SMIC

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SMIC



80th ANNIVERSARY

SMIC CSR REPORT 2017-2018

Senju Metal Industry Group CSR Report

LOOK AT THE WORLD

SMIC is commemorating its 80th anniversary in 2018.
During the past 80 years, we have contributed to global manufacturing industry with our original soldering technology, with the corporate vision of fulfilling our mission as a public institution by supplying our own products to the world.
We will continue existing as a company that makes social contributions with a global perspective, connecting our future to the world of 90 or 100 years ahead.

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Editorial Policy

SMIC strives to report on key challenges and topics of high social importance in order to determine materiality. We declare that this report complies with the "core" requirements of the GRI standards. Furthermore, SMIC presents its reports on: "society", "environment" and "economy", and provides reporting of results of the business activities that aimed to solve social problems.

Note: The photographs published on the cover and this page were taken in August 2018 at the Kinugaoka Plant.

CSR Information of SMIC www.senju.com/en/csr/
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Period covered April 1, 2016 – March 31, 2018 (includes some information from April 2018 and later)
Scope of report 26 group companies (includes non-consolidated subsidiaries and associated companies): Note that SMIC's environmental initiatives are listed separately.
Changes in this period One (1) non-consolidated subsidiary closed.
Membership RBA, JWES, JIEP, JEITA, JAPIA, TEA, JCCI (Note)

Note: 1 RBA: Responsible Business Alliance
2 JWES: Japan Welding Engineering Society
3 JIEP: Japan Institute of Electronics Packaging
4 JEITA: Japan Electronics and Information Technology Industries Association
5 JAPIA: Japan Auto Parts Industries Association
6 TEA: Tokyo Employers' Association
7 JCCI: Japan Chamber of Commerce and Industry

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Reference guidelines GRI standards, Environmental Reporting Guidelines, ISO26000
*The GRI standards comparison table will be posted on our CSR website.

Disclaimer This report contains descriptions of plans and strategies pertaining to the future activities of SMIC, as well as predictions and forecasts related to its business performance. Such descriptions include estimates, judgments and opinions formed by information gathered and analyzed based on what're available at the current time. Please be aware that SMIC and its related companies will assume no responsibility whatsoever for damages or losses occurring directly or indirectly from the use of the information or content included in this report. Also, the original text of this report is written in Japanese language and has been translated into English language. If there are any discrepancies between the Japanese version and the English versions, the Japanese version shall supersedes. Please be aware that SMIC assumes no responsibility whatsoever for any and all damages occurring from translated version other than Japanese.

Message from the President



Look at the world

—— Connecting the future ——

President **Ryoichi Suzuki**

This year we are celebrating our 80th anniversary. After the establishment of the company as Senju Lead Works Co., Ltd. in 1938, we experienced a variety of turning points in our journey to become a global business.
The CSR report for this fiscal year is a special edition that commemorates our 80th anniversary and takes you through our corporate journey of the past 80 years. With the theme "Look at the World — Connecting the Future", we look at the our natural environment, economic climate, technological breakthroughs, and human resources on a global scale as a company that continues to be a social contributor while connecting us to the future.

Sustainability and Value Creation

As a global enterprise, SMIC contemplates how to coexist with nature. We promote the expansion of our eco-friendly products such as lead-free solder M705 series and halogen-free paste, in addition to energy-saving production activities, zero emissions waste products, and chemical management. We have also made our products by sourcing conflict-free minerals to promptly comply with the U.S. Dodd–Frank Act enforced in 2013. Furthermore, we minimize overheating in our soldering applications as much as possible and promote the use of products such as low temperature solder paste that suppresses the CO_2 emissions.
We have made sustainability of our environment, society, and economy our major theme, and we promote the creation of added values through our business activities.
Now, we are looking forward to welcome a new era by expanding our outlook on diversity and by promoting the hiring of candidates with disabilities.

Work-style Reforms for Bringing Energy into our Corporate Management

There is a pressing need to create a comfortable workplace for all and to train the human resources by promoting work-style reforms in Japan. We will make every effort to reduce overtime work, which is a major issue especially in Japan, and make further improvements to our work environment and enhance various benefit programs.
As a company we are providing support for child and elderly care to achieve an optimum work-life balance and offering opportunities for various educational programs to enrich and fulfill the needs of not only existing employees but all dedicated employees, regardless of gender or experience.
Furthermore, to improve both the work environment and experience, we will automate our manufacturing equipment, adopt IoT technologies, and incorporate AI wherever necessary and appropriate.
We have been creating high quality products together with our customers and supplying eco-friendly products to protect our society and environment for a long time. We are committed to continue making contributions to our society by forging ahead toward our 90th and 100th anniversaries.

Management Philosophy

Perform our mission as a socially valued institution via providing universally beneficial products

“company” is a place where all employees share core values and are able to use the lines of communication as a “dojo” for the mastery of oneself. It is our strongest desire that company growth is directly interwoven with employee happiness – materially and spiritually. In the face of modern society, as the foundation of a company’s existence, we are expected to continue to provide universally beneficial products year after year. Our management philosophy is to harmonize societal goals with employee desires, thereby enabling our mission to be a valued institution sharing peace, happiness and progress to all of society.

Three key pillars are necessary under this philosophy in order to advance company development and ensure the success of our mission: Ability, Integrity and a Fighting Spirit. These pillars are the three sacred treasures that form the cornerstones of every aspect of life.

When these pillars are indomitable inside our institution, a bright, peaceful and vigorous workplace will naturally emerge. We are confident that with this workplace as a driving force we will overcome any challenges and the company will continue to grow as long as this pioneering spirit is encouraged each and every single day. Together, let’s take this philosophy to heart and embrace it as our belief, and build a bridge of peace and friendship across the entire corporate landscape while progressing into joyful, healthy lives.

The late Mr. Senju Sato
Honorary Chairman

As president: June, 1960 – June, 1978
As chairman: July, 1978 – May, 2008
As honorary chairman: June, 2008 – October, 2008

June, 1960

Sekido Museum of Art

The Sekido Museum of Art located at the SMIC headquarters and is operated by The Satoh Artcraft Research & Scholarship Foundation.
The Foundation was established in May 1979 with the startup capital from SMIC and its then president the late Mr. Senju Sato, and et al. The mission of the Foundation is to promote international cultural exchange, mutual understanding, and promotion of our national culture through exhibiting art and craft.
As part of the efforts to promote cultural activities, the Sekido Museum of Art was opened on April 15, 2006. The museum exhibits primarily earthenware from around the world, pottery and Buddhist sculptures, bronze ware, and jade stone as well as many "Nishiki-e" or multi-colored woodblock printing by Katsushika Hokusai and Utagawa Hiroshige that are associated with the Senju area, where the museum is located.



TALK SESSION

Future Expectations Toward SMIC

**Since its establishment, SMIC has been contributing to the industries for 80 long years.
A group of researchers had met to discuss the future of the company as well as their own with Chief Executive Advisory Engineer Toshihiko Taguchi (of Taguchi Laboratory), who is leading our technology sector.**

The bridge in the background in the picture is the Great Senju Bridge (Senju Ohashi) directly behind our headquarters.
Senju Ohashi was built in 1594, soon after Tokugawa Ieyasu entered Edo, and has been in existence now.
Throughout our history from the past to the present and to the future, we continue supporting the lives of the people.

We challenge to develop new technology and providing new products to the world.

Moderator: I would like to know from our young researchers, what kind of aspirations or dreams do you have while working at SMIC?

Sugii: Our products such as solders and bearings are indispensable products for manufacturing of electronic appliances, electronics, and automobiles. Although our brand may not be widely known, our products are used in almost all products used by common households. I am extremely proud of that fact, and I wish that the products developed by my team be widely used everywhere in the world. Mr. Taguchi, as the Chief Executive Advisory Engineer at SMIC, you have been instrumental in development of a variety of products, in particular, solder pastes are now used throughout the world.

Taguchi: Yes, that's right! While we are working on developing a new product, nobody can predict whether it will sell. By the time the developed product is in the market, I am already working on something else. So I often find out about a product is a hit after I had forgotten about it. We are researchers, so it is the development that we enjoy the most. It is rare for a developed product to sell well right away. Besides, sometimes the products we aren't confident about during development phase turn out to be successful selling well. Therefore, perhaps a good approach is to invest all of one's energy and focus on development and be confident that the product will sell well at some point. We must also remember that the after-sales follow up with customers is critical to our business. Hence, it is also necessary for us to continually improve the products to make sure that the products we develop are successful.

Asami: SMIC has constantly challenged itself to develop new technology and provide new products to the world. I, too, dream to reach out to the world with revolutionary products developed by me.

Taguchi: Ms. Asami, I learn you are active in fundamental research. We have great expectations from you! One of our key strengths is how we flexibly respond to customer needs, and that's impossible without a solid basic research. Another merit of our company is how we value teamwork.

Asami: I agree. It is fun to work in a team and there are a lot of things we can learn from each other. In addition to work being enjoyable, the environment is encouraging and I gain different perspectives about my work from other team members.

Miyagi: I primarily work in developing solder paste. SMIC developed the product M705-GRN360 during the time when the industry was transitioning to lead-free products, and this product has been trusted by customers for almost 20 years now. Product development is not at all simple. Perhaps there are many difficulties to overcome, but my goal is to develop a new quality product that surpasses this product.

Taguchi: The higher your goal is, the better the outcome will be. Our customer demands shape our developmental objectives and willingness to respond to their needs are important. Besides, we are having to respond to increasing diversified demands from our customers. I believe our product line will also be increasing more diverse to meet these demands.

Muraoka: I work with flux coated preforms. My objective is to help increase SMIC's earnings and manufacture the products that can be popular among customers and be beneficial to the society, in addition to be able to increase profit for the seller (beneficial for sellers, buyers, and the society). I wish to work harder to expand my expertise and experience.

Taguchi: It's important to listen to customers' feedback. Do you regularly communicate with your overseas customers?

Muraoka: Yes, my focus is on the Chinese market. So I regularly communicate with Chinese people during business trips and the like. It is indeed challenging to effectively communicate with the overseas customers.

Taguchi: I can imagine the stress and the sense of responsibility when representing the company in front of the customers. But I believe experiences are important, because those experiences result in "being developed while being nurtured by customers."

I want our engineers to experience the fun working with metals.

Moderator: Are there any more questions to our Chief Executive Advisory Engineer Mr. Taguchi?

Muraoka: Have you ever experienced unhappiness or dissatisfaction with your R&D work to the degree you experienced strong work related pressures? How did you cope with it?

Taguchi: One of the most difficult times I recall was when I working with solder development for camcorders. The demands from the customer at that time far exceeded our existing production technology. The inability to fully meet their demand put me in great distress knowingly that I was the person responsible for the development of the product.

