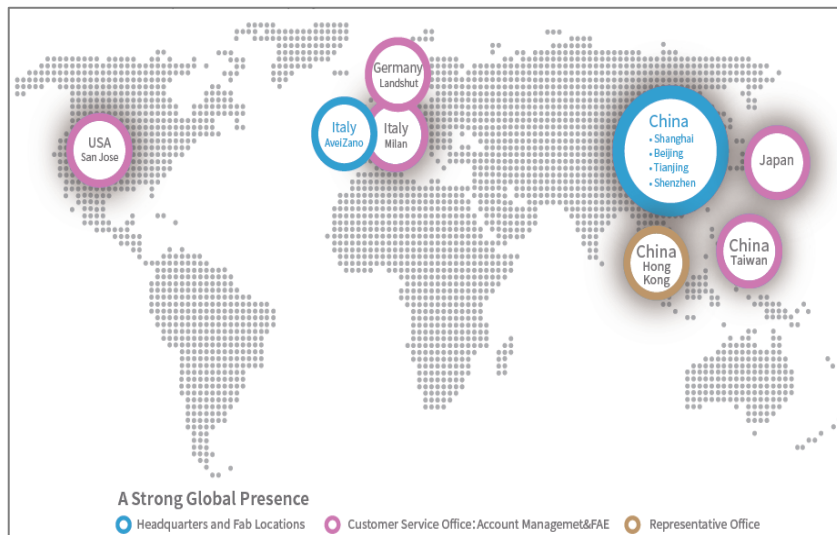
- Data on waste gas emissions was monitored by qualified testing institutes
- Data on hazardous waste was checked by treatment vendors and the government via bills
- Data on energy consumption was verified by the related energy management agencies
- Data on greenhouse gas emissions was certified via 3<sup>rd</sup> party ISO 14064 certification

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# 1 Environmental Footprint

Semiconductor Manufacturing International Corporation is one of the leading semiconductor foundries in the world and the largest and most advanced foundry in mainland China. SMIC provides integrated circuit (IC) foundry and technology services on process nodes from 0.35 micron to 28 nanometer. Headquartered in Shanghai, China, SMIC has an international manufacturing and service base. In China, SMIC has a 300mm wafer fabrication facility (fab) and a 200mm fab in Shanghai; a 300mm fab and a majority-owned 300mm fab for advanced nodes in Beijing; 200mm fabs in Tianjin and Shenzhen; and a majority-owned joint-venture 300mm bumping facility in Jiangyin; additionally, in Italy SMIC has a majority-owned 200mm fab. SMIC also has marketing and customer service offices in the U.S., Europe, Japan, and Taiwan, and a representative office in Hong Kong.



# 2 Environmental Protection Policy

In its early days, SMIC established the environmental protection and safety and health policies based on ISO 14001 environmental management system and OHSAS 18001 occupational health and safety management system. Based on the continuously improved concept, by optimizing and revising the policy, SMIC gradually develops the following new management policies:

### SMIC Environmental Protection, Safety and Health Policy

Established in 2000, SMIC provides high-quality wafer foundry services. In our daily operations, we focus on product innovation and quality control while putting emphases on preventing environmental pollution, using energy/natural resources effectively, protecting our human resources and forestalling accident loss. We believe this is vital to employee well-being as we raise environmental protection, safety, and health (ESH) standards for every employee at SMIC. We are striving to be environmentally responsible through continuous improvements. We aim to strengthen our operational risk management to ensure future growth of SMIC.

To achieve the above goals, SMIC is committed to:

1. Following ESH regulations and international protocols while fulfilling customer requirements.
2. Enhancing environmental quality and promoting employee safety and health as a primary responsibility for every SMIC manager.
3. Carrying out site ESH management through employee's ownership and teamwork.
4. Establishing a green supply chain, implementing green manufacturing and providing customers green products.
5. Strengthening accident prevention measures, emergency response capabilities and recovering abilities.

Approved by:

  
Haijun Zhao, CEO

Date:

2017/6/2

To achieve environmental protection objectives in the management policy, the company takes the following environmental management measures:

- Plan and take environmental protection measures and promote energy saving and emission reduction projects
- Classify, collect and recycle wastes
- Supervise and manage transfer, safety treatment and manufacturer qualification identification of hazardous wastes
- Control the content of hazardous substances in the product
- Carry out regular environmental monitoring and carbon emission check and disclose the results

### 3 Environmental Protection Management

Under the guideline of environmental management systems, laws, regulations and standards, SMIC systematically and normatively integrates the environmental management project into the whole process of production and operation in the areas such as organizational structure, document control, operational control, super vision and management, improvement and enhancement, by planning, implementing and operating environmental management projects.

### **3.1 Management Team and Capital Investment**

SMIC sets up a separate environmental management sector consisting of members with professional environmental management knowledge and skills. The environmental management sector works with other functional divisions to jointly implement environmental management projects with clear responsibilities, to ensure the realization of environmental objectives and make sure that ISO 14001, ISO 14064, QC 080000 and other environmental management systems run effectively. In 2017, the company invested more than RMB 83 million for operation, reconstruction and expansion, monitoring and third-party audit of the environmental protection facilities for waste water, waste gas and waste materials.

