Product Quality

V Achieved ↑ Exceeded — Missed Target

Strategies	2030 Goals	2021 Targets	2020 Achievements	
Enhance Quality Culture ▪ Promote continuous improvement programs to enhance the internal quality culture	▪ Generate up to **NT$ 20 billion** in value from improvement projects and involve outstanding projects in the Taiwan Continuous Improvement Award	▪ Generate **NT$ 12 billion** in value from improvement projects and involve at least five outstanding projects in the Taiwan Continuous Improvement Award	▪ Generated more than **NT$ 15 billion** in value from improvement projects and involve **6** outstanding projects in the Taiwan Continuous Improvement Award **Target: NT$11 billion; 5** projects	↑
▪ Encourage local suppliers to participate in the Taiwan Continuous Improvement Award to strengthen a culture of quality and competitiveness within TSMC's local supply chain	▪ Encourage **100%** of major local raw materials suppliers and **75%** of back-end packaging materials suppliers to participate in the Taiwan Continuous Improvement Award; **60%** to advance to the finals[Note 1]	▪ **100%** of major local raw materials suppliers and **50%** of back-end packaging materials suppliers to participate in the Taiwan Continuous Improvement Award; **20%** to advance to the finals **NEW**	▪ **79%** of major local raw materials suppliers to participate in the Taiwan Continuous Improvement Award **Target: 100%** ▪ **46%** of back-end packaging materials suppliers to participate in the Taiwan Continuous Improvement Award **Target: 30%**	—[Note2] ↑
Improve Quality Capability ▪ Leverage machine learning to construct a visual defect inspection and classification system for outgoing 12-inch wafers to increase employee productivity	▪ Increase the productivity of each visual inspector that is responsible for outgoing 12-inch wafers to **7,000** pieces	▪ Increase the productivity of each 12-inch wafer outgoing visual inspector to **5,570** pieces per month	▪ Increased the productivity of each 12-inch wafer outgoing visual inspector to **5,423** pieces per month **Target: 5,415** pieces	↑
	▪ Increase the productivity of each visual inspection worker that is responsible for outgoing packages by **5%** per month and **50%** accumulatively (Base year: 2019)	▪ Increase the productivity of each visual inspection worker that is responsible for back-end packages by **10%**	▪ Increased the productivity of each visual inspection worker that is responsible for back-end packages by **5.5%** **Target: 5%**	↑

Note 1: Major suppliers are those that meet at least one of the following conditions: 1. accounted for 85% of purchasing expenses; 2. single-source supplier; 3. ongoing orders in each quarter.

Note 2: Due to the COVID-19 pandemic, fewer suppliers were involved with the award. The suppliers not engaged with the award shared experiences remotely.

(Continued from previous page)

V Achieved ↑ Exceeded — Missed Target

Strategies	2030 Goals	2021 Targets	2020 Achievements	
Improve Quality Capability				
▪ Develop hazardous substance analysis capabilities in chemical laboratories to ensure occupational safety and health (OHS)	▪ Develop the ability to analyze **100%** of CMR (Carcinogenic, Mutagenic, and Reprotoxic) substances and help major suppliers develop the same capabilities	▪ Develop the ability to analyze **100%** of CMR substances and help **20%** of the major suppliers to develop the same capabilities **NEW**	▪ Developed the ability to analyze **100%** of CMR substances **Target: 100%**	V
▪ Strengthen management for hazardous substances to improve green manufacturing	▪ N-methylpyrrolidone (NMP) **100%** replacement (Base year: 2016)	▪ Reduce the use of NMP by **95%**	▪ Reduced the use of NMP by **59%** **Target: 95%**	— Note3
	▪ No process involves Perfluoroalkyl Substances (PFASs) that have more than four carbons	▪ VisEra requires photoresist suppliers to complete the assessment and selection of substitutes for Perfluorohexanoic acid (PFHxA) related substances and launch production line testing	▪ Did not use PFASs with more than four carbons for the development of advanced processes of 3nm and below **Target: 100%**	V
Realize Quality Application				
▪ Complete reliability qualification for advanced process technologies, specialty process technologies, and wafer-level package process in the design and development stage based on the Company's technology roadmap	▪ Complete reliability qualification for advanced process technologies, specialty process technologies, and wafer-level package process in the design and development stage based on the Company's technology roadmap.	▪ Complete reliability qualification for advanced process technologies, specialty process technologies, and wafer-level package process per the R&D targets	▪ Completed reliability qualification for 5nm process technology volume production, 22nm Ultra-Low Leakage embedded MRAM IP, and the fifth-generation integrated Fan-Out packaging (InFO)	V

Note 3: Reduction of NMP usage is limited to sites in Taiwan. Since the substitute chemicals affect the product yield in several sites, formula testing and adjustments were necessary. TSMC subsidiaries will proceed with chemical substitution in 2021.

