

High Material Issue 02

Reinforcing product safety evaluation and management

We continue to enhance quality management by prioritizing safety and quality of our products. We strive to develop products that even take into consideration our end-user environments, to supply batteries and electronic materials suitable to different applications required by the market. Learning from the Galaxy Note 7 incident, we have established more rigorous quality management in an effort to satisfy our customers.

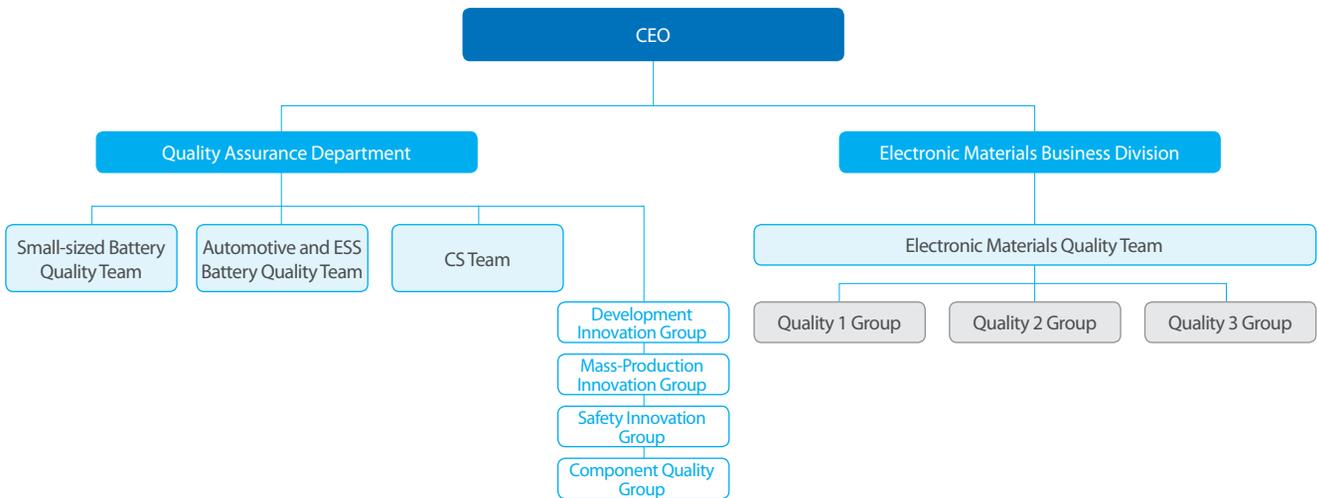
Organization Management

Samsung SDI established the Quality Assurance department under the direct supervision of the CEO, which was upsized to be in charge of the company-wide quality functions.

The Quality Assurance department acts as a quality control tower for improving the synergy of quality management in the Battery divisions and consists of small-sized battery quality, automotive and ESS battery quality, and CS teams. Subgroups are composed of development, mass-production, safety innovation, and component quality groups.

The Quality team of Electronic Materials Division is composed of Development Quality Assurance team responsible for verifying and registering new resources as well as assuring the quality of new product, Mass Production Quality Assurance team responsible for supplier management and quality assurance on mass production, and Customer Service team that deals with customer quality issues and VOC responses.

Quality Management Organization Chart

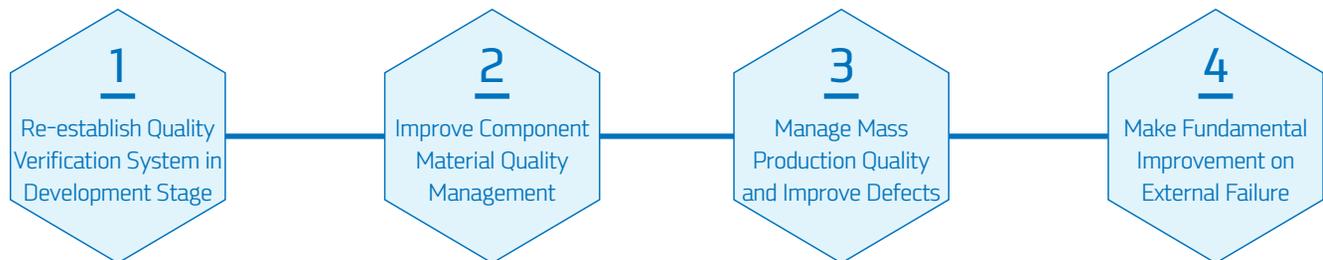


Company-wide Quality Management Activity

Samsung SDI discontinued the existing quality assurance award policy targeted towards work sites, and implemented a new year-end bonus policy on tasks driven by the Quality Assurance department. Each group was assigned a project in regards to improvements in the process and quality competitiveness, and presented before the judges. As a result, best practices were selected and shared with the rest of the employees.