### **3.2 Cleaner production**

In order to minimize and even eliminate the impact of the production process on humans and the environment, we implement cleaner production measures. These measures include reduction of pollution sources, increase of resource utilization, reduction and elimination of pollution in the links from production and maintenance to product use.

In accordance with regulatory requirements, SMIC regularly implements cleaner production audits and implements cleaner production improvement plan according to the expert audit suggestions. In 2017, SMIC implemented 28 cleaner production improvement programs with an investment of more than RMB 60 million.

### **3.3 Product Hazardous Substances Control**

In accordance with QC 080000 hazardous substances control system, the company controls hazardous substances risks in the whole production process, so that the products meet the Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and

Electronic Products, EU RoHS/REACH, Sony GP standards and other domestic and international hazardous substances control standards, to reach the green product level.

Source control---promote green supplier evaluation mechanism and control hazardous substances from the source; select the suppliers that meet the requirements for green supplier evaluation, conduct regular documentation and site audits of suppliers, request the raw material suppliers to provide a statement of no hazardous substance; and require suppliers to provide periodic test reports of no hazardous substances for high-risk substances.

Process control---strictly implement production process control and put the equipment under isolation management; provide training for operators to prevent the production process from pollution by external hazardous substances.

Product test---monitor the content of hazardous substances in the products, conduct hazardous substances test for the products produced each year to verify the content of hazardous substances contained in the products is under control.

## 4 Greenhouse Gas Management

The climate change caused by greenhouse gas emissions has a great impact on the global ecological environment, human life and health and economy, so it is an environment issue receiving great concern from the United Nations, governments, society and business circles.


### 4.1 Climate Change Policy

SMIC is actively responsible for mitigating climate change, and it develops climate change policies and implements the measures to reduce greenhouse gas emissions.

**SMIC Climate Change Policy**

SMIC conducts business with the wellbeing of our environment, our community and our next generation in mind. Concerned about global climate change, SMIC remains committed to save resources, reduce disaster losses caused by extreme weather, slow down and reverse the effect of climate change to achieve sustainable development and leave behind a cleaner and more stable environment. To achieve these objectives, SMIC commits to:

1. Decrease Greenhouse Gases emissions;
2. Reduce product energy consumption;
3. Lower product water consumption;
4. Pursue green production and energy saving products; and
5. Enhance the ability to prevent, respond, and recover during adverse weather conditions.

Approved by:  Date: 2017/6/1

HaiJun Zhao, CEO

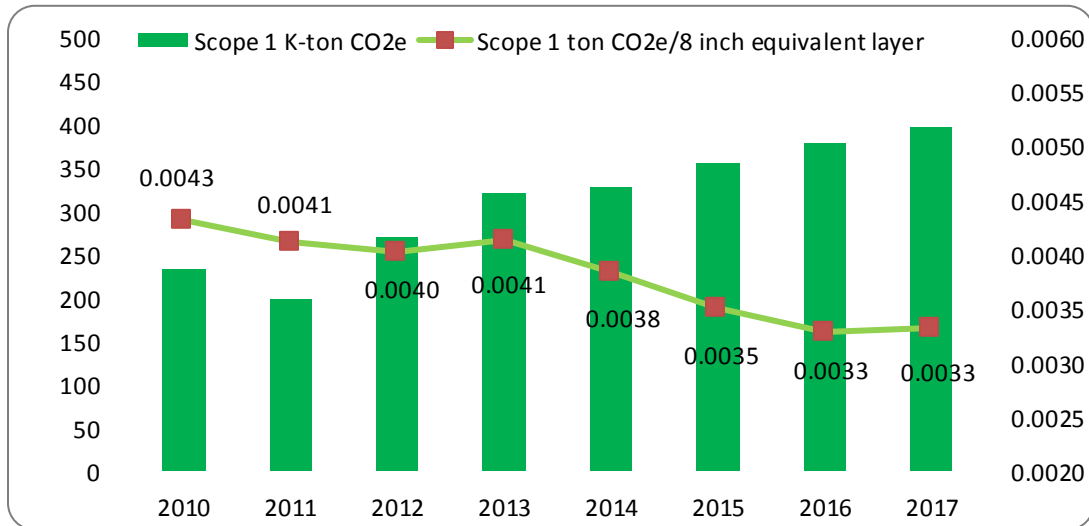
### 4.2 Verification of Greenhouse Gases

In accordance with international standard ISO 14064, SMIC establishes a greenhouse gas verification mechanism. It calculates the greenhouse gas emissions in the operating factory on a regular basis each year, to acquire the company's greenhouse gas emissions and implement emission reduction measures as planned. The total of greenhouse gas

emissions increased by 11.7% in 2017 to 1,510,877 tons because of adding new Fab emissions data.