TSMC strives to provide global customers with outstanding semiconductor foundry services. To continuously reduce product defect, while improving process control and the timely detection of abnormalities to avoid quality incidents that may affect our clients, the Quality and Reliability Organization works alongside other divisions to refine the quality management system. In 2020, TSMC precisely defined each process's identification for various packaging technologies to ensure quality control is implemented correctly at each stage. TSMC also synchronized the technology identification system with the customer-facing business units to enhance the coherence and accuracy of the flow from ordering to the production lines. In terms of system management, TSMC set up quality control procedures with clients (system providers) to ensure product quality.

Besides expanding its quality improvement efforts to VisEra, TSMC established Quality and Reliability laboratories across the globe to cultivate more advanced, efficient quality analysis capabilities, which are the basis for continuously optimizing processes. Quality is the sound support for TSMC's technological advancement. In 2020, TSMC set up the highly automated Advanced Materials Analytic Center (AMAC), which adopts machine learning in analyzing the relevance between raw materials and process parameters to strengthen quality control of incoming materials.

Devoted to cultivating the next generation of quality management talents, TSMC continues to invest in the Industry-Academia Joint Development Project. As of 2020, the Quality and Reliability Organization has completed 16 research projects with five universities, covering subjects of materials, process, and chip designs. A portion of research results has been introduced to the development of TSMC advanced processes. Meanwhile, TSMC has also donated premium analytics and measurement equipment to universities to elevate the quality analysis capabilities of academic institutions and strengthen the synergy of industry-academia collaborations.

Interdepartmental Collaborations of the Quality and Reliability Organization

TSMC Quality Management System

Design Service
- IP/Library Development Quality Assurance
- Design Kits Deliverables Management

Tech Development
- SPICE Model Management
- Process Technology Development Management
- Built-in Reliability Test
- Process Release Standard

Mask Making
- Remote Mask DB Check
- iTapeOut
- eJobView
- Mask Defect Inspection

Wafer Manufacturing
- Incoming Quality Control Note 1 NEW
- Advanced Process Control
- EQ Real Time Monitor
- Process Reliability Monitor
- Wafer Acceptance Test
- Outgoing Quality Gating

Backend Service
- Process Quality Control Note 2 NEW
- Package Reliability Monitor
- Outgoing Quality Gating
- System Quality Procedure Note3 NEW

Customer Satisfaction
- Customer Claim Management
- Annual Customer Satisfaction Survey

Quality Tools Application | Potential Failure Mode & Effect Analysis | Control Plan | Statistical Process Control | Measurement System Analysis | Continuous Improvement-8Ds

Change Control Platform | Failure Analysis | Supplier/Subcontractor Quality Management

Note 1: Leverage machine learning to analyze the correlation between raw materials and TSMC process control parameters; build the highly automated Advanced Materials Analytic Center (AMAC) to enhance the raw material detectability.

Note 2: Optimize the naming rules for different packaging technologies to enhance the raw material detectability.
Note 3: Build related quality control procedures to have better cooperation with the system-level customers to ensure product quality.

Enhance Quality Culture

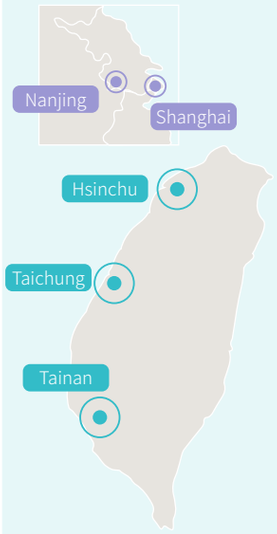
Quality is the cornerstone of sustainable development for TSMC. To ensure product quality and customer satisfaction, TSMC strives to improve the quality system and methodology. In 2020, the Quality and Reliability Organization held company-wide conferences such as the Total Quality Excellence and Innovation Conference (TQE), training programs, and quality improvement projects on experiment design, statistical process control, measurement technologies, machine learning, and quality auditing. These programs aim to deepen TSMC employees' problem-solving capabilities.