Muraoka: What exactly was needed? Did you feel collaboration with



the manufacturing technology team essential?

Taguchi: Yes, that's right. I, along with my colleagues from the Manufacturing Department, rolled up our sleeves, through many trials and errors and finally we come up with a product that met needs of customers. We learned the importance of failing among other things to learn know-hows. It was a profoundly moving experience when we finally launched the camcorder, it turned out to be a huge success. Every cloud has a silver lining! At the time, camcorders were an advanced product comparable to today's smartphones, every household had one to capture images of children as they competed in athletic meet in schools.

Sugii: As it is apparent from the story you've just shared with us, the customer demands and needs are diverse. How do you decide where to begin?

Taguchi: In believe it is through exhaustive research study. If you gather all available data and study them including related technologies, you will eventually find ways that will lead to resolution. When I was young, I had to go all the way to the National Diet Library to gather data, but it's much easier now, thanks to the Internet. One great thing about SMIC is that there are no departmental barriers. This enables everybody in the company cross departmental and functional communication with others in the company and we can ask questions to employees from other departments whose



Hiroshi Sugii
PROFILE Joined SMIC in 2010. Currently involved in the development of flux and solder paste in the Flux R&D Dept.

practices may be different. It's also important to study products of our competitors. One of our associated companies has a specialized analytical body called the Industry Analysis Center. I want everybody from the company to know about them and utilize their resource and expertise. Additionally, in previous time, engineers developed documentation for patent application and I would recommend everyone to try writing them as it helped me a great deal.

Sugii: Patents... I have never done one myself.

Taguchi: I definitely recommend giving it a try. You will learn a lot from it.



Ai Asami
PROFILE Joined SMIC in 2010. Currently involved in the development of solder paste at the Solder Technical Center.

Asami: Were there any occasions when you could not come up with anything groundbreaking as such? Did it frustrate you or did you feel loneliness?

Taguchi: As I just mentioned, I always did an exhaustive research on whatever I worked on. But if that didn't lead to a breakthrough, I shifted my focus on something else.

Asami: It's stressful when things don't go as expected.

Taguchi: Yes, that's right. Therefore, when I reach a dead end, I immerse myself in my hobbies or have drinks with friends.

Asami: Mr. Taguchi indeed tries to strike up a conversation with us when he sees us being stuck. It helps us a great deal in redirecting our attention to something else.

Taguchi: SMIC is like our extended family. The long-cultivated SMIC company culture prevails today, even though the company employs greater number of employees. I think we have great company culture and definitely would like for it to be passed down.

Miyagi: Mr. Taguchi, what do you enjoy and treasure most about metals?

Taguchi: I didn't know anything about solder until I joined SMIC, and had never heard of flux. Through observation, I learned that metals melt and harden at a relatively low temperature. That was an



Nanako Miyagi
PROFILE Joined SMIC in 2012. Currently involved in the development of solder paste at the Solder Technical Center.

interesting and intriguing discovery for me. I even found that their color and gloss change according to the composition of metals. The unique gloss of the tin and lead based solder those days aroused my curiosity about them. When the analysis results turned out as expected, it was exhilarating. I definitely would like all of you to experience it first hand and pass down knowledge you gain through your experience.

It is necessary to create an environment that embraces diverse talent.

Moderator: The number of female researchers recently has increased remarkably. What do you think about this?

Taguchi: I think it's great. If I am not wrong, our hard-working employee Ms. Asami is a mother of two. I'm really impressed by her ability to manage multiple demands.

Asami: Thank you. Not only I am a mother, but also I am a researcher, it is important for me to generate results of my hard work. I am thankful to everyone around me for providing an environment in which I can continue working and being productive while raising my children.

Miyagi: Nowadays, there are quite a few working mothers, and some of them even work at managerial positions. The work environment at SMIC is conducive for women workers to build their career as a professional.

Taguchi: I am glad to hear that. A strong family support is essential to reaching one's full potential at work. Maintaining the balance in one's personal and professional life is critical not only for a person but also to the company. I hope SMIC continue striving by fostering a workplace where everyone can realize their potential.

Muraoka: I agree. Both men and women may have personal issues, and I feel the company can create a supportive working environment that all employees are valued. My understanding of a workplace that



Manabu Muraoka
PROFILE Joined SMIC in 2009. Currently involved as a researcher in the development of flux coated preforms at the Moka Laboratory.



Toshihiko Taguchi
Chief Executive Advisory Engineer
PROFILE Joined SMIC in 1958. Has held the positions of Executive Director and General Manager of the Development & Engineering Div. Received the Science and Technology Agency Award in 1990, and the Medal with Yellow Ribbon in 1992. The Taguchi Laboratory was founded in 2008 in the honor of his contributions to the company, and he became the first Director of the laboratory. Received The Japan Welding Engineering Society Award in 2011.

is friendly to women is one of such workplaces.

Taguchi: Even though women, may be only able to work reduced workhours, but if they put forward their best effort, that is all that can be expected. Having said that, I don't believe I am conscious in my daily interaction and communication with others whether the person or people I am interacting or communicating with are women or men.

Sugii: SMIC is certainly a good workplace for us men as well. When we decide on work priorities in our schedule, we based them on work itself. Sometimes, manager will offer an advice by suggesting that it can be later.

Taguchi: When it comes to making work related improvements, how managers get involved is important. It is responsibility of a manager to make sure that she/he fosters a work environment where researchers can strictly focus on what they are interested in studying. On the other hand, there may be a conflicting demand from customers. It will take company wide effort to decide on how best to develop the work environment that is conducive to efficiency and productivity.

Moderator: We strive to be a dynamic and growing company that offers the superior customer service and products.
Thank you for your valuable time.

SPECIAL PROGRAM

A Brief Look At The Past 80 Years

Special program taking you through SMIC's 80-year journey based on the timeline of important events in the company's history and photographs from the past. The program will take you through the 80 years into the history of a company that has underpinned the global electronics industry and our society.



1957: Analysis Room and the then researchers



1938: Founding of Senju Lead Works Co., Ltd.





1960 ~1979



1966: Started the Tochigi Segment



1969: Tochigi Segment

Episode

Started the manufacturing and sales of sprinkler heads in the 1960s, and developed the first domestically produced sprinkler heads in 1963. In 1974, the company span off of SMIC to form a separate company called Senju Sprinkler Co., Ltd. The Souka Plant opened in August 1962, and the Tochigi Segment in November 1966 as part of the solder business, thus expanding the solder manufacturing factories. Established a new Industrial Equipment Division in the 1970s, and developed solder products for electronic materials such as solder balls and solder pellets.

1938 Founding of Senju Lead Works Co., Ltd.

1939 Started the production of wire solder, solder bars, flux cored solder, and water lead pipes

1944 Changed the company name to SENJU METAL INDUSTRY CO., LTD.

1950

1952 Established the Automotive Bearings Division

1955 Completed the development and started the production of sparkle solder for TV and radio connecting wires

1956 Developed the first domestically produced two-layer rolled bushing

Developed solder cream

1960

1960 Successfully mass-produced the sparkle solder

1963 Developed the first domestically produced sprinkler head

Received Type 1 approval from the National Research Institute of Fire and Disaster

1965 Completed building a laboratory affiliated to the company, in Souka

1966 Established a plant in Moka City, Tochigi, Japan

1970

1970 Sparkle print development

1972 Established the Specialized Equipment Sales Div. (currently known as the Equipment Div.)

1974 Founding of Senju Sprinkler Co., Ltd.

1977 Developed the silver cored solder balls

Completed the first fully automatic soldering machine

Developed and began the production of electronic material preforms

1979 Developed oilless Clean Metal bearings

1938 ~1959







1958: 20th anniversary of founding

Episode

Senju Metal Industry Co., Ltd., founded in April 1938 as Senju Lead Works Co., Ltd., initially manufactured the products such as water lead pipes, lead plates, solder bars, and tinfoil. Opened a laboratory in 1950, which was rarely seen at the time. Devised a technique for clarifying the blending ratio of tin and lead with simple measurements. This was highly regarded by the customers. In 1955, the company started the production of Japan's first flux cored sparkle solder, which was used in black and white TV sets which were in vogue at the time, thus making remarkable contributions to the development of Japan's electronics industry.



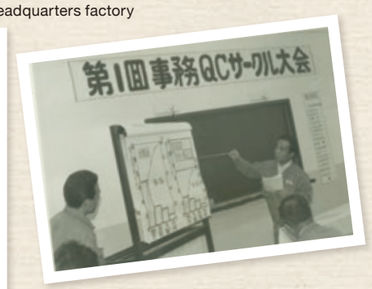
1961: Solder manufacturing activities at the headquarters factory



1962: Opened the Souka Plant



1973: 35th anniversary of founding



1972: First business QC publication meeting
Note: QC: Quality Control



1976: Senju Sprinkler Co., Ltd.
Manufacturing activities at the Shibajuku Plant



1976: Senyu-kai 20th anniversary athletic meet





1990: Ceremony to commemorate the anniversary of the founding of Senju (Malaysia) Sdn. Bhd.



1997: AT&T (the largest American telecommunication company) visits Senju Comtek Corp.

1980 ~1999

Episode

In the 1980s, the electronic device sector took off with rising demand for PCs and the like. We started expanding to America where the semiconductor and computer market was centered, and established manufacturing plants and sales sites in the 1990s in Asia, North America, and Europe. In 1996, we developed solder that does not contain the lead that is harmful to environment and humans. It was the era when Senju Metal Industry Co., Ltd. went global and adopted an ecological outlook.

1980

1980
- Completed the first fully automatic soldering machine

1982
- Finished the development of the first reflow oven
- Developed flux WF-70 for molten solder coat applied on DIP ICs ▸P.17

1986
- Developed the ZN series sprinkler head ▸P.18

1989
- Developed the flux cored solder TSURU22 for soldering robots

1990

1990
- Developed a high reliability, no-clean flux cored solder RMA22 ▸P.15
- Developed N2 reflow oven series
- Established manufacturing and sales bases in Malaysia
- Established the new Iwate Factory (Marumori) (Senju Sprinkler Co., Ltd.)

1992
- Commercialized and released sparkle EX series for fast and efficient work
- Opened the Kansai Segment

1994
- Developed and commercialized heat-resistant solder LL pure alloy

1995
- Developed Clean Metal CB90 ▸P.18

1996
- Commercialized environmentally friendly lead-free ECO SOLDER series
- Developed automatic soldering machine SPD-300
- Established Senju Manufacturing (Europe) Ltd.

1997
- Expanded the supply and increased the production of BGA sparkle balls ▸P.16
- Established Senju Comtek Corp.
- Established Senju Metal (Hong Kong) Ltd.