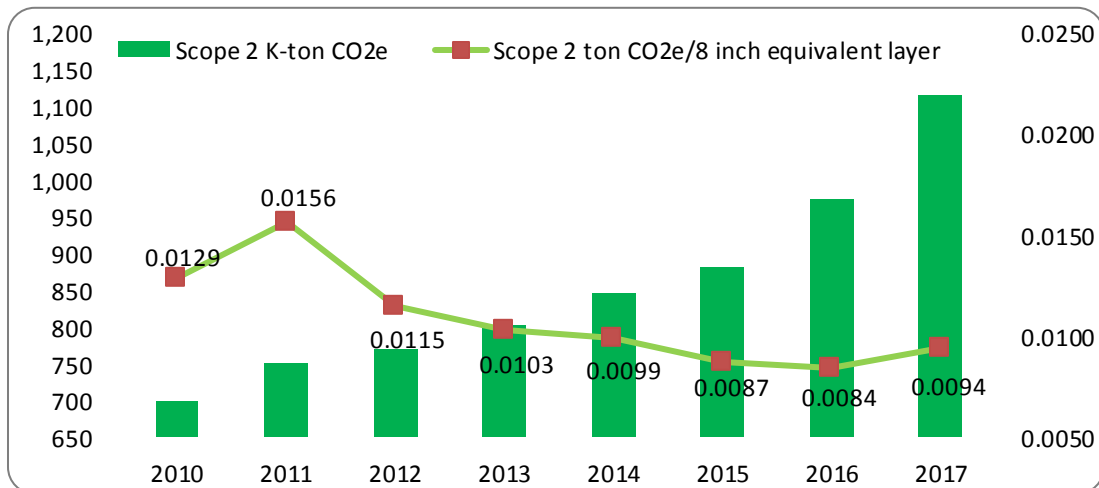
#### 4.2.1 Direct Emissions of Greenhouse Gas

Direct greenhouse gas sources: combustion of gasoline, diesel, natural gas and other fossil fuels, perfluorinated compounds gas in the process of chemical vapor deposition and dry etching, organic exhaust combustion, refrigerant fugitive emissions, wastewater treatment system emissions and pure water system fugitive emissions, etc.



#### 4.2.2 Indirect Emissions of Greenhouse Gas

Indirect greenhouse gas sources: greenhouse gas emissions of outsourced power, steam, heat and other energies.



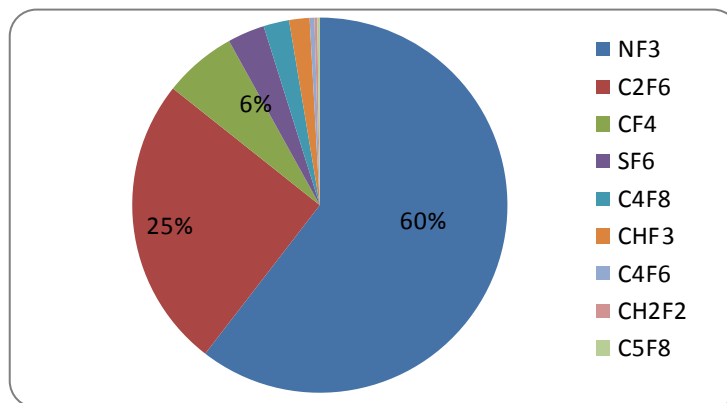
#### 4.2.3 Perfluorinated Compounds Greenhouse Gas Emissions

As an important member of China Semiconductor Industry Association, SMIC provides annual perfluorinated compounds greenhouse gas emission information to the Association, which then report it to the World Semiconductor Council (WSC). SMIC is

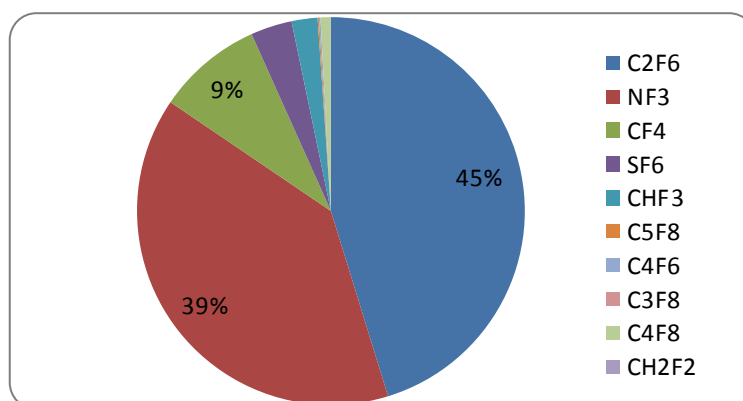


actively implementing the agreement developed by WSC on voluntary greenhouse gas emission reduction of perfluorinated compounds (PFC), trying to implement the best practice emission reduction technology advocated by WSC and reduce the emission of PFC greenhouse gas.

2017 PFC gas consumption information is shown in the following figure:



Information of CO<sub>2</sub> from PFC emission in 2017 is shown in the following figure:



SMIC has been following WSC's goal which is equivalent to a 30% Normalized Emission Rate (NER) reduction from the 2010 aggregated baseline to 2020. The NER in 2017 is 0.661 kg/cm<sup>2</sup> which achieved 48% reduction from the 2010 baseline with 1.29 kg/cm<sup>2</sup>. But the great efforts are still being made to achieve the WSC's NER absolute reduction goal with 0.22kg/cm<sup>2</sup>. (The NER value calculated via WSC's computation method).