TSMC has held TQE for 28 years, which is a rewarding mechanism of public recognition. In 2020, a knowledge sharing platform for outstanding projects had been created as a new approach of TQE. Organizations and divisions were encouraged to learn from one another, sparking innovation in quality improvement. In 2020, TSMC employees submitted more than 10,000 improvement projects, generating more than NT$15 billion in value. Notably, more than 240 projects recognized by the TQE are now published on the platform. As of December 2020, the posts have earned more than 300,000 clicks.

Moreover, TSMC puts up posters to promote quality in all sites, strengthening the commitment to quality among TSMC employees. In 2020, more than 99% of our employees stated that the posters and sharing of the outstanding projects are beneficial to raising awareness towards quality.

TSMC established a new theme - STOP & FIX - in 2019 to encourage our employees to take the initiative to prevent potential quality abnormality or outdated operation standards. In 2019, the category received 5,500 cases. By 2020, a total of over 6,500 cases were submitted, generating more than NT$4.4 billion in value due to the improvement projects.

TSMC Quality and Reliability Laboratory Network



Subsidiaries

TSMC (Nanjing)	TSMC (China)
▪ Chemical Lab ▪ SA Lab	▪ SEM Lab ▪ TEM Lab

Hsinchu

Fab 2&5	Fab 3			Fab 12A Fab 12B	
▪ RA Lab ▪ SEM Lab	▪ AMAC NEW ▪ Chemical Lab ▪ SEM Lab ▪ TEM Lab ▪ RA Lab	▪ SA Lab ▪ AFA Lab ▪ PEFA Lab ▪ PAFA Lab ▪ PFA Lab	▪ Chemical Lab ▪ SEM Lab ▪ TEM Lab	▪ RA Lab ▪ SA Lab	

Taichung

Fab 15

- Chemical Lab
- TEM Lab
- RA Lab

Tainan

Fab 14
Fab 18

- Chemical Lab
- Special Gas Lab
- TEM Lab
- SA Lab

TSMC Company-wide Quality Culture

All Employees →

Improvement Project Registration System

Document Review by Factory Supervisors →

Knowledge Sharing Platform for Outstanding Projects NEW

Selection by Factory Committee of the TQE →

Total Quality Excellence and Innovation Conference (TQE)

- Group Production Capacity Improvement
- Group Quality Improvement
- Group Cost and Production Support
- Group ESH and Green Corporation
- Group STOP & FIX
- Group Assistant Engineers
- Group Outstanding Proposals from Direct Labor
- Group Process and Efficiency Improvement

Selection by Factory Committee of the TQE

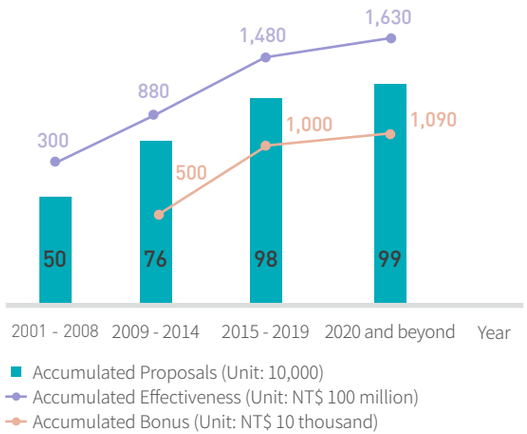
500 Projects
An average of 500 outstanding projects are recognized each year

> 6,000 Projects
More than 6,000 projects have been recognized as of 2020

NT$1,090 M
Over NT$10.9 million in cash prize

Timeline of Total Quality Excellence and Innovation Conference (TQE)

Progress	Key Tasks
2001-2008 Preparation stage	▪ Digitize the project submission system (including project registration, review, and calculation of benefit value)
2009-2014 Expand the recognition of outstanding projects	▪ Set outstanding project standard
2015-2019 Optimize application process and recognition themes	▪ Optimize the inquiry function of the submission system ▪ Add report analytics to the submission system
2020 and beyond Strengthen organizational learning	▪ Build the knowledge-sharing platform for outstanding projects