1982: Opening of Souka Plant, 20th anniversary party



1989: Set up our booth at Internepcon

1989: Tochigi Segment





1983: Disaster training at headquarters



1987: Technical partnership with a Chinese company for the solder manufacturing plant



1988: Tochigi Segment
The ribbon cutting ceremony to celebrate the completion of Houyoku-Rou



2007: The late Mr. Issaku Sato, SMIC's Chairman, and the Governor of Miyazaki prefecture at the completion ceremony of Senju Giken Co., Ltd.



2005: Completion of new headquarter premises



2008: Held a celebration to commemorate the 70th anniversary of founding



2015: Set up our booth at SEMICON China

2000

2001
- Started sales of the lead-free soldering material M705, which became a JEITA standard material. ▸P.13

2002
- Developed lead-free paste M705-GRN360 ▸P.14

2003
- Developed the local soldering device SOLZEUS ▸P.17

2004
- Received the ISO/TS16949 certification Solder Material Div.
- Established Senju (Thailand) Co., Ltd.

2005
- Lead-free soldering material with high workability and low spattering Development of flux cored solder ESC series
- Received the ISO/TS16949 certification Bushing Div.
- Completed the construction of new headquarter building

2006
- Developed preforms containing Ni balls ▸P.15
- Established Senju Metal Korea Co., Ltd.

1998
- Established Senju Electronic Corp.
- Received the ISO14001 certification Tochigi Segment

Established Senju Micro Institute of Technology Co., Ltd. (currently known as Senju Giken Co., Ltd.).

2007
- Samsung Electronics Co., Ltd. publicly recognized our Tochigi Segment and Senju Metal Korea Co., Ltd. as "A-grade factories" and Senju Metal Industry Co., Ltd. as a "Superior Quality Enterprise"

2009
- Developed ECO SOLDER M24 Achieved significant dross reduction and switched to resource saving

2010

2010
- Won the ASE Group Best Supplier Award

2011
- Became a member of RBA (formerly know as EICC)
- Low-silver lead-free solder alloy M40 Received Technological Development Contribution Award (Second Place) by Panasonic Corporation

2013 ▸P.16
- Started the mass production of tin-zinc alloy wires for anti-corrosive water pipes

2014
- Gained full membership of RBA/RMI (formerly known as CFSI)

2015
- Declared the complete elimination of conflict minerals from our products

2017
- Senju Manufacturing (Europe) s.r.o. started operations in Czech Republic
- Won the Intel SCQI Awards 2016 (consecutively since 2009)

2018
- **80 years since founding**



2001: Founding of Senju Metal (Tianjin) Co., Ltd.



2003: Trained the quality control inspector of Beijing Senju Electronic Materials Co., Ltd. at the Tochigi Segment Analysis Center



2017: Completed the construction of our new building of Senju System Technology Co., Ltd.



2000 to present

Episode

At the dawn of the 21st century, as environmentally friendly products came in demand due to EU environmental regulations, we developed lead-free solder M705 in 2001. The product set the Japan Electronics and Information Technology Industries Association (JEITA) standard material for lead-free solders. This flagship product of SMIC then went on to become the industry standard solder used around the world. In 2005, the new hexagonal building of SMIC headquarters was ready. After becoming a member of RBA (Responsible Business Alliance, formerly EICC) in 2011 and RMI (Responsible Minerals Initiative, formerly CFSI) in 2014, the company was successful in supplying conflict-free materials to the industry.

FEATURE

The Product That Became a Turning Point

Throughout its 80 year history, SMIC has been creating a variety of breakthrough products. On this page we have described each product, and asked the concerned parties about the ideas or background behind those products, the history, and future outlook.



Solder paste
M705-GRN360

Back during the shift to lead-free, the solder paste had poor wettability, aged quickly, and was not easy to use. To solve these issues, a lead-free "M705-GRN360" solder paste for surface mounting was developed in 2002. Many of our customers around the world chose the solder paste over other products for its excellent wettability, stable printing performance, and user-friendly characteristics such as a six-month product guarantee.

M705-GRN360 significantly backed the global shift to lead-free products

This product was developed at the start of the global shift to lead-free products (the Japanese electronics manufacturers being particularly influential in this shift to lead-free products) together with customers by leveraging the overall strength of our company in terms of technology, manufacturing, and sales. With its high degree of perfection, the product became popular throughout the world. Everything right from development of new highly reliable materials to development of the manufacturing technology and soldering process will help us make the next-generation solder products available in a variety of forms.
Examples include heat/fatigue-resistant solder alloys for vehicle applications and paste made for fine solder powder for small, light, and thin products.



Director
Tochigi Segment
Tetsuya Okuno



The development of M705 began when it was necessary to manufacture soldering material suitable for the outer atmosphere

When we first began working on the development of "M705", we researched the fundamental properties of solder alloys and paste/flux for use as lead-free solder suitable for JAXA (Note) applications. As we were a small team, the non-technical people such as Mr.Hasegawa were also involved. I remember we worked days and nights as we to tackled with the problems. Development of new mounting applications, low-temperature mounting, high heat-resistance, and the use of resin in mounting will play a critical role in the evolution of "M705" in days to come.

Note: JAXA = Japan Aerospace Exploration Agency

Executive Advisory Engineer
Taguchi Laboratory
Rikiya Kato

The lead-free solder modernized into a global standard solder

Back when lead-free solder was a rare item, the tin-silver-copper solder developed by SMIC's Executive Advisory Engineer Mr.Kato in collaboration with the customers was in the spotlight for its high reliability and ability to be transformed into various shapes. Japan's industry, government, and academia jointly suggested it as the global standard. Following the endorsement by ISO and IEC (Note) standards, it soon replaced the tin-lead solder that had dominated the industry for a long time. Currently, the lead-free solder is the global standard for soldering.

Note: ISO = International Organization for Standardization, IEC = International Electrotechnical Commission



General Manager
Moka Laboratory
Kaichi Tsuruta



The pioneering and unparalleled mass production of tin-silver-copper solder

When M705 was a new player in the industry, tin-lead was the predominant solder. Hence, M705 was manufactured by melting silver and copper with tin to make a master alloy. However, due to productivity issues, we launched a project together with the Research Division to find the conditions in which they could be melted directly. This discovery was the key to the mass production of M705. M705 is a readily castable and workable alloy. I hope SMIC continues to develop M705-based products combining technology, manufacturing, and sales.

Senju Metal (Huizhou) Co., Ltd.
Plant Manager
Shigeo Funayama

ECO SOLDER
M705

Lead-free solder was developed in the second half of the 1980s for use in communication satellites. Later, the assorted lead-free solders were properly assessed, and a national project led by JEITA (Note) was launched to select an industry standard. A tin-silver-copper base was chosen for its well-balanced composition. In 2001, SMIC launched the lead-free solder in the market under the product name "M705". At present, the patents held by SMIC at the time have been widely published, thus making SMIC's lead-free solder an industry standard soldering material used throughout the world.

Note: JEITA = Japan Electronics and Information Technology Industries Association



The "lead-free project", a boundary-pushing cross-departmental collaboration

Turning M705 into a paste was an urgent task to change with the times that demanded lead-free products. It was difficult to develop the original ideas and system to achieve what was needed, and at times we fell behind the market. However, thanks to sincere efforts of manufacturing, sales, and technology departments, we could achieve an unprecedented collaborative system, information dissemination speed, and several technological breakthroughs through substantive, cross-departmental discussions (the lead-free project). Market approval of M705-GRN360, which was a product of those efforts, brought us great value beyond just winning the market.



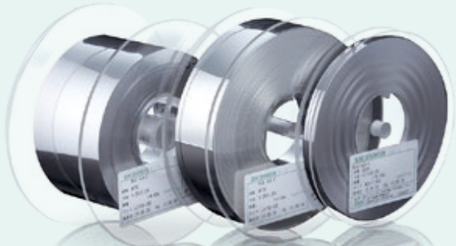
Solder Technical Center
General Manager
Masato Shimamura

The "M705-GRN360" paste was something that I knew our American customers would definitely like

It was used by many of our customers in North America, where I was stationed at the time. I have always had confidence that customers would choose our products over competitors, which were suitable for a variety of usage applications. I remember always being excited about what results could be obtained. Any new technology can quickly become outdated as soon as another new technology emerges. Hence, it is important to constantly seek ways to improve and continually upgrade existing technology.



Divisional General Manager
International Business Div.
Satoru Akita



Preform

Preforms containing Ni balls

Mounting of parts in power semiconductors is a challenge in terms of improvement of heat dissipation properties. Our "Preforms containing Ni balls" use an original technology in which Ni balls are evenly dispersed throughout the solder to control the tilt following the mounting. To improved the heat dissipation in power semiconductors, we secured the contact of semiconductors with the heat sink. It is used in most of the power module products including eco-cars such as HEVs (Note) and EVs. SMIC will continue to expand globally to cover the fields such as EV, IoT, AI, and server-related (information, communications, infrastructure).

Note: HEV: Hybrid Electric Vehicle

We invested in a dedicated rolling mill for in-house production of Ni balls, to be used in premium HEVs

In 2003, we proposed a product for in-vehicle power semiconductors. Preforms made by inserting Ni balls in pellets to stabilize the height and position after soldering were our first product. The main aim was to use them in premium HEVs. However, the first sample did not meet the customer requirements for rolling technology and quality of Ni balls. Hence, SMIC's Chairman The late Mr. Issaku Sato decided to invest in a dedicated rolling mill and develop the Ni balls in-house. SMIC successfully met the customer requirements and used these in-house developed Ni balls in the premium HEVs.



Divisional General Manager
Solder Material Sales Div.
Mitsuyoshi Hirayama



General Manager
Electronic Materials Div.
Koji Watanabe

The pursuit of rolling technology through collaborative development with the customer

The request for manufacturing the performs containing Ni balls came from the customer while we were developing the preforms for fluxless soldering. At the time, rolling was all about making a piece thin. However, the presence of a lot of voids (Note) in the product resulted in repeated rejections by the customer. Therefore, during the collaborative development with the customer, the entire process was revised to reduce the voids and to shape the product in its present form. Completion of these high-quality preforms triggered the development of preforms containing Ni balls.

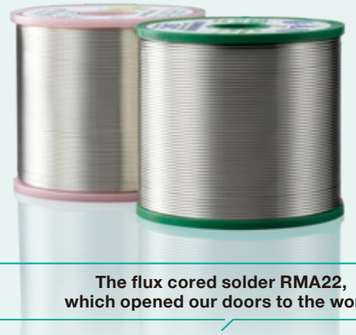
Note: Voids reduce the bonding strength of components and PCBs

We carefully listened to the customer requirements and continued to forge on into new areas

Initially, we did not have an R&D Sector or technical documents like for other products. Hence, while getting pointers from the customers, consulting with the on-site factory workers, and continuing to forge on into new areas, a project team was formed. Thanks to our speedy response to customer requirements, our product was finally approved by the customer. Through this industry-first product that let us continue to grow together with customers, we established a sales style for Japanese automobile giants. By including EVs in this unique attempt, we wish to expand our reach to new areas, and continue to carefully listen to customer requirements.