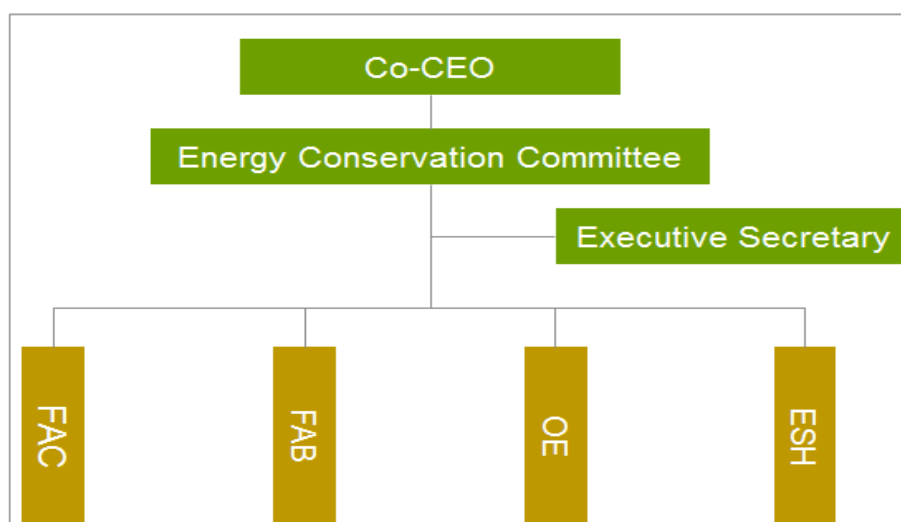
## 5 Energy Management

SMIC actively responds to national energy-saving and emission reduction calls, establishes energy management organizations and continues to implement energy-saving and emission reduction projects, achieving a double win for economic and environmental benefits.

## 5.1 Energy Management Mechanism

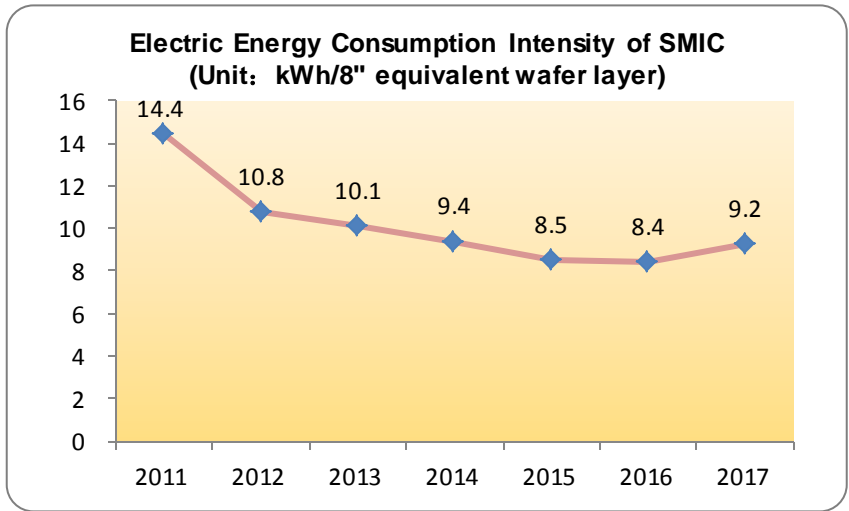
At the beginning of 2014, SMIC set up Energy Conservation Committee to promote power management, where the Co-CEO served as Chairman of the Energy Conservation Committee and took overall charge of energy-saving related work. The members of the Committee include factory affair divisions, equipment divisions, production divisions, general service divisions, production planning divisions, finance divisions and environmental protection, safety and health divisions in all factories. Besides, a sound energy management system was established to implement three-level energy management networks, practice the energy management post responsibility system, establish full-time energy management agencies and full-time managers for energy management, to ensure the implementation of energy management in both system and organizational construction. The factory in Beijing and Tianjin established the energy management systems in accordance with the national standard GB/T23331-2012, to further strengthen energy management.

The Energy Conservation Committee holds working meetings on a regular basis each month to discuss energy management related issues, including: reviewing the implementation of energy saving plans for the past month; analyzing energy consumption trends or causes of anomalies; demonstrating outstanding energy saving cases and sharing them in all factories; implementing energy contract management, and actively cooperating with suppliers to achieve win-win.



## 5.2 Consumption of Energy

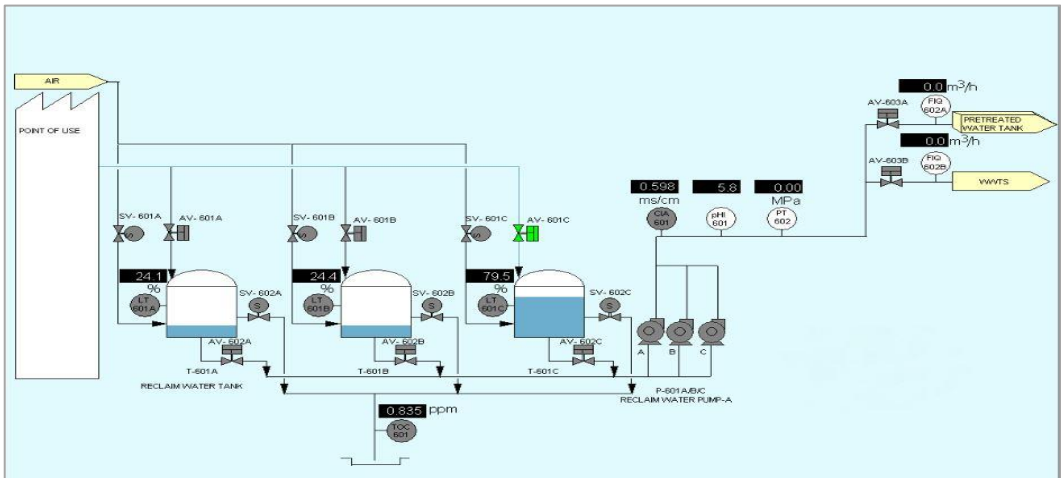
Compared with 2016, the energy consumption intensity per unit output presented an increasing trend in 2017, it is due to many tools and facilities were installed in Beijing and Shenzhen plants newly, which caused high energy consumption with low output in 2017. The target of unit power reduction in 2018 is 9.62 kWh/8" equivalent wafer layer.