Team members who presented the best practices were given incentives to reward their continuous improvement. Since 2015, Samsung SDI has established the four key assignments of quality development, components, mass production and market based on the issues identified from the management examination. We launched a total of 52 tasks (21 in 2015, 31 in 2016) and completed 38 of them as of 2016 year-end. We have further identified 15 additional tasks from the Galaxy Note 7 incident, which are currently in progress.

Four Quality Improvement Projects



2016 Milestones on Quality Improvement

Project and Activity	Achievement
[Project 1] Establish Quality Verification System in Development Stage	The Quality team at Automotive and ESS Division improved its internal verification process for customer sample by enhancing customer audit responses, carrying out activities to reduce VOC from sample issues, and reinforcing pre-management of the samples. Small-sized Li-ion Battery Division improved sample verification by verifying the qualities of pre-developed products, expanding the scope of product verification, and establishing development verification process and sample shipment standards.
[Project 2] Improvement on Raw Material Quality Management - Improving impurity content in raw materials	The Quality team at Electronic Materials Division continued their effort to improve quality of raw materials. In 2016, the team focused on removing impurities in raw materials in order to improve the quality in line with more refined semiconductor production process, and identified 17 items for micro quality management. In addition, we review and make improvements on quality conformity of raw materials with our suppliers, and enhance raw material quality management by providing technical supports such as optimization of processing conditions at raw and subsidiary material suppliers.
[Project 3] Manage Mass Production Quality and Improve Defects - Reducing nonconformity in measuring instruments	Measuring instruments are the basis of ensuring product quality. We strived to reduce nonconformity in measuring instruments to retain the quality of calibration and control, and succeeded in lowering the nonconformity rate by 45% from 0.6% in 2015 to 0.33% in 2016. We conduct regular management of our measuring instruments to prevent any malfunction.
[Project 4] Make Fundamental Improvement on External Failure - Improving visual inspection failure	In order to fix defective appearances at the production line, we established reasonable and realistic standards derived from consultation with our customers. Internally, we performed improvement activities on welding process and prohibited rework on defects occurring during the production process so that all non-conformant products would be rejected. Moreover, We identified root causes and reinforced management in the production lines, and reduced the defect rate by 96% from 12,225ppm in 2015 to 481ppm in December 2016, leading to higher customer satisfaction.

BUSINESS CASE

Quality Improvement Plans on the Galaxy Note 7 Issues

Quality issue of the Galaxy Note 7 series featuring Samsung SDI's batteries were widely reported in August 2016, and Samsung SDI analyzed weaknesses in the battery structure and production process to establish and execute improvement plans for development, manufacturing technology and quality verification. In late August following the incidents, Samsung SDI immediately established daily emergency situation room under direct supervision of the CEO, in which a team of 100 employees from Development, Production/Technology, and Quality/Verification teams executed Task Force activities on product safety innovation until December to analyze the root causes and establish response plans. Detailed safety management items, including material acceptance standards, were reinforced in the Development sector. In Production/Technology sector, a flawless system was built by supplementing the existing sampling test with a new X-ray inspection process for all products. In Quality/Verification sector, we increased the sample size by 1,000 times and added testing under extreme conditions to build a thorough verification system. Samsung SDI will solve the quality issues at a fundamental level and restore customer trust with our TF activities.

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Customer Satisfaction

We take Voice of Customers (VOC) into account as a major management KPI in an effort to fundamentally improve potential issues. We have a range of communication channels in place including website, social media, customer visits and customer satisfaction surveys, and registers VOC and customer needs through customer visits and Quarterly Business Reviews (QBR). In addition, Samsung SDI is improving the response lead time on quality issues by managing the lead time for each customer VOC level to make timely responses.