Supervisor
Central District Sales Office
Naoki Hisamoto



Flux cored solder

RMA22

RMA22 is our first RMA type flux cored solder that complies with US standard QQ-S-571. We developed it at the start of the 1990s when the demand for RMA22 in information, communication, and in-vehicle applications took off. Back then, a shift to no-clean was gaining ground due to CFC regulations. This required that the solder wettability be secured while maintaining its insulation properties. RMA22 met these requirements. Hence, the technology that went into its making has been passed down to the present.



General Manager
Moka Laboratory
Kaichi Tsuruta

The flux cored solder RMA22, which opened our doors to the world

When working on the development of RMA22, which demonstrates high solderability and reliability while assuring minimum corrosion, we exhaustively evaluated all kinds of chemical materials. The whole development team was overjoyed when we discovered the material that had the desired properties. However, it was when the material was used in American automobile PCBs that we experienced the joy of embarking on a global journey. Currently, we are improving the existing and developing new flux cored solder products for information, communication and on-board applications to develop special products such as Macros featuring a soft residue.



Solder balls

BGA ball

The solder balls that find their roots back in 1977 are more than 40 years old now. However, in those times, their use was limited to only a few applications and were manufactured in small amounts. However, their demand suddenly rose when a package substrate called BGA (ball grid array), in which solder balls are arranged in a grid, was created in 1994. To meet this growing market demand, SMIC, too, increased the production at fever pitch, and grew into a leading business catering to the market demands.

BGA balls changed everything... sales, development, manufacturing, and inspection

In the early 2000s, we started delivering solder balls to leading semiconductor companies and gained the top market share, thus profoundly changing the R&D approach, manufacturing technology, and the inspection and quality control system linked to sales. This ensured our safe entry into the semiconductor business. However, at the present time, when it is difficult to differentiate between good and bad quality, it is impossible to outdo the competitors without giving equal consideration to cost, delivery time, capacity, and flexibility to respond to market demands. SMIC will also bolster its ties with the customers to excel in the market.



General Manager
Ball Manufacturing Div.
Daisuke Souma



Senju Electronic Corp.
Divisional General Manager
Production Div.
Iwao Chiba

In the days to come, automation will be the key to cater to the diverse needs of customers, and SMIC will do precisely that

Looking back at how we made the "BGA balls", I remember our struggle when switching from lead cored to lead-free. In contrast to the essentially labor-intensive process flow of the past, we are coming up with ways to promote mechanization and automation to make improvements. Specifically, we are developing and promoting a mechanism with which the ball diameter can be adjusted automatically by remote monitoring, as well as a visual inspection system. SMIC is working towards bolstering its production system to manufacture the products that will make our customers happy, and on further automation of work for manpower reduction.

Cast iron pipes for water

Anti-corrosive coating alloy (zinc-tin-magnesium alloy)

Surface treatment of cast iron water pipes with "zinc-tin-magnesium alloy" is exactly what was essential to making of water pipes that will last 100 years. During the initial stages of development, the wire would not draw properly. But after trying for two consecutive years, we finally succeeded in establishing the mass production technology in 2013. The product then went on to support the social infrastructure.
We are currently leveraging this technology to upgrade the existing mass production technology involved in the production of sprayed alloy wires for capacitors and solder products.





General Manager
Bearing & Bushing Sales Div.
Masafumi Seino

We challenged ourselves to pioneer the development of a unique alloy to prevent the corrosion of water pipes for 100 years

Many water pipes laid in the period of high economic growth of Japanese economic history had exceeded their service life, but had not been replaced with the new ones. This highlights the need to use long-lasting (100 years) water pipes featuring the presence of "zinc-tin-magnesium alloy". At the time when not many companies or groups were competent enough to come up with a solution to this, SMIC dared to take up the challenge of mass production of the "zinc-tin-magnesium alloy". It was difficult; I am happy that, in two years, we could devise a new manufacturing technology for mass production, no matter what kind of challenges we faced.

The development of the "zinc-tin-magnesium alloy" started from the development of brand new machinery

As the "zinc-tin-magnesium alloy" has a large range of melting temperatures, it is prone to segregation, becoming stiff and brittle, which makes it difficult to work with a conventional extrusion-based machine. We invested more than a year to study the problem in terms of machinery, and used the knowledge in the development of the continuous casting and rolling method of alloys. As our current flagship product is packaged in the units of 400-kg, we implement strict controls to ensure that it is free of defects and does not break easily. In addition, we process the waste material collected from our customers and reuse it.



Executive Advisory Engineer
Advanced Product Engineering & Development Div.
Takashi Hori

Flux

WF-70

In the 1980s, the lead frames of ICs (Integrated Circuits) were plated predominantly with molten solder to improve solderability. If the flux used was highly active, the circuit board members would get damaged. "WF-70" reduced the damage to components, while achieving good wettability. Many customers used it as a specialized flux for molten solder plating.

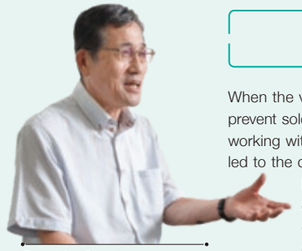


Our halogen-free flux underpinned the mass production system for semiconductors

The molten solder plating of the lead frames caused repeated cuts in aluminum wires due to the presence of chlorine. As a countermeasure to this problem, we thought of developing a halogen-free flux. We created "WF-70" in joint development over two years, and contributed to establishing a worldwide mass production system for semiconductors.
As the trend is shifting from the use of lead frames to solder balls, we are transitioning to WF6000. In the next few decades, the 3D technologies will take over the industry and necessitate the development of flux suited for further technological evolution.



Executive Director
Yuji Kawamata



Executive Director
Isamu Sato

From the development of a solder pot to soldering system equipment

When the vehicle ECUs started having a high heat capacity, it was challenging to prevent solder wicking during through hole soldering of the PCB components when working with a dipping machine. The development of a single solder pot eventually led to the development of a soldering system equipment possessing an automatic loader and unloader. Currently, it is the Equip't Div. that provides system equipment suited to materials. SMIC will continue to accommodate the changing requirements of the industry by manufacturing newer products, digitizing the equipment, and training global talent.

Soldering machine

SOLZEUS

The name SOLZEUS means" god of soldering". "SOLZEUS" is a compound word combining "SOLDER" and the chief god "ZEUS" from Greek mythology. By fundamentally reviewing common knowledge about conventional soldering machines with a focus on Archimedes' principle, we developed a brand new molten soldering machine. The machine feeds a constant amount of solder at constant pressure to realize stable high-quality solders, hence serving for a variety of applications in on-board electrical components.

First lead-free, then reflow soldering, and now EVs... SOLZEUS is making great strides with time

Following the shift to lead-free solder triggered by environmental issues, "SOLZEUS", which uses flow soldering for local mounting, was developed and launched in 2003 as a post-soldering method for weakly heat resistant components. Later, the surface mounting with reflow soldering became more and more common, but, some components did not support surface mounting. Hence, SOLZEUS gained further attention for its ability to retrofit parts with pinpoint accuracy. With the automotive industry shifting to EVs and driverless cars, SOLZEUS is gaining more and more importance in the market.



Deputy Counselor
Toshimaru Sumiyashiki



Senju System Technology Co., Ltd. (SST)
Deputy Counselor
Noboru Hashimoto

The heart and soul of SOLZEUS is its jet pump, a microcosm of our unique know-how

The jet pump is the heart and soul of "SOLZEUS". This jet pump is called a continuous flow pump, and was developed roughly over a period of two years. Over the course of 20 years, it became the heart and soul of not just SOLZEUS, but SST as well. There is a constant demand for this product one after the other, the chief clientele being automobile-related manufacturers. This is because, we take pride in not just getting repeat customers, but reliably suggesting modifications and new mechanisms to shape the product into something perfect for the customer.



Clean Metal

CB90

It is a bearing product that started with the development of bushing for scooters in 1952. Before the shift to lead-free bearings started in 2007, the lead-free three-layer slide bearing CB90 was developed in 1995. Its excellent friction characteristics, thanks to SMIC patent technology, are highly regarded by the customers. The product has been used as a guide bushing for shock absorbers. Many of our customers are still using the product.



Osaka University,
National University Corporation
Naoki Sato

CB90 is a product of racking our brains every day about how to reduce bearing friction

CB90 is a lead-free bearing created by instantly putting into practice an inspiration. Every day I made a modest effort to think of ways to reduce the bearing friction. It is a long-selling product that is still in demand by the customers over 20 years after its development. Despite of a variety of Clean Metal products being manufactured in limited quantities according to the application, Clean Metal is positioned as a critical strategic product for bearings.

Collaborative development with customers is and will remain inevitable

CB90 was first used in the motorcycles. The next target was automobiles, but its use in automobiles was difficult considering that it was used only in motorcycles till then. Therefore, to prove its performance to the customers, we conducted endurance tests in laboratories of automobile manufacturers. CB90 is currently used in many automobiles, low-friction characteristics being one of its key strengths. For this, it was necessary to develop the evaluation methods in collaboration with the customer.



Manager
Bushing Manufacturing & Development Div.
Kenzo Tadokoro







Senju Sprinkler Co., Ltd.
President
Mitsuaki Kikuchi

Turning Higashiyama into the Silicon Valley of sprinklers!

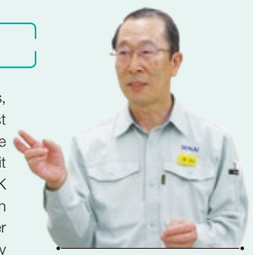
The development of the "ZN type" sprinkler heads was a turning point for SMIC. The industry-leading automated line enabled its subsequent mass production, raising our industry share to 70%. With the falling birth rate and aging population, the number of buildings in Japan is predicted to decrease. But the global demand is 100 million buildings/year. Hence, to realize the dream of "turning Higashiyama into the Silicon Valley of sprinklers! (Note)" as The late Mr.Issaku Sato, SMIC's President, would say, we are supplying the world with peace of mind and security.

Note: Higashiyama refers to Higashiyama-cho Ichinoseki City in Iwate prefecture in which our Iwate Segment is located.