### 5.3 Main Energy Saving Projects in 2017

#### 5.3.1 Energy-saving Renovation Project of Ultrapure Water Recycling System in Shanghai Plant

The ultrapure water system including the complicated process flow is responsible for providing the ultrapure water to the production end. The ultrapure water is transferred by water pump between each process flow. In the original design, the water pump control is controlled by the MCC control cabinet. With the development of science and technology and the control of energy consumption, the ultra-pure water system uses the VFD control mode to replace the MCC control cabinet. Advantages of VFD: (1) Reduce electric consumption, (2) System supply pressure is more effectively controlled, (3) Water Hammer is eliminated, (4) System stability is greatly improved, and equipment is at optimum efficiency. In 2017, the project saved a total of 87,600 kWh of electricity.



System Diagram of Project

### 5.3.2 Boiler Energy-saving Project in Tianjin Plant

Oxygen scavenging tanks of boiler emit large amounts of flash steam each year, and there is energy waste. The Tianjin plant uses a flash heat exchanger to use the flash steam to raise the temperature of return water of the hot air-conditioning system and reduce the steam consumption in the hot water system to achieve energy-saving purposes. In 2017, about 194,000 cubic meters of natural gas were saved.



Before change



After change

### 5.3.3 Other Energy-saving Projects

Plant	Project Name	Brief Description of Project	Energy-saving Performance
Shenzhen	Energy-saving Renovation Project of Central Air-conditioning System	By adding VFD (Variable Frequency Drive) to the motors of the 14 central air-conditioning systems, the purpose is to increase motor efficiency and save energy	Power: 910,000kWh
Shenzhen	Energy-saving Technology Reform Project of New Air System	By changing the outlet of the blower in the fresh air system, wind resistance can be reduced and electric energy can be saved	Power: 47,320kWh
Shenzhen	Energy-saving Renovation Project of Gas Supply System	Change one gas cooler supplied with one gas cabinet into one gas cooler supplied with two adjacent gas cabinets to save electricity	Power:157,248 kWh
Shenzhen	Energy-saving Renovation Project of FAB Lighting System	A 36-watt general lighting system was replaced by an 18-watt LED lighting system in the lighting system in the workshop to save electricity	Power:189,280 kWh
Shenzhen	Energy-saving Renovation Project of Plant Street Lighting System	A 250-watt fluorescent lamp was replaced by a 100-watt LED lamp in the street lamp lighting system in the plant to save electricity	Power: 438,88kWh
Shenzhen	Boiler Energy-saving Project	By optimizing and reducing the temperature of the boiler outlet water, the temperature of the exhaust gas can be reduced, the heat of exhaust gas emission can be reduced, the boiler efficiency can be improved, and energy can be saved	Natural gas: 3,250stere
Shanghai	Energy-saving Renovation Project of Hot Pump	Using hot pump unit to heat the backwater of the hot water system saves the use of steam in the hot water system. It can also reduce the temperature of the ice water return water, reduce the operating load of other chillers, and reduce energy consumption	Steam: 34,367ton
Shanghai	Energy-saving Renovation Project of Plant Street Lighting System	An 80-watt energy-saving lamp was replaced by a 30-watt LED lamp in the street lamp lighting system in the factory to save electricity.	Power: 45,370kWh
Beijing	Energy-saving Renovation Project of Central Air-conditioning System	By adding VFD (Variable Frequency Drive) to the motors of the central air-conditioning system, the purpose is to increase the motor efficiency and save energy.	Power: 1,144,080kWh

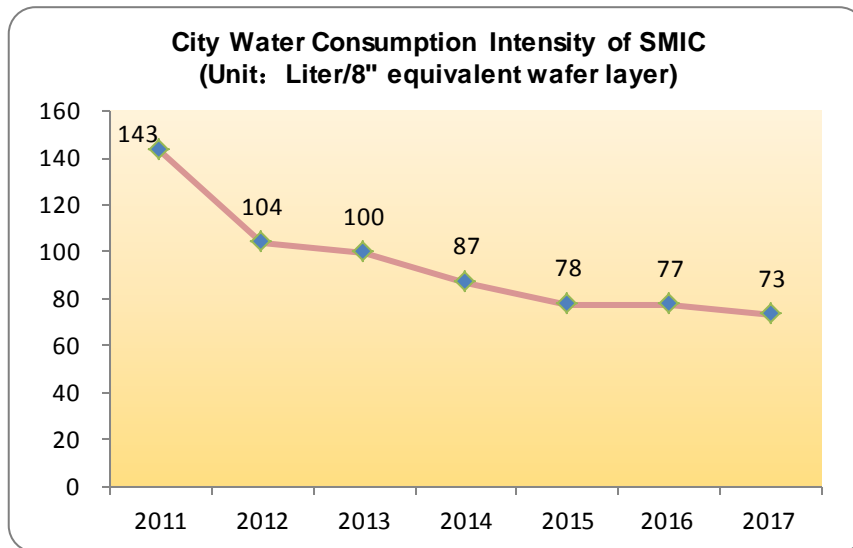
## 6 Water Resource Management

SMIC's factories are located in different areas, where there are differences in the conditions of the available water resources. We measure local conditions and implement management measures to conserve water resources.