2020 TQE-Winning Cases

Group	Improvement Strategy	Improvement Benefit
Production Capacity Improvement Improve production capacity of photomask tools	Established the three major automated systems ▪ Optimized scheduler system for photomask robotic arms ▪ Inspection system for photomask control wafers ▪ Integrated platform for photomask pattern inspection	5% Daily output increased 30% Operation time reduced 140 million per year (NT$)
Quality Improvement Improve the quality of photo-sensing products	▪ Increased the concentration of ion implantation to increase color saturation ▪ Introduced 3D gates to reduce the after-image effect	>50% Yield increased 20% Increased rate of color saturation After-image effect reduced by five times; such improvement allows photosensors to maintain ultra-high resolution as the size continues to become smaller
Cost and Production Support Breakthrough in the monitoring structure	▪ A first-ever automated monitoring processing structure that calculates the optimized process and automatically selects programs and tools ▪ Increased monitoring flexibility, reduce the preparation time for monitoring and reduce the waste of production capacity	>20% Increased rate of productivity of the monitoring staff >25% Reduced rate of monitoring loss 120 million per year (NT$)
ESH and Green Corporation Clean air free of ammonia safeguards our health	▪ Vent renovation for tools that produce high concentrations of ammonia ▪ Increased the efficiency of ammonia removal by washing towers	28 tons Ammonia emission reduced by 28 tons/year, at a reduction rate of > 60% >70% Reduced rate of Ammonia emission per product unit 45 million per year (NT$)
STOP & FIX The exclusive technology of AI photomask image generation and matching	▪ Designed innovative AI models that allow the computer to generate standardized photomask images	>50 Intercepted photomasks that have quality concerns >50 Reduced inspection time for photomask tools
Assistant Engineers Tool maintenance and jig improvement	▪ Optimized equipment maintenance ▪ Modularized jigs to reduce the hours required for tool maintenance	38.4 million per year (NT$)
Outstanding Proposals from Direct Labor Establish the first maintenance and repair center for automated wafer transportation	▪ Developed recycling and reuse technologies for the motors ▪ Established a standardized calibration procedure for humidity sensor drift	74% Reduced alarm frequency ↓ Reduced motor scraps and calibration of humidity sensors, and reduced maintenance costs 30 million per year (NT$)
Process and Efficiency Improvement NEW Strengthen IT security capabilities	▪ Introduced IT vulnerability scanning tools ▪ Established a review mechanism for new systems; all new systems must pass the IT security review before going online ▪ Replaced 100% of software with no security updates	↓ Reduced information security vulnerabilities significantly 99 99 points scored for Corporate IT security, higher than the average score for semiconductor companies (90 points)

TSMC is entirely devoted to improving quality. By participating in the Taiwan Continuous Improvement Award Competition, TSMC exchanges practical knowledge on quality improvement with peers from other industries and facilitates the advancement of all local industries. TSMC also encourages employees to observe and learn from the experiences of other sectors, which sparks innovation and problem-solving among the employees. In 2020, TSMC received five Golden Awards, one Silver Award, and one Best Innovation Award in the Taiwan Continuous Improvement Award Competition.

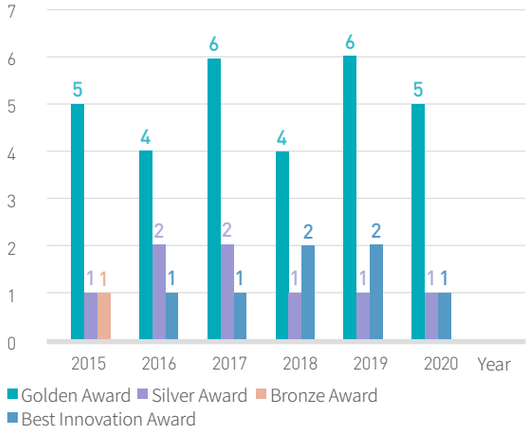
To facilitate the supply chain's sustainability, TSMC also encourages suppliers to participate in the Taiwan Continuous Improvement Award Competition. In 2019, 100% of the local major raw materials suppliers participated; in 2020, TSMC first expanded the scope to back-end packaging materials suppliers, 46% of whom participated. In 2021, TSMC will continue to improve participation and quality, aiming to achieve 50% of participation and 20% of advancement to the finals. In 2020, TSMC suppliers received four Golden Awards, five Silver Awards, and five Bronze Awards. To highlight such achievements in quality improvement, TSMC published the supplier award list on the official website.