The strength of ZN type sprinklers is still being harnessed

As new structures and technologies were adopted to miniaturize the ZN sprinklers, they became more expensive than multi-type sprinklers (Note), making cost reduction an issue. To solve this issue, the shape and material of its parts were revised, and the parts were increasingly produced in-house, gradually making it a highly profitable product. The traditional ZN sprinklers have given way to the K type sprinklers, their domestic successors. But the structure of the decomposition section, the essence of the ZN sprinkler, has been carried over into SMIC's other products. The RC series products are a representative of this, and are sold every month throughout the world.

Note: Multi-type refers to our MF series sprinkler heads.

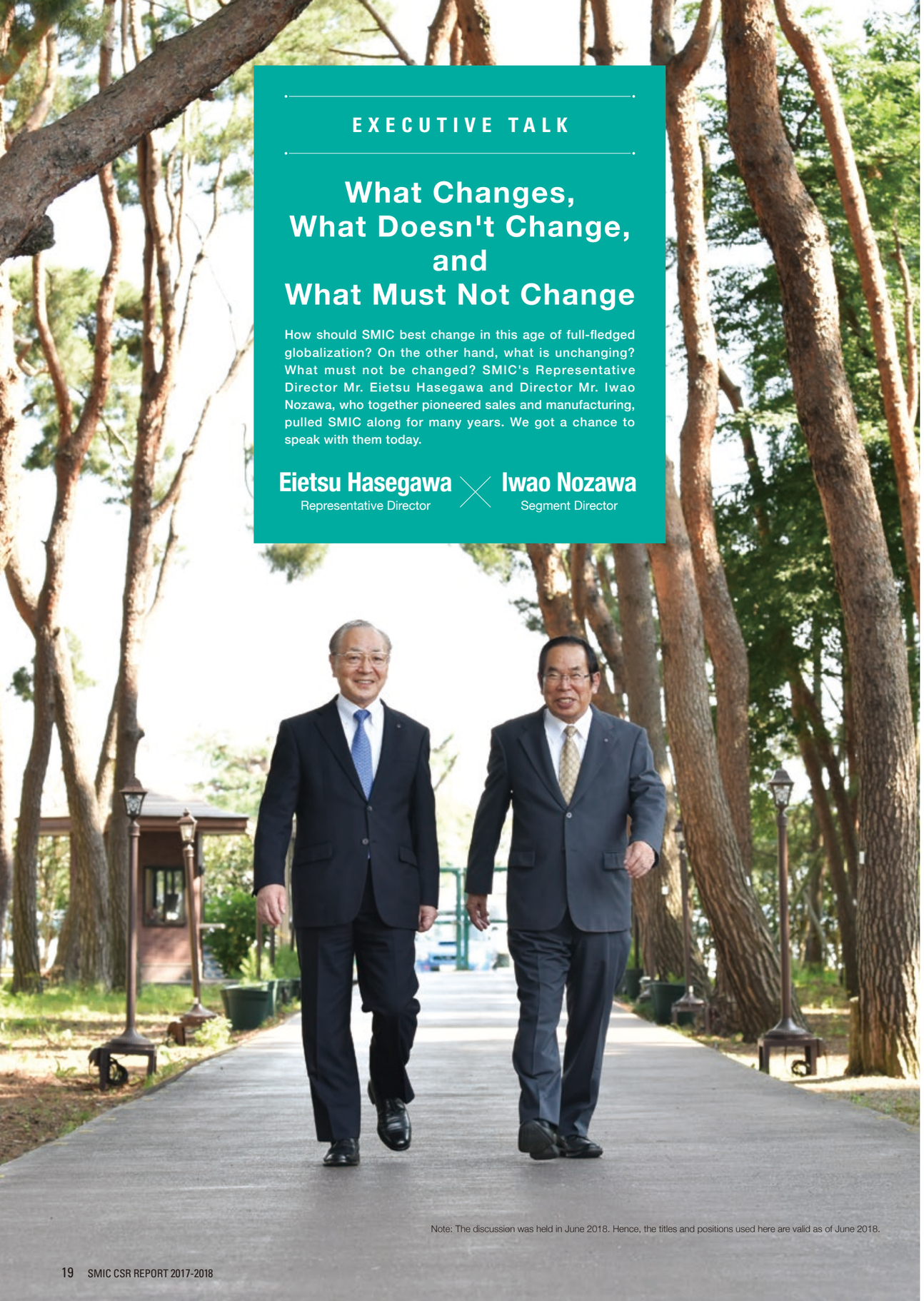


Senju Sprinkler Co., Ltd.
Executive Advisory Engineer
Tetsuro Kikuchi

Sprinkler

ZN type

SMIC was the first to gain domestic certification, in 1963, for a sprinkler head, an applied solder product, that detects fire and sprinkles water to extinguish it. "ZN type" was made focusing on mass production, and was the first product of its kind whose production was fully automated to achieve a stable supply while securing a large production volume. 20 years since its release in 1986, the product is still in the market as the longest selling product of the series, raising our industry share to 70%.



EXECUTIVE TALK

What Changes, What Doesn't Change, and What Must Not Change

How should SMIC best change in this age of full-fledged globalization? On the other hand, what is unchanging? What must not be changed? SMIC's Representative Director Mr. Eietsu Hasegawa and Director Mr. Iwao Nozawa, who together pioneered sales and manufacturing, pulled SMIC along for many years. We got a chance to speak with them today.

Eietsu Hasegawa Representative Director × **Iwao Nozawa** Segment Director

Note: The discussion was held in June 2018. Hence, the titles and positions used here are valid as of June 2018.

CHANGE THE SOLDER OF THE WORLD BASED ON AN UNCHANGING CORPORATE VISION

No matter how much the times change, the corporate vision will not change

Moderator: Can you first tell us what is unchanging at SMIC?

Hasegawa: Our corporate vision (see P4) created by the Honorary Chairman The late Mr. Senju Sato has not and will never change. He once sent me a birthday message saying "your brain is like a spring, and the company is counting on it." In later years, when I became a manager, I realized that we had an exceptionally strong foundation. Employees being the asset of any company, training and development of human resources will always remain important.

Nozawa: I, too, think it is our corporate vision that will never change. As correctly said by Mr. Senju, "A company is a place where all individuals are able to attain self-actualization, a place like a "Dojo", a space for immersive learning." In other words, we are fundamentally an employee-based company. So SMIC will always provide opportunities for employees to grow as a human being. Of course, being a company we need to be in pursuit of profit. However, these values have been and will be at the foundation of the company in any era.

Moderator: Interesting. Is there anything else you feel is unchanging?

Nozawa: The perspective of customers, I would say. Across departments, the customer-centric approach is deep-rooted. Customers often visit our Tochigi segment to see our Tochigi plant from inside. As "seeing is believing", actually viewing the factory builds trust.

A turning point that gave us a chance to grow a lot through work

Moderator: What was it that gave you an opportunity to grow as a human being?

Nozawa: It was when we launched the Solder Paste Factory for SMT (Note). The current solder paste plant of Tochigi Segment was once a rolling plant, mainly manufacturing solder tape for radiators. When orders fell during a transition period due to technological innovations, Our Chairman The late Mr. Issaku Sato asked me if I had any ideas to boost the sales. I suggested him that it would be better to produce the solder paste, which was more promising than the solder tape from the production volume and sales perspective, at the rolling plant of the Tochigi Segment and to shift the production of the solder tape to the Kansai Segment that had just started its operations. In addition, I proposed to keep the solder paste factory open to the customers so that they can visit the plant if they wish to. An emergency board meeting was convened the next day and my suggestions were accepted.

Hasegawa: Just after that, we noticed that the viscosity of the solder paste products changed depending on the moisture content in the atmosphere. Mr. Nozawa sealed the walls of the new factory with Cedar wood to prevent the moisture from seeping in. Cedar is an effective moisture-absorbent. The late Mr. Issaku Sato learned this when he visited a brewery in Akita, and told the same to Mr. Nozawa.

Nozawa: Besides, the wood imparted a nice look to the factory. The customers were impressed. By now, the solder paste for SMT is already a key product of SMIC, and the rolling plant, which was moved to Kansai Segment, has also been supporting our business, even though it has been away from the spotlight. In order to produce better and better products, it is essential to secure right environment at the right place and right moment.

Note: SMT: Surface Mount Technology

Moderator: Mr. Hasegawa, what do you think?

Hasegawa: Our Chairman The late Mr. Issaku Sato always said, "Listen to the customer's voice". In other words, we can learn a lot from our customers, and if we try to know what exactly they want and act accordingly, our projects will be beneficial for our own growth. For example, preforms containing nickel balls. This idea itself was presented by a customer, but was technologically challenging at the time.

Nozawa: SMIC has been an industry pioneer in development and manufacturing under the Representative Director Mr. Hasegawa. It was under his able leadership that the preforms became a core product of the company. It's now an important product that has opened up on-board applications.

Hasegawa: One more case is when we implemented computer control in our melting plant as suggested by the customer. Customers saw the system and praised it as a ground-breaking effort for a solder manufacturer.

Development of global standard lead-free solder, which contributed to major growth of SMIC

Moderator: What do you think was a major growth milestone in the 80-year history of the company?

Hasegawa: It certainly was the development of M705, which became the standard composition of lead-free solder in 2001. The environmental regulations to promote lead-free products originated in the EU, and it was deemed to be an urgent task by the Japanese administration. In 1999, the Ministry of Economy, Trade and Industry of Japan launched the "lead-free national project", and, as part of this project, initiatives towards using lead-free solder soon started everywhere in Japan. Each major Japanese manufacturer agreed with and joined this movement. SMIC also participated as an observer. It was an incredibly good project.

Moderator: Why was SMIC able to join the movement as a member?

BUILDING A "CUSTOMER PERSPECTIVE" IS NEVER OPTIONAL



Representative Director
Eietsu Hasegawa

PROFILE Joined SMIC in 1966. Starting from a Sales Manager of the Solder Division, he has assumed several positions in the company. He was appointed as SMIC's Representative Director and President in 2008, as a Chairman in 2014, and as a Representative Director and Senior Advisor in 2016. His favorite motto is "There is no difference in the abilities of people; if at all any, it is in their motivation."

Hasegawa: SMIC had already proven its technological capabilities as its soldering material was already used in the satellites. A satellite becomes hot when it comes in contact with the sunlight, but attains subzero temperatures when the earth forms a shadow over it. SMIC's solder was used in satellites because it could withstand the temporary changes of this harsh space environment. This was about ten years before the lead-free project came into the spotlight.

Moderator: This lead-free solder was highly regarded in the industry.

Hasegawa: Yes. The "lead-free national project" recommended the use of tin-silver-copper lead-free solder M705, whose shared patents were held by Panasonic and SMIC, as a standard product and the information on the product was disclosed to public. In conjunction with this, we decided to license M705 to competitors to promote its spread. Later, this composition became the international standard in JIS, ISO, and IEC, gaining popularity throughout the world.

Moderator: Mr. Nozawa, what according to you was the turning point of growth?