### 6.1 Water Consumption Status

SMIC manages water resources to save water consumption, increase water resources usage efficiency and reduce waste water discharge. See water consumption data of SMIC

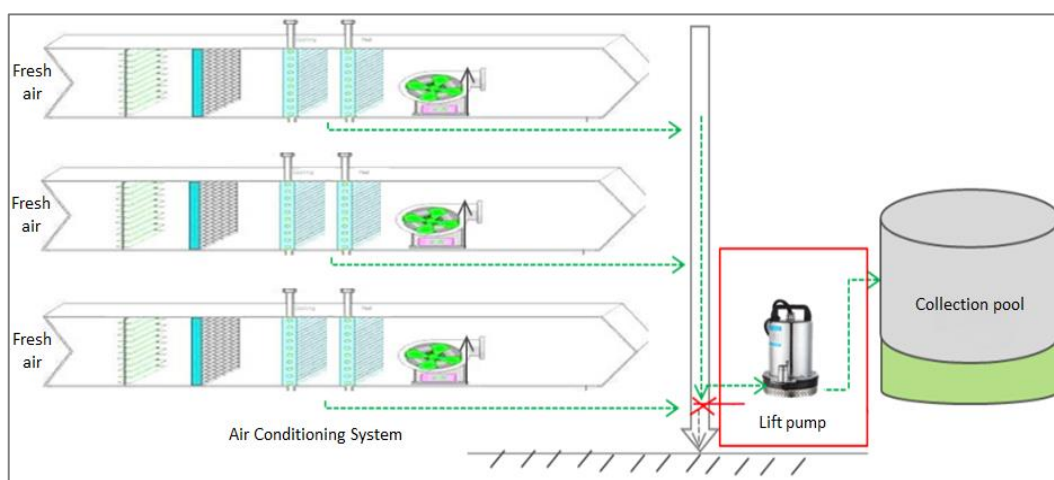
in 2017 in the following figure. The target of unit water consumption in 2018 is 80.52 liter/8" equivalent wafer layer.



## 6.2 Main Water Saving Projects in 2017

### 6.2.1 Air Conditioning System Condensate Recycling Project in Shenzhen Plant

Originally, the condensed water of air-conditioning system is discharged into the rain and sewage pipelines in Shenzhen plant, resulting in the waste of water resources and increasing the amount of sewage treatment. In order to achieve the reuse of water resources, the condensed water can be collected and reused to cooling tower of ice system after analysis and research. It is can supplement evaporation and self-damage water.

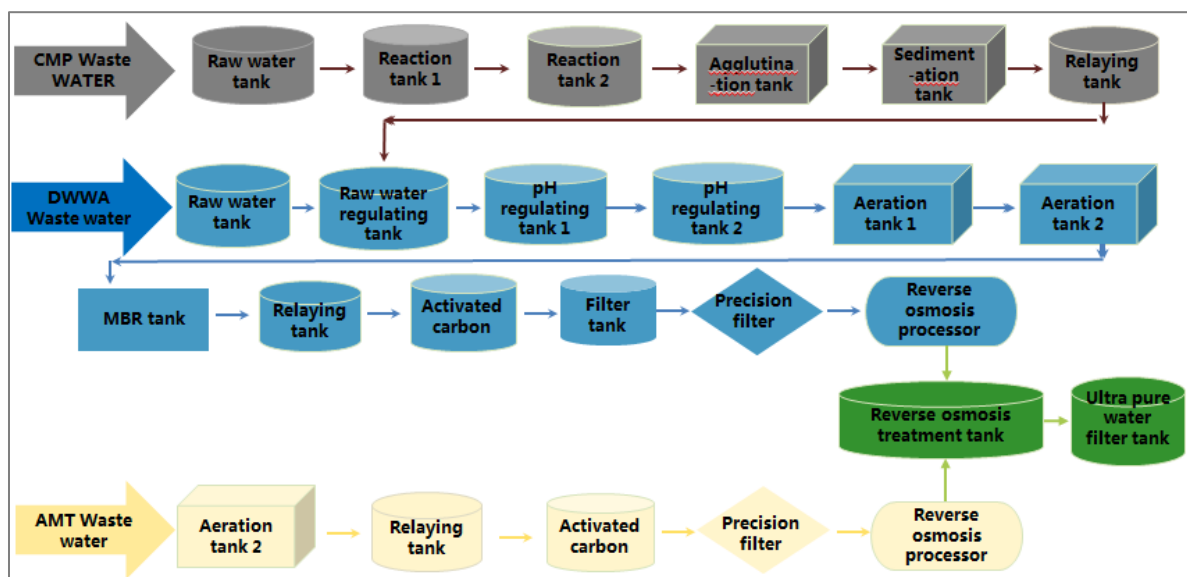


Project achievement: In 2017, the project saved a total of 36,545 tons of city water.