In 2020, while complying with COVID-19 regulations, TSMC's Quality and Reliability Organization promptly adjusted strategies and invited suppliers that did not participate in the competition to observe as a form of benchmark learning. TSMC's quality experts also offered consultation remotely, helping the suppliers pinpoint where to improve and selected appropriate improvement measures for their companies.

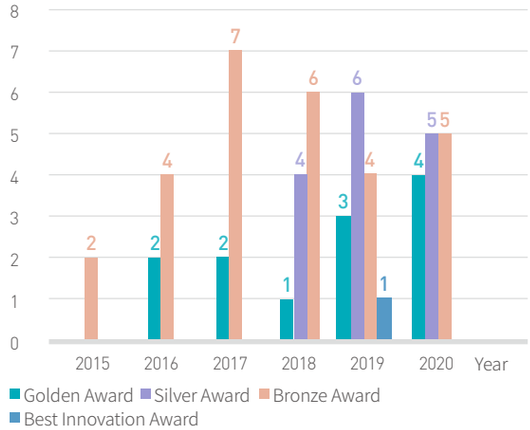
TSMC Track Record of Participating in the Taiwan Continuous Improvement Award Competition

Award	Improvement Benefit
Golden Award & Best Innovation Award Establish new repair techniques for probe needles, increasing the productivity of package testing	18% Increased probe needle efficiency; 65% Reduced maintenance time; 31% Increased total production capacity of testing; 312 million per year (NT$)
Golden Award Revolutionize ion implantation for higher production capacity	18% Increased production capacity; 1.8 billion per year (NT$)
Golden Award Improve defect inspection of automotive electronics products	89% Improved large-scale wafer defect; 15.7% Increased production capacity; 97.9% Reduced scraps; 806.72 million per year (NT$)
Golden Award Intelligent management of tool software that safeguards quality	100% Software version control reached; 300 million per year (NT$)
Golden Award Establish an intelligent online inspection system that increases efficiency	58% Increased defect inspection efficiency; 60% Increased the percentage of intelligent automation; 4.8 billion per year (NT$)

TSMC Track Record of Participating in the Taiwan Continuous Improvement Award Competition

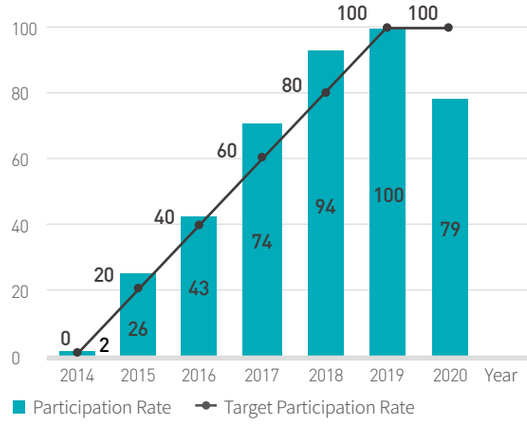


TSMC Supplier Track Record of Participating in the Taiwan Continuous Improvement Award Competition



Percentage of Raw Material Suppliers Participating in the Taiwan Continuous Improvement Award Competition

Unit: %



Improve Quality Capability

In order to improve quality and efficiency, TSMC started to utilize machine learning technology and method in 2014, and successfully applied advanced spectrum analysis to automated classification of wafer defects so that differences among processes and equipment were detected, immediately triggering improvements. TSMC established a defect inspection and classification Outgoing Visual Inspector Productivity for the system for 12-inch wafers to refine the consistency of outgoing inspection and strengthen TSMC's overall competitive advantage. In 2020, the productivity of each 12-inch wafer outgoing visual inspector increased to 5,423 pieces per month. Furthermore, machine learning automation was expanded to back-end packaging visual inspectors, whose productivity was increased by 5.5%.