Hasegawa: I also think it was the lead-free solder. The change in the manufacturing method from conventional lead cored solder to lead-free solder was the turning point even from our manufacturing point of view. Our flux cored solders, solder paste, solder balls, solder bars...everything changed. We segregated our manufacturing lines and machines producing the conventional lead cored solders from those producing the lead-free solders, divided the work areas, and developed and invested in the machines suited to the respective manufacturing processes as fast as possible. All of these contributed to our growth.

Employees banded together to overcome the Lehman Shock and Great East Japan Earthquake crises

Moderator: There was growth and there were crises. What kind of crises were there? How did SMIC overcome them?

Hasegawa: During the 2008 Lehman Shock, no business restructuring was needed. We survived because of the joint efforts put by all the SMIC employees. When many companies had to undergo restructuring, the conditions in SMIC were quite stable. This would not have been possible without the cooperation of all the employees who shared the pain.

Nozawa: Much the same way, our employees and affiliates became our greatest strength after the Great East Japan Earthquake. Tochigi experienced a magnitude 6 earthquake on March 11, 2011 (Fri.) 2:46 p.m., roughly for five minutes. A period of 5 minutes may seem small otherwise, but it is not easy to withstand such a huge earthquake for that long. For a moment, we had lost hopes of survival. The aftershocks continued. But I knew that the octagonal structure of the Tochigi Segment, which acted like a paper umbrella, had superior earthquake-resistance. Because of my confidence in the structure, I managed to cheer everyone. Further, Mr. Hasegawa, SMIC's President at the time, rushed to the Tochigi plant the next day. He was really happy to see the plant with his eyes, and his happiness boosted the morale of all Tochigi Segment staff.

Moderator: What sort of damage did the Tochigi Segment suffer?

Nozawa: The worst part was that the electricity was out and the manufacturing machines had come to a dead stop. The special high-voltage substation equipment was damaged too, and there was no power for over 10 days. Luckily our in-house power generation worked, but we could only run at 40% of our normal capacity. Every morning the General Manager-level executives gathered to discuss the challenges ahead of us. By deciding which production lines to prioritize and allocating power supply to the high-priority lines, they managed to partially start the production activities. We were thrilled when power supply was resumed to the special high-voltage substation equipment so that some of the hampered production activities could be resumed. While other issues such as food, gasoline, and disaster-affected families of employees were yet to be solved, thanks to our employees who worked 24/7 for plant restoration. Had they not been with us, things would have been all the more difficult.

Hasegawa: We got to experience their unity and cooperation when we launched the BGA balls. With orders sharply increasing, and machines not yet automated, all the employees worked on manufacturing for one whole year, giving up their New Year holiday. I was in sales at the time. We teamed up to create solder balls. We must pass on this company culture of being united at critical times.

Nozawa: Here, the most important element is to build bonds of trust between supervisors, subordinates, colleagues, and affiliate companies to bring the employees together to support the company in critical times. SMIC's company culture of mutual trust and cooperation is something that must not change, just as Mr. Hasegawa said. On the other hand, it is important to bring revolutionary changes such as automation through time.

Message to the world with respect to the future of SMIC

Moderator: Lastly, what do you think is important for the SMIC employees to play an active role on a global scale?

Hasegawa: It's a global stage, but welcoming customers to our factories can definitely help build a relationship of trust, like Mr. Nozawa said at the beginning. Hence, the global expansion of our Japanese factories, such as the Tochigi Segment, is extremely important.

Nozawa: For language support during such visits, we will need multi-lingual professionals. Many overseas visitors come to visit our factories, and some customers demand that they want speakers of their language, not interpreters, to guide them through the factory. This is the next skill we all must learn, regardless of which department we are from. Customers come to our Tochigi Segment from all over the world. Everyone at the plant must strive to provide global support in order to be a good host to our existing or prospective customers.

Hasegawa: I want SMIC's next generation to know that even though solder is not an attractive product as such, many of our customers are the most leading companies in the world. Because we have such special audience, I want you all to go global with the sense of shaping new trends in the solder industry. The fact that we have received the SCQI award (Note) from Intel eight years in a row since 2009 is a proof that the quality of SMIC product is being globally renowned. Now we are sending more and more employees in their twenties and thirties to Europe and the Americas so that they can be globally active through the solder business established by their predecessors.

Note: The SCQI award is the most prestigious award by Intel Corporation presented to the companies for their excellent performance.

Moderator: I am sure that your words will pave the way for the 90-and, eventually, the 100-year anniversary of SMIC. Thank you for sharing your valuable insights with us.



THE COMPANY CULTURE OF MUTUAL TRUST AND COOPERATION MUST NOT CHANGE



Segment Director
Iwao Nozawa

PROFILE Joined SMIC in 1967. Before assuming the position of Operating Officer of the Tochigi Segment & Manufacturing Sector in 2009 and its Director in 2010, he has served as the Manufacturing Manager of the Solder Mfg Div., Bush'g Mfg & Dev Div., and Industrial Machinery Div. of the company and the Officer responsible for Quality Assurance. His favorite motto is "Where there is a will, there is a way."

Disclosure of Information on Key Challenges

The international guideline for sustainability reports, the Global Reporting Initiative (GRI), amended its guidelines in May 2013 to G4 and in October 2016 to GRI Standards with the goal of changing their approach of information disclosure from an exhaustive one to the one focused on key challenges (material aspects).
In order to disclose the sincerity of our management through people, and to disclose how we communicate globally with our stakeholders, SMIC is identifying the materiality (key challenges) of the five aspects stipulated in the code of conduct of the RBA (Responsible Business Alliance: renamed in October 2017 from EICC) and of contents reported in the monthly CSR meetings, based on the following four-step flow recommended by GRI.

Step 1. Identification of key issues and events

- GRI aspects and important RBA self-audit items
- Identification of the range of impact

Step 2. Prioritization

- Severity assessment for stakeholders and the company
- Qualitative and quantitative assessment in the monthly CSR meeting

Step 3. Validation

- Assessing the scope, impact, and period of GRI aspects
- Approval and disclosure by the management team

Step 4. Review

- Distribution and disclosure of documents in hard copy and soft copy (Japanese, English, and Chinese versions)
- Analyze and report opinions in the monthly CSR meeting, and use them in the future meeting

SMIC Group CSR Basic Policy

We have basic policy(based on Management Philosophy) that governs maintaining of a balanced and harmonious relationship with stakeholders including customers, employees, suppliers, local communities, financial institutions and governments.
We strive to fulfill the following commitments to achieve the highest possible level of standards.

Human Rights and Labor Standards

1. We adhere strictly to relevant employment and labor laws to ensure compliance with human rights standards, including child labor and forced labor.
2. We strive to value and respect the differences among individuals in the workforce. We are an equal opportunity employer and do not tolerate any form of harassment or discrimination based on age, race, color, religion, sex, national origin, disability status, protected veteran status, or any other characteristic protected by law.
3. We strive to maintain positive work environment by communicating frequently with our employees.

Health and Safety

1. We ensure to be compliant with federal and local labor law standards and health and safety legislation to achieve the standards of good practices and to create comfortable and hygienic working environments.
2. By establishing and implementing a Management Systems for Health and Safety, we provide sufficient resources to protect our employees and to ensure that risks are effectively managed and alleviated.
3. We adopt and implement appropriate preparative measures for emergencies.
4. We strictly comply with all applicable laws and established standards to prevent accidents and injuries from occurring in the workplace by actively promoting good health and adopting safe practices.

Environment

1. We fully comply with all relevant legislations in all areas in which we operate and to set our own environmental targets to adopt responsible environmental practices.
2. We assess, evaluate, quantify and monitor our business activities that may or may not have affect and impact the environment:
   1) Energy and resource conservation preservation
   2) Appropriately manage disposal of contaminated water and reduction of wastes
   3) Reduction in the use of hazardous chemical substances
   4) Hazardous substances/materials and wastes are properly identified and handled according to the related hazardous materials regulations
3. To protect the Earth's ecosystems such as wildlife habitat, forests, oceans, and to conserve biodiversity, we will participate in environmental preservation activities such as tree planting.
4. We work diligently to build and maintain relationship with the community to protect and sustain environment.

Competitions and Fair Trading

1. We comply with relevant laws and regulations to engage in free competition and conduct business with the highest standard of ethics and integrity.
2. We endeavor to establish a management system in order to implement and maintain confidentiality of internal and external business information.
3. We will make certain that all disclosures made in financial reports and public documents are full, fair, accurate, timely and understandable.
4. We fully comply with relevant laws and regulations to properly handle import and export transactions.
5. We respect the intellectual property rights of others and will not infringe any third parties rights.
6. We will not have any interaction with any group or faction that threatens the public safety or security.
7. We avoid engaging in any actions that creates a perception that illicit gains are made in exchange for offering or receiving money, gifts or personal business courtesies.
8. Transactions with individuals or groups or factions that directly or indirectly support or assist military conflict or terrorism shall be forbidden, and thorough measures shall be taken to ensure that conflict minerals are not used where it is appropriate.
9. We set up an anonymous reporting channel for unethical and/or illegal behavior within the organization.

Product Quality and Safety

1. We comply with customer requirements, related laws and regulations, and strive to improve customer satisfaction continually through the supply of products and services with excellence in quality and safety.
2. According to the Quality Manual, we develop, implement and maintain a management system, and continually improve its effectiveness.
3. In addition to activities necessary to maintain our quality policy for achieving quality goals, we review and amend the management system on a regular basis and evaluate (interval, frequency, scene) opportunities for additional improvement.
4. We assess the need for improvement of the quality management system. If any amendment is required, we will make necessary changes while maintaining the adequacy of management philosophy.

Information Security

1. We take highly advanced protective measures against cyber threats on our computer network and manage our computer system to safeguard it so that no harm will come to others and our own.
2. In order to prevent breach of confidentiality and possible loss of personal information of customers, third-party and our employees, we implement various security measures to manage and protect their information properly.
3. In order to prevent breach and loss of confidential information received from a third party and customer, we manage and protect their information appropriately.
4. We acknowledge that use of social media presents certain risks and carries with it certain responsibilities, and strive to properly utilize social media as a responsible and mature member of the society.