## 6.2.2 Wastewater Recycling Project in Shenzhen Plant

Ammonia nitrogen wastewater is treated by blowing ammonia nitrogen and entered into the recycling system. After ACF + RO treatment, the RO outlet water is collected in the RO tank and reaches the UPW treatment system filtration tank when reaching the standard.

CMP wastewater is treated with chemical coagulation, mixed with general acid-alkali wastewater, adjusted pH value, and entered aerobic tank aeration treatment, then enters MBR. After ACF+RO treatment, MBR water enters RO water tank, then enters UPW after reaching the standard. Treatment system filter tank.



Project achievement: In 2017, the project saved a total of 419,684 tons of city water.

## 6.3 Water Pollution Prevention and Control

According to the nature of production wastewater, SMIC constructs a number of waste water treatment facilities to treat production wastewater and domestic sewage, so that discharged wastewater meet national or local standards. Besides, we strictly implement wastewater discharge monitoring requirements to conduct real-time or regular monitoring of the concentration of pollutants in wastewater to ensure that all wastewater meets discharge standards. For specific monitoring data, see the information published on: <http://www.smics.com/eng/about/esh.php>.



## 7 Air Pollution Prevention and Control

SMIC is concerned about the air quality in its business locations and attaches great importance to the treatment of the company's exhaust gas. All emitted gas is treated and meets national or local standards. Data on waste gas emissions are as following:

Data Name	Total
<b>Total Emission of Exhaust Gas (Million Cubic Meter)</b>	30,870
<b>Emissions of Nitrogen Oxides (ton)</b>	60
<b>Emissions of Sulfur Dioxide (ton)</b>	6
<b>Emissions of Volatile Organic Solvents (ton)</b>	36

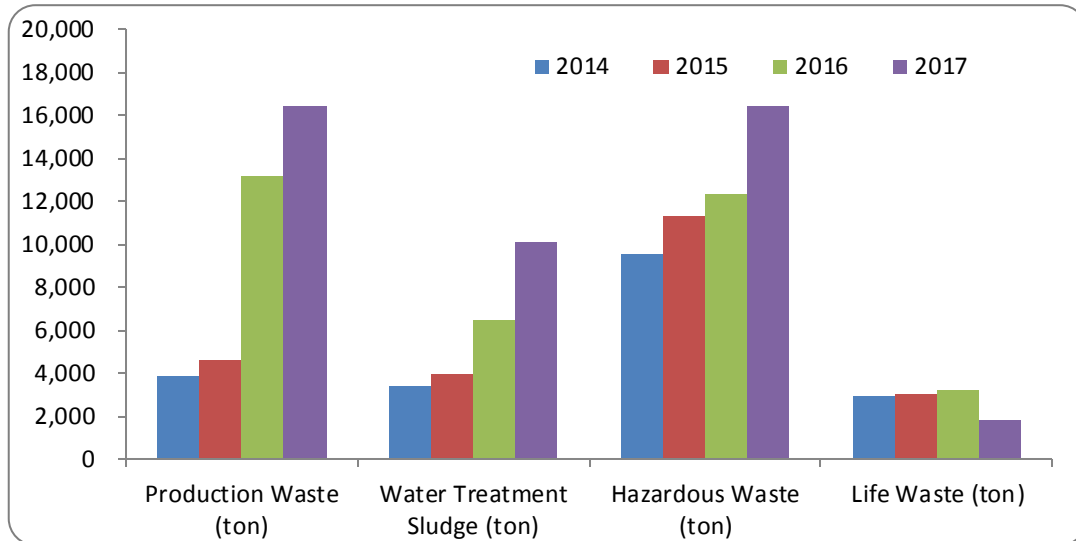
The company employs two- levels waste gas treatment at the console end and the central processing end, respectively. In the production process, the waste gas emitted from the console end is first treated by the local waste gas treatment system to meet the stipulated standards and then sorted into the main pipes for exhaust gas collection. The main pipes for exhaust gas collection fall into acidic, alkaline, organic and general types, where acidic and alkaline waste gas enters the acid central washing tower via the main pipes and enters the alkaline central washing tower for retreatment, while organic waste gas enters the zeolite runner system for burning. The waste gas processed by the central system is discharged into the atmosphere by the exhaust pipe conforming to the requirements of the State. To verify emission compliance, we regularly entrust third party agencies to monitor emissions and all test results meet national requirements. For specific monitoring data, see the information published on: <http://www.smics.com/eng/about/esh.php>.





## 8 Waste Management

SMIC establishes a sound waste management system and strictly complies with the national regulations in treatment of the produced waste. The waste produced in the workshop is subdivided into acidic, alkaline, toxic, oxidizing, natural, flammable and general substances, which are distinguished with the recycling buckets in different colors. The classified waste substances are collected on a regular basis and transported to the hazardous waste warehouse for temporary storage, before being delivered to the firms with hazardous waste treatment qualification. The waste liquid produced in the workshops is transported to the temporary waste tank by an independent pipeline, and then treated by the firms with the corresponding qualification. The waste treatment plants must be under strict management and all waste treatment firms need to have a government-approved qualification and meet our company's waste management evaluation scores to sign the contract; during the cooperation, the Environmental, Safety and Health Division will conduct on-site or vehicle-following examination of the waste treatment firms; for hazardous waste, strict implementation of the waste transferring table system is required. Production of various types of waste in 2017 is as follows, which presented an increasing trend in 2017, it is due to many tools and facilities were installed in Beijing and Shenzhen plants newly:



## 9 Promotion of Environmental Awareness

In 2017, the company continued to hold environmental awareness advocacy activities to enhance employees' awareness of environmental protection in the form of posting posters, sending initiative mails to all employees, displaying promotional documents on the company's internal website, organizing special events such as second-hand market, garbage cleanup, tree planting, and species conservation activity and so on.