Customer Satisfaction Survey

Samsung SDI conducts customer satisfaction surveys for each business division. Customer satisfaction surveys are a process that derives indices from calculated scores on a number of categories including product quality, service, delivery date and technology development. We analyze strengths and weaknesses of the products and infrastructure of each business division based on the survey results. The surveys are intended to provide basic data for customer satisfaction management and to link points of improvement with the quality system.

The Small-sized Li-Ion Battery Division conducted Customer Satisfaction Index (CSI) surveys for 33 major customers in 2016. Based on objective data and our customer's complaints in quality characteristics, quality satisfaction and service level in comparison to the competitors, the division performed improvement activities on customer satisfaction. In addition, Samsung SDI introduced the Customer Quality Sentiment Index to build an internal feedback system on our current performance in product quality. According to the preliminary research, the system improved the external failure rate by 51% due to regular management on product quality trends and early inspection and mitigation on quality issues. Samsung SDI operated a preemptive response system and improvement activities on major customers in response to customer audits. A total of 129 customer audits were conducted in 2016 resulting in 100% conformity, and improvement requests decreased by 11% compared to the previous year.

The Electronic Materials Business conducts annual customer satisfaction surveys and evaluates five items, such as quality and technical support. VOC improvement tasks are under development and the contents of surveys are being improved to improve consistency. We also systematically manage the generation and processing of customer VOCs through our customer quality management system (Focus119).

Quality Improvement Support for the Partner Companies

By 2015, our supplier quality control, which mainly consists of export inspection, has been changed to approach preventive management. In addition, Samsung SDI designated themed audit checklist items, including change point implementation, quality issues and failure management to support a thorough quality management. For automotive and ESS batteries, we inspect the product quality from the customer's point of view, revised the quality assurance manual, and trained 14 VDA (Verband Der Automobilindustrie) 6.3 auditors to perform due diligence. Additionally, we hold discussions about technical issues on a quarterly basis through Quality Technology Reviews (QTR) on important materials.

Overseas Corporation Support

With the establishment of Samsung SDI Wuxi Co., Ltd. (SDIW), Samsung SDI built the quality assurance system and achieved mass production and quality stabilization at an early stage.

The SDIW is equipped with analysis credibility instruments and respective quality assessment systems for raw material/process/product phases. Also, it was certified to ISO9001 and received production approval from major customers on time. The quality management system in the SDIW enables a stable flow of supply for mass production in major polarizing film models and PV paste.

Key Performance Index

KPI	2017 Target	2016 Performance
Ratio of ISO 9001 auditor qualification (%)	23	18
Ratio of quality management qualification (except for ISO 9001)(%)	39	29

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Input



Output		Unit	2014	2015	2016
Energy Solution	Small-sized Li-ion batteries, etc	million	1,147	1,079	1,053
Electronic Materials	EMC	million	7,825	6,469	6,218
	Polarizing films	1,000m ²	31,015	34,217	45,023



Quality Management Investment		Unit	2015	2016
Inspection cost / Revenue		%	0.65	0.97
Prevention cost / Revenue		%	0.45	0.46



Quality Management Training		Unit	2016
Quality experts		Persons	725
Quality Management Training Hour		Hour	20,480

Output



Quality Management Cost		Unit	2015	2016
Customer complaint cost to revenue ratio		%	0.28	0.57
Quality failure cost to revenue ratio		%	0.91	1.35



Quality Management Training		Unit	2015	2016
Ratio of ISO 9001 auditor qualification		%	15	18
Ratio of quality management qualification(except for ISO 9001)		%	11	29



Customer Satisfaction		Unit	2016
Small-sized Li-ion Battery	Score	Score	76.8
	No. of Company	EA	33
	No. of Customer	Persons	35
Automotive Battery & ESS	Score	Score	82
	No. of Company	EA	2
	No. of Customer	Persons	2
Electronic Materials	No. of Company	EA	28
	No. of Customer	Persons	178

* For Electronic Materials division, we did not present a comprehensive customer satisfaction score due to various product portfolio