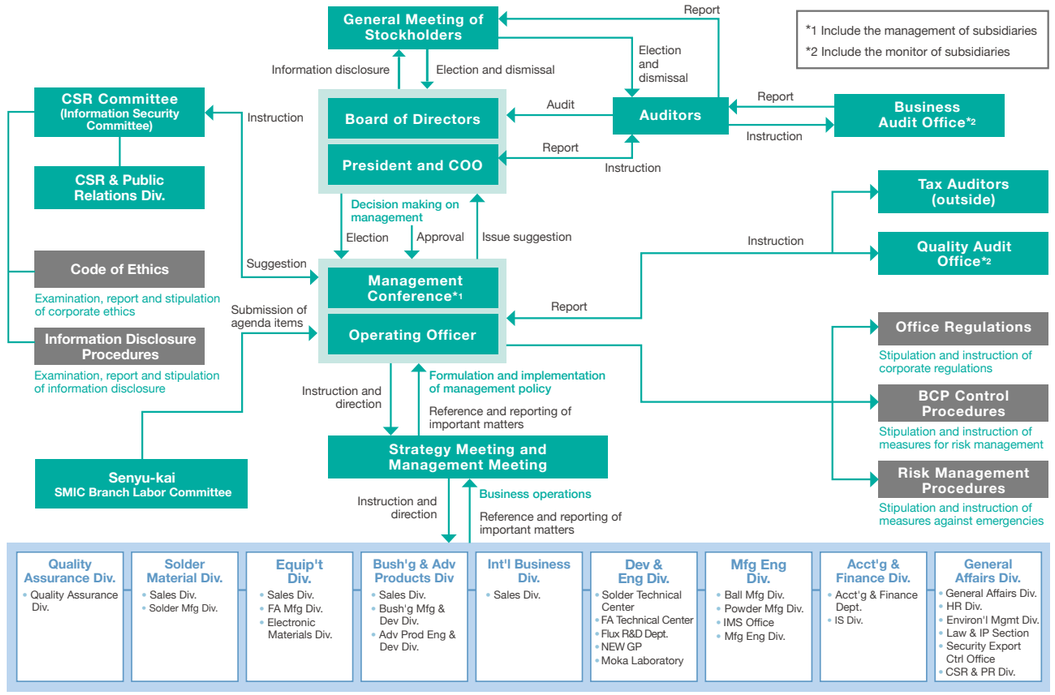
Social contribution (Community Engagement)

We strive to actively participate in social contribution activities and to build long-term relationships with community neighbors and partners.

Economy

Corporate Governance and Financial Status

SMIC holds a General Meeting of Stockholders and Board of Directors as required by law, and strives to strengthen its governance through the placement of auditors including external auditors and tax audits, as well as the establishment of corporate bodies such as a CSR Committee, or convening meeting such as the Management Meeting and Strategy Meeting.



Board of Directors

The board consists of five directors and two auditors (of which one is an external auditor), and as the ultimate decision-making body of SMIC business management, it handles the appointment and dismissal of operating officers and votes on resolutions concerning the submission of agenda items from the Management Conference, in compliance with the relevant laws and regulations and the Articles of Incorporation.

Management Conference

The meeting consists of directors, auditors, and operating officers who deliberate on legal matters and decide on or approve important matters concerning the company's business operations. In addition, it submits to the Board of Directors the agenda items concerning the business operations that the Board of Directors should deliberate and make a decision on.

Auditors

Two auditors (of which one is an external auditor) are elected. They conduct audits of day-to-day management activities including the execution of duties by directors. The auditors attend the Board of Directors and the Management Conference to fulfill their responsibilities for preventing illegal or highly improper decisions as well as conduct activities in conformity to the laws and regulations.

Fraud Prevention

The employee office regulations stipulate the importance of compliance. Employees sincerely observe these regulations to maintain order in the company. We also prohibit acts of bribery to comply with "fair trade and ethics" of SMIC's CSR basic policy and "ethics" of "CSR Goals" in order to prevent corruption.

Financial Situation

[Company Information]

Senju Metal Industry Co., Ltd.
DUNS# 690663091
Address of Headquarters
Senju Hashido-cho 23, Adachi-ku, Tokyo 120-0038, Japan

[Scale of Operations (Group Consolidated Basis)]

Sales: 76,772 million yen (April 1, 2017–March 31, 2018)
Capital: 400 million yen (as of March 31, 2018)

[Countries and offices where we have established our business]

UK, Thailand, Czech Republic, Germany, Philippines, America, Malaysia, Mexico, South Korea, Taiwan, China
(Major Japanese domestic customers: 570 companies Major overseas customers: 1,100 companies)

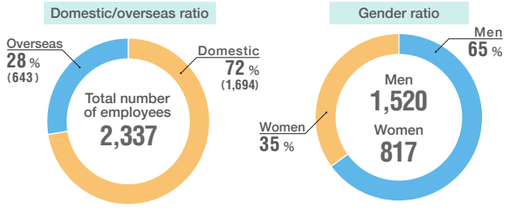
[No. of sites by region]

Japan: 20 (including 8 manufacturing sites)
Overseas: 32 (including 15 manufacturing sites)

[SMIC's Business Areas]

① Manufacturing and sales of alloy, casting, extension and processed goods
② Manufacturing and sales of metal powder, and bearing and bushing products
③ Manufacturing and sales of soldering solvent and adhesive
④ Manufacturing and sales of soldering equipment
⑤ Manufacturing and sales of fire extinguishing and explosion prevention equipment and materials (Affiliate business)
⑥ Manufacturing and sales of equipment related to the products above

Employee ratio



Society

Relationship between Customers and Employees

Reference:
Our responsibility to society
www.senju.com/en/csr/society/

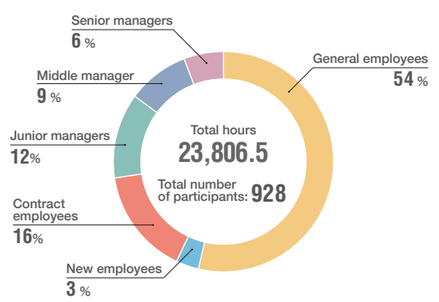
The Senju Metal Industry Group develops and manufactures safe and reliable products. Furthermore, in order to provide the product information promptly and accurately, we aim to disseminate the latest information through exhibitions and events, in addition to the customer support by the Sales Division and Service Division, and have opened an online customer consultation service from our website.

Employee training

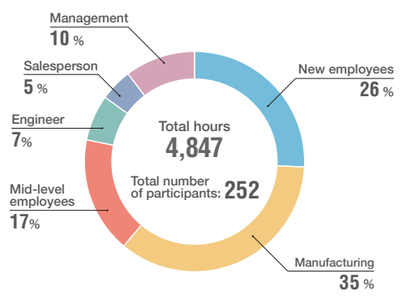
– As a program to train the best human resources, we aim to train the human resources so that they acquire "ability, sincerity, and fighting spirit" –

SMIC's basic educational policy is aimed at making all its employees to be in constant pursuit of knowledge and to train the human resources as such that they can make reasonable decisions by utilizing a broad perspective. Together with e-Learning, group training and other education, 1,365 participants attended 31,594 hours of lectures in the FY2017.
Employees involved in manufacturing participated in an on-site improvement training, following which a debriefing was conducted to discuss what they learned from the training.

e-Learning



Group training



Other training

- English conversation classroom
- In-house product workshop
- Diversity workshop
- Junior management training

Total hours **2,940.5**
Total number of participants: **185**

Social contribution activities

For contributing to the local community, promoting arts, and training the next generation, the Senju Metal Industry Group provides financial assistance to 57 organizations at various sites in Japan and overseas by sponsoring their various activities. For example, we donate to medical/welfare organizations such as Medecins Sans Frontieres (MSF Japan). Our Taiwan branch has been financing the schools and children in need, in addition to making financial contributions to disaster relief funds, etc. We are socially active at several sites in China including Tianjin. In addition to bringing about the economic growth of these areas, we hope that our financial help will cater to the cultural education of the budding generation and boost the creative power of the society.

Securing and confirming the safety of employees

If the Senju Metal Industry Group's Emergency Disaster Control Headquarters are established to deal with any emergency occurring in any of its companies, the Emergency Disaster Control General Headquarters shall be housed in the SMIC Headquarters, from where necessary assistance shall be provided to the affected business establishment. The Emergency Disaster Control General Headquarters shall be responsible for coordinating with whomsoever concerned, making appropriate decisions, and issuing instructions, etc. to check the condition of the affected establishment and ensure smooth execution of the restoration efforts. Furthermore, to secure the means of communication with disaster affected plants in the event of an emergency, we have arranged for satellite mobile phones at our main plants to confirm the safety of our employees while they are not in the office and to make emergency calls from one plant to another. We have also kept stockpiles of disaster goods and emergency supplies for use in case someone is trapped in an elevator.
In order to protect the life of employees in earthquakes and fires, SMIC periodically conducts evacuation drills, fire drills, and lifesaving lessons under the direction of the fire department.

Results of administrative audit

In 2017, we conducted a total of 119 audits at all our plants and sales offices, domestic affiliates, and 11 overseas sites, regarding CSR and security exports. The CSR audit, which is conducted in line with the CSR Basic Policy and Goals that are based on the RBA Code of Conduct, is composed of seven segments, namely "human rights and labor", "health and safety", "environment", "fair trade and ethics", "quality and safety", "information security", and "social contribution". The audit that covered about 260 points was aimed at confirming that the company has continuously maintained a sound management system while protecting the occupational health and safety, and confirmed that corporate compliance was upheld.

(Unit: Number of audits)

Audited locations	Business audit	Security exports	Specified shippers
SMIC	47	30	10
Group Companies In Japan	16	2	3
Overseas locations	11	0	0
Total	74	32	13

Society

Relationship with Suppliers

Our Path to "Conflict-Free Sourcing"

Ever since January 2011, when we became a member of the RBA (Responsible Business Alliance, Formerly EICC), we have been attending the RBA General Meeting held around the world, and have established close relationships with the client companies listed on the US market. As a member of the RMI (Responsible Minerals Initiative, formerly CFSI) since 2014, we have actively encouraged the smelters to participate in RMAP (Responsible Minerals Assurance Process, formerly CFSP) and get third party certification. In February 2015, we reported that all our smelter partners were RMAP certified. From the third year on, when stricter compliance with SEC final rules was required, we have continued to call on all smelter suppliers to renew certification with RMAP.
We aim to sustain the safe and reliable supply chain of SMIC products such as solder bars, flux cored solder, preform, anode, paste, and balls.

Procurement Activities – Promotion of Supply Chain Assessment –

Senju Metal Industry clearly states its basic approach in the form of the purchase policy (have a high regard for etiquette towards business partners, fair and sincere procurement) and the following CSR procurement policy for procurement from suppliers.
We also ask our suppliers to fulfill 14 items based on the ISO9001 and ISO14001 requirements and the supply chain assessment guidelines established by the RBA, as our basic approach towards procurement from suppliers.
Audit activities for our Japanese and overseas business partners are carried out according to the annual plan by the Development and Production Div. that are associated with the Procurement Div. In the FY2017, with cooperation from our domestic and overseas suppliers in supply chain assessment, we confirmed that our supply chain complies with the SCM requirements.