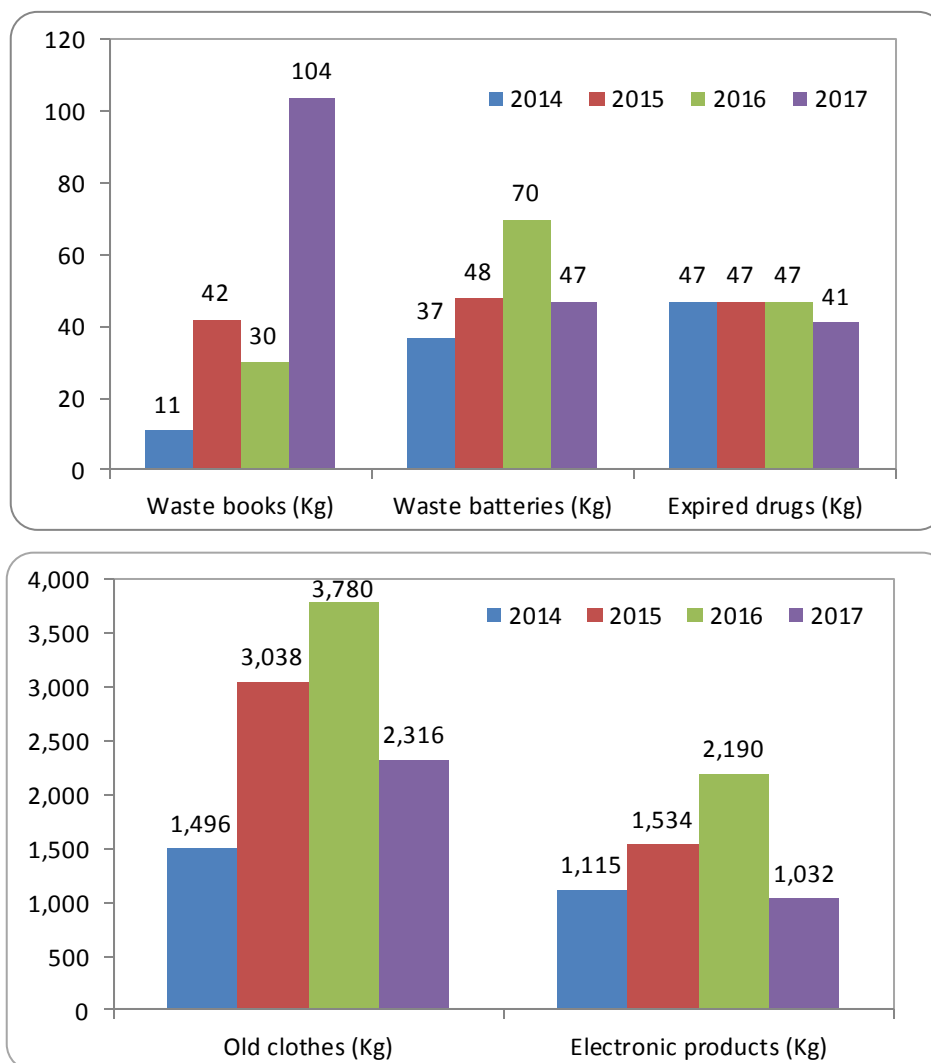
### 9.1 Theme Day Activities

- Publicize "World Environment Day" on June 5, calls all employees to participate to create a green home.
- Publicize "Car Free Day" on September 22 to advocate green travel, reduce greenhouse gas and automobile harmful exhaust emissions.



## 9.2 Second-hand Market

In 2017, our Shanghai Plant, Beijing Plant, Tianjin Plant and Shenzhen Plant held a number of special second-hand market activities to promote waste utilization. The number of people involved and the results were more than last year.



## 9.3 Tree Planting Activity in Inner Mongolia

Tree planting activity in Inner Mongolia began in 2007, which is a joint program launched by "Root and Bud" association and the Environmental Protection Club of SMIC Shanghai Private School, aiming to enhance environmental awareness and show the way to reduce the impact of personal behaviors on the environment. The program gives people the opportunity to grow trees in Inner Mongolia. It was the 11th year in 2017 for SMIC Shanghai Private School to participate in the program and the Environmental Protection Club raised money to fund 3,000 trees. Ten students and a teacher went to Inner Mongolia to plant the trees, where students received environmental education in the real environment.



## 9.4 Protection of Dushan Biodiversity

On June 3, 2017, the company launched the "uniting charity heart and transferring positive energy" themed green environmental protection public welfare activity --"Dushan Defense" jointly with its businessman partners. In this activity, efforts were contributed to remove remained bird nets on Dushan Mountain, pickup biodegradable garbage and remove alien invasive plants, in order to protect Dushan biodiversity and protect the green mountains.