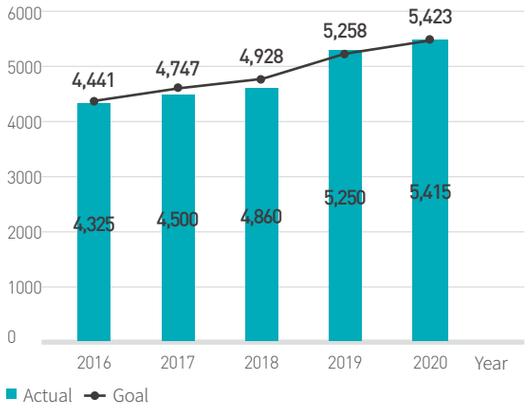
To fulfill the goals of raw materials and supplier management, the Quality and Reliability Organization first applied machine learning to the raw materials characteristics monitoring system in 2020, fortifying the inspection capability of the quality of incoming materials. Meanwhile, to deepen supplier management, the Quality and Reliability Organization worked with the Materials Management Organization to recruit the material quality improvement project team and increase key checkpoints on production lines for raw materials quality check. The project team also asked the suppliers to adopt Statistical Process Control (SPC) to enhance upstream raw materials analysis and monitor the consistency of processes and the quality of upstream raw materials. TSMC requires suppliers' factories to receive ISO 9001 certification and ensure that process change management, assessment, and quality auditing comply with international standards.

To implement hazardous substance management on raw materials, especially carcinogenic, mutagenic, and reprotoxic (CMR) substances, in 2020, TSMC achieved 100% of inspection capabilities and incorporated hazardous substance management regulations in Supplier Sustainability Standard, training, auditing, and consultation. TSMC asks major materials suppliers to secure qualifications in hazardous substance management, complete testing and analysis on certain carcinogenic substances, and include such findings as mandatory items in the Certificate of Analysis, voluntarily disclosing the quality check results of incoming materials. Meanwhile, TSMC asks all materials suppliers to inform TSMC of any supplies and materials containing any CMR substances and disclose such information on the Safety Data Sheet following Regulation of Labelling and Hazard Communication of Hazardous Chemicals. TSMC categorizes all materials with potential risks and conducts random sampling tests. By sharing CMR inspection technology, TSMC can elevate the monitoring and control capabilities of hazardous substances across the entire supply chain. In 2020, according to the audit results of the Risk Management and Materials Management Organization, failures regarding hazardous substance management included insufficient labeling and categorized storage, insufficient personal protective gear, and failure to conduct regular product testing for hazardous substances. Relevant suppliers implemented corrective measures according to TSMC's recommendations by December 2020. Meanwhile, in terms of recycling and reusing acidic solutions, the Quality and Reliability Organization offers a reliable quality verification and control method that aids the Operations Organization to keep reducing the percentage of impurities in acidic solutions. In 2021, TSMC plans to share the recycling and reuse technologies with the chemicals suppliers, expanding the effort to achieve its sustainable goals of balancing between product quality and environmental protection.

In 2020, TSMC once again worked with the SEMI to hold the second SEMICON in Taiwan to facilitate technological exchanges and deepen the local supply chain's sustainability and competitiveness.

Productivity of Each 12-inch Wafer Outgoing Visual Inspector

Unit: Wafer quantity



In 2020, Chairperson of the TCIA Northern Taiwan Steering Committee and Vice President of TSMC, Dr. Jun He (Fourth from the right), served as the award presenter and encouraged the establishment of a responsible supply chain and inter-industry exchange.

Case Study

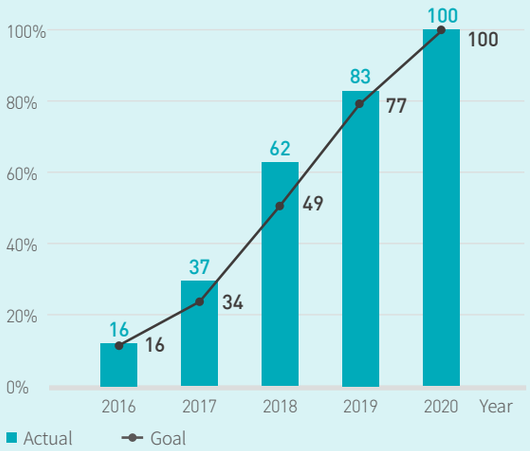
TSMC Develops the High-Efficiency Hazardous Substance Testing Mechanism of 100% Detection

To fully track materials with potential risks, TSMC built the highly automated Advanced Materials Analytic Center (AMAC), creating an exclusive database for Carcinogenic, Mutagenic, and Reprotoxic (CMR) substances. Using three major spectrometry technologies - inductively coupled plasma optical emission spectrometry (GC-MS), chromatography/time-of-flight/mass- TSMC scans for carcinogenic substances listed in Group 1 (carcinogenic to humans) by International Agency for Research on Cancer. In 2020, TSMC completed the assessment and selection of technologies and materials for 3nm process, conducted analysis on 100% of the materials with potential risks, and identified 178 CMR substances in the semiconductor materials. TSMC significantly streamlined the analytic process and reduced the time required from seven days to twelve hours, elevating testing efficiency by 93%.