Basic Stance on Requirements for Suppliers
① Compliance with laws, regulations, and social standards
② Promotion of sound business management
③ Priority on product quality, delivery, and reliable supplies
④ Priority on Business Continuity Plans (BCP)
⑤ Environmental considerations
⑥ Prohibition of procurement from regions with social conflict
⑦ Priority on VE (Value Engineering) activities
⑧ Priority on providing information
⑨ Priority on initiatives to shorten material procurement periods
⑩ Strict compliance with confidentiality
⑪ Priority on promoting IT application
⑫ Information security
⑬ Exclusion of antisocial forces
⑭ Social contributions

CSR Procurement Policies
① SMIC “Quality and Safety Policy”
② SMIC “Environmental Policy”
③ SMIC “Purchasing Policy”
④ SMIC “Basic Stance Required of Suppliers”
⑤ IATF16949 (Note) Requirements for Consideration regarding Delivery Items
⑥ Environmental Management Requirements for Consideration regarding Delivery Items

Note: IATF16949: Automotive Quality Management System standard



Visit to the Peru-based smelter minsur

Society

Relationship with Local Community

The Senju Metal Industry Group actively engages in the initiatives to contribute to local communities through culture, sports, and a number of business activities at our sites around the world.

Assistance for basketball tournament for the mentally handicapped

[Event date: October 28, 2017] (Senju Metal Industry Co., Ltd. Kaohsiung Branch, Senju electronic (Taiwan) Co., Ltd.)

Taiwan's social welfare organization "Syinlu Social Welfare Foundation" has been organizing basketball tournaments for mentally handicapped persons since 2011, with the aim of enriching their lives and providing them opportunities of growth. In this tournament that was held with approval from SMIC Kaohsiung Branch and SENJU ELECTRONIC (TAIWAN) CO., LTD., 52 local staff members volunteered at the 7th Nice Day Ball basketball tournament held at the Kaohsiung City Youth Basketball Courts in Taiwan, guided the players of each team and supported the tournament.





CONCERT in MUSEUM [Event date: July 10, 2017] (Sekido Museum of Art)

In the arts and crafts exhibition area at the Sekido Museum of Art located inside our headquarter, "CONCERT in MUSEUM" is organized every year in cooperation with the Adachi Lifelong Educational Promotion Corporation as an activity where locals can enjoy music and art at the same time.
In 2017, animal-themed songs were played on cello, contrabass, and violin, while animal-themed ceramics, metalwork and stonework pieces from around the world were exhibited as part of the "Sekido Zoo" theme. The live performance was graced by about 60 guests.



CSR Committee Launch (Senju Comtek Corp.)

In 2017, Senju Comtek Corp. launched the CSR Committee aimed at local contribution and volunteering activities.
The main activities conducted by the committee included:

- Donation of food items to food bank organization
- Sponsoring the coat donation movement of major US clothing retailers
- Donation of toys to the local fire department
- Donation of stationery to Catholic charitable institution
- Donation to charitable organizations such as the Japan Society for the Prevention of Cruelty to Animals and YWCA (Note)
- Cleaning activities for environmental protection and restoration of local rivers
- Local forest reserve conservation activities

Note: YWCA: The Young Women's Christian Association





Environment

Eco-Factories

What are SMIC eco-factories?

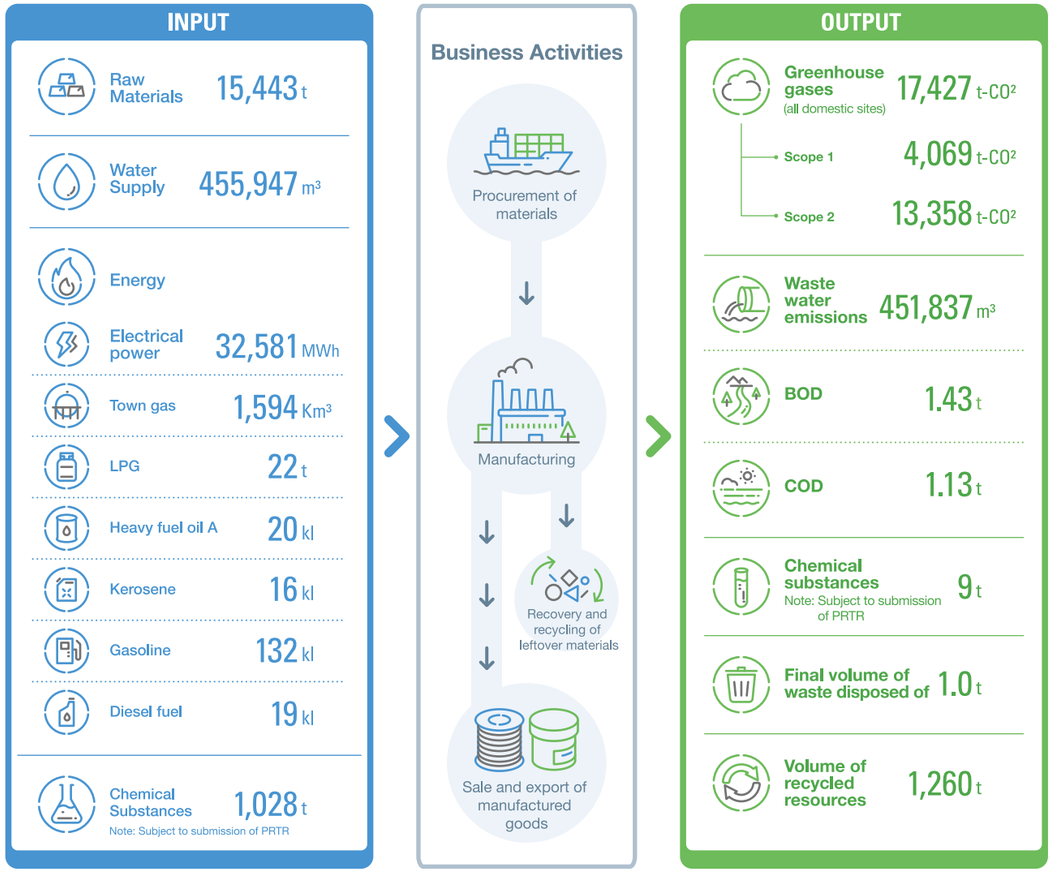
In addition to complying with laws and regulations and reducing the risk of environmental, we conduct energy conservation and 3R (reduce, reuse, recycle wastes) activities at our plants.

The Senju Metal Industry Group not only develops and manufactures products, but also promotes the introduction of eco-friendly facilities at all our production sites, promotes the reduction and reuse of waste, and engages in eco-friendly production activities.

Prevention of global warming – Environmental emissions from business activities in the FY2017 –

We quantitatively monitor and measure the environmental burden associated with our business activities to track input and output information such as the amount of energy used and the amount of emissions. We have implemented environmental improvement efforts to reduce energy consumption, reduce, reuse and recycle wastes, and reduce the amount of specifically defined chemical substances used by us.

GHG (greenhouse gases) emissions at all our domestic sites in the FY2017 reached -6.8% (total emissions being 17,427 tons), to beat our target of -2% compared to 2011.

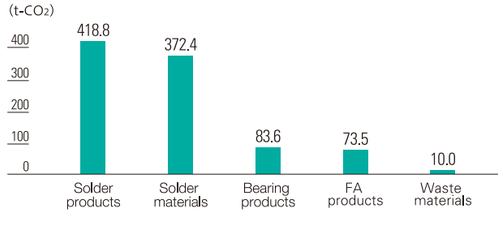


The input and output chart for our Tochigi Plant, which accounts for the majority of all emissions in our Japan facilities

Carbon dioxide emissions due to transport

We are monitoring the items required in scope 3 by calculating the emissions from logistics in 2017 based on the consigned domestic cargo transport volume calculated for each product category, from the transport zone and distance. We also monitor the carbon dioxide emissions pertaining to employee commute.

Carbon dioxide emissions due to transport



Environment

Activities for Preserving Biodiversity

At the United Nations Conference on Environment and Development (Rio de Janeiro Earth Summit) held in 1992, a treaty was signed for the prevention of global warming and conservation of biodiversity. The Senju Metal Industry Group considers it to be an essential task to maintain the earth's ecological balance, declares it as one of the CSR goals, and participates in the ongoing local activities to preserve the biodiversity. A total of 165 employees and their families participated in the FY2017.

The 21st Ishizaki Beach Clean [Event Date: May 20, 2017] (Senju Giken Co., Ltd.)

A local volunteer organization "Miyazaki-no-kaigan-wo-minna-de-utsukushiku-suru-kai—The association to make the Miyazaki coast beautiful" studied how to use the coast in an eco-friendly way and engaged in improving the manners of the coast visitors along the coast of Miyazaki, where rare plants and animals such as loggerhead turtles live. Every year when the loggerhead turtles hatch, cleanup activities are conducted at Ishizaki Beach in order to remove garbage and driftwood which hinder the movement of baby turtles returning to the sea. In 2017, 19 people from Senju Giken Co., Ltd. participated in the activity.

Note: Loggerhead turtles are designated as an endangered species and natural treasure in Miyazaki prefecture.



The 68th Nationwide Tree-Planting Festival Toyama 2017 [Event date: May 23, 2017] (Senju System Technology)

The Nationwide Tree-Planting Festival has been held as the main event of the National Afforestation Campaign since 1950 by the National Land Afforestation Promotion Organization in collaboration with the cities and prefectures where the events have been held every spring in order to deepen the national understanding of forests and afforestation. 6 people from Senju System Technology participated in "The 68th Nationwide Tree-Planting Festival Toyama 2017" attended by Their Majesties the Emperor and Empress. As part of the activities designed to combat cedar pollen allergy, the non-pollen cedars "Tateyama, the brilliance of the forest" researched and developed in Toyama were planted.



Mangrove planting [Event date: October 21, 2017] (Senju (Malaysia) Sdn. Bhd.)

Mangroves are supposedly effective in preventing global warming, because they absorb carbon dioxide, store a lot of carbon, and emit oxygen. The local NGOs plant mangroves every year in the Kuala Selangor Nature Park located to the northwest of Senju (Malaysia) Sdn. Bhd. In 2017, 22 people from Senju (Malaysia) Sdn. Bhd. participated and planted 250 mangrove seedlings.



"The Sea is longing for the forest" tree-planting festival

[Event date: June 3, 2017] (Senju Sprinkler Co., Ltd.)

Satetsu River Cleaning [Event date: April 14 and 15, 2017]

(Senju Electronic Corp., Senju Sprinkler Co., Ltd.)

Creating a healing space in Moka

– Creating wooded areas suited to modern times –

[Event date: March 3, 2018] (Tochigi Segment)

Satoyama Conservation Volunteers

[Event date: September 30, 2017] (Kansai Segment)