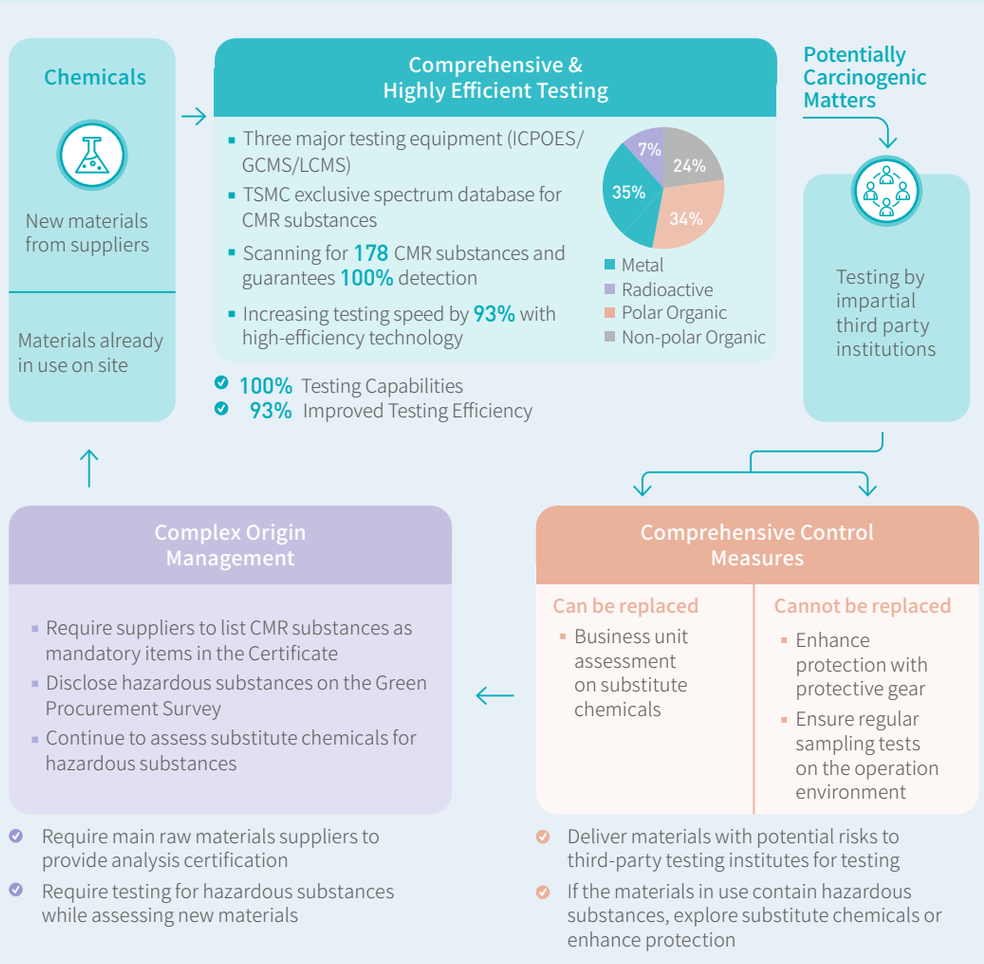
TSMC adheres to its commitment to hazardous substance management. Following its chemicals management procedure, TSMC actively sets up a defense against CMR and hazardous substances. Regarding the materials currently in use, once the chemical laboratory finds CMR substances in testing, the materials must be tested by an impartial third party institution and adopt comprehensive control measures. TSMC would require the business units that use such materials to assess alternative chemicals, aiming to substitute the material completely. If 100% substitute is not immediately possible, TSMC will continue to invest in developing alternatives while providing adequate protective gear for employees on-site and conducts regular sampling tests on the operation environment complying with Regulations of Monitoring Labor Operational Environment to prevent risks of exposure for the workers. Regarding new materials, the control and monitoring are conducted through the TSMC Green Procurement Survey. TSMC requires that suppliers provide a certificate of analysis to prove that the materials comply with regulations to safeguard TSMC employees and the industry supply chain.

TSMC CMR Testing Capabilities

Unit: %



TSMC Hazardous Substance Testing Mechanism



Management of Hazardous Substances from Fabrication

TSMC's hazardous substance management is based on the QC 080000 Hazardous Substance Management System Requirement, aiming to avoid entirely or minimize the use of hazardous substances that may affect human health or pollute the environment. TSMC is committed to fully comply with international standards and the customers'requirements on hazardous substances for all customer products.

In 2020, TSMC continued substituting all PFOA-related (Perfluorooctanoic acid, PFOA) substances and succeeded after multiple improvements and tests. In recent years, the international community have noticed concerns for Perfluoroalkyl substances, PFASs, including the 6-carbon Perfluorohexanoic acid, PFHxA. The European Union is planning to regulate the substance in the future. Within TSMC, only a part of the photoresists used by VisEra contains such substance. Anticipating the regulatory tightening worldwide, TSMC has taken the initiative to assess substitute chemicals with suppliers in 2020.

Furthermore, TSMC uses N-Methyl-2-Pyrrolidone (NMP) in several photoresist wet-stripping processes. To reduce risks of exposure and pollution, TSMC started the replacement project in 2016, avoided using 100% of the NMP in 7nm and more advanced processes in introducing and designing stage of photoresist wet stripping process, and existing fabs continued to conduct replacement. Since replacement requires changing equipment hardware and process parameters, partial sites' product yield was affected and had to undergo multiple formula adjustments and testings. In 2020, TSMC continued to work closely with several customers, assessing substitute materials for more than 50 processes. Although TSMC missed the target to replace 100% of NMP compared to the base year of 2016, the Company is still working towards goals of company-wide 95% reduction of NMP in 2021 and 100% NMP replacement and avoid using PFASs of more than four carbons in all processes by 2030.

Hazardous Substance Management Throughout the Product Life Cycle

	Key Tasks	2020 Achievements
Process Design and Development Stage	Comply with Green Procurement Procedure, avoiding raw materials containing hazardous substances for new processes	In 2020, added PFASs with one to four carbons are substances that require disclosure
Production Stage	Require suppliers to provide documentation proving that the raw materials comply with hazardous substance regulations. TSMC conducts random sampling tests to ensure compliance with such raw materials	171 In 2020, TSMC completed testings for 171 raw materials, whose results all complied with TSMC regulations
Product Stage	Sampling every primary product to third party impartial institutions for hazardous substance testing every year	2020 test results all complied with regulations and TSMC requirements
Disposal Stage	Scrapped products are categorized and stored according to Waste Disposal Act and commission legitimate contractors for proper disposal	In 2020, to minimize hazard, TSMC stipulated the individual storage management procedure for scrapped products containing a low amount of lead solder bump

Realize Quality Application

The Quality and Reliability Organization helps customers introduce product reliability needs to product design during the stage of technological development. In 2020, TSMC's Quality and Reliability Organization collaborated with its R&D team to focus on the advanced logic manufacturing process, specialty process, advanced packing technologies development, and quality qualification to ensure that component features, product yield, and reliability meet the requirements.

For the advanced logic process, the Quality and Reliability Organization completed product quality and reliability qualifications of EUV lithography 5nm Fin Field Effect Transistor (FinFET), helping the world's first 5nm product into mass production in 2020. For the specialty process, TSMC completed reliability qualification for 22nm Ultra-low Leakage (ULL) embedded MRAM IP. Furthermore, for high-performance mobile computing and high-performance ULL process platforms, TSMC successfully passed the consumer-grade qualification and automotive grade-1 qualification for 28nm Embedded Flash. For advanced packaging, TSMC integrated the front-end wafer process and back-end chip packaging to provide advanced packaging solutions. This is the system integration for wafer-grade processes. Also, TSMC completed qualifications for the fifth-generation integrated Fan-Out packaging (InFO), whose linewidth is more sophisticated, and heterogeneously integrated larger-size CoWoS® packaging technology and went into mass production to meet the demands for mobile devices and high-performance computing products.

Thanks to the qualification of technologies, the real-time defense system of semiconductor manufacturing services, the application of innovative approaches, and the establishment of quality culture among the suppliers, TSMC did not encounter any significant re-calls in 2020. The Company also continued to pass third-party certifications, meeting requirements of IATF 16949: 2016 of the automotive industry and IECQ QC 080000: 2017 by the International Electro-Technical Commission (IEC).