

Fastener World Exclusive!

Global Fastener Leaders, Their Carbon Reduction Volume and Progress

CBAM has entered the pilot phase this October. The affected business owners are required to prepare carbon emission data for Q4 calculating from October 1 onwards. This transition period doesn't require the owners to pay for the amount of carbon emission exceeding the quota. The first year of the pilot phase allows the owners to use in their submitted data the default value or verification regulations applicable to the manufacturing countries. CBAM comes into force starting 2026, and from then on, products exceeding EU's carbon emission threshold and entering the EU market will be subject to a carbon tax.

According to the Commission, EU importers of affected products must submit data on the greenhouse gases generated from the entire manufacturing process. The first report will have to be submitted by January 31 next year on a quarterly submission basis. From October 1, an online registration platform which EU sets up for the transition period goes live, through which the importers can make calculations and write emission reports. The Commission will provide detailed guidelines, instructions, and online training resources.

Taiwan exports up to 75% of its fastener production and in 2022 it translated to NTD 200 billion export value, of which 25% was exported to Europe. Taiwan Ministry of Economic Affairs (MOEA) estimates as many as 3,500 manufacturers and traders in Taiwan to take the impact of CBAM, and one of the potentially affected groups is the fastener industry having a total of about 1,860 fastener companies. Fastener owners prioritizing their export target to Europe will bear the brunt. The American and European fastener owners along with a few in Japan have gone ahead collecting data and implementing measures for carbon reduction. So how much have they deducted from their carbon emission? What measures did they take that have been verified to be of reference to us? What are their carbon reduction targets? Referencing their experience, this article aims to help readers get into the basics of carbon emission data and encourage business owners to think up ways to reduce carbon.

● This article will narrow down to two topics—carbon emission statistics and carbon reduction measures.

For the former topic, I will select American, European, Japanese and Indian listed companies with weight in the fastener industry, and extract carbon emission data from their ESG reports into separate tables to help readers understand their respective carbon emission volume and target setting. These tables include Scope 1 (direct emission from a company's own manufacturing process, facilities and use of transportation vehicles), Scope 2 (indirect emission from a company's purchased energy sources),

Scope 3 (all indirect emission from a company throughout the external supply chain, including the emission from business trips and within product lifecycles), as well as the sum of carbon emission.

For the latter topic, I will lay out their respective carbon reduction measures. The common ones include producing green power, planting trees, installing solar panels, and I will repeat those here. Rather, ways that are unique to their characteristics will be picked out for readers to brainstorm and encourage discussion for more creative solutions.



Ground-breaking !

Fastener Distribution Provider The Fastenal Way:

| Fastenal Emission | | | | |
|-----------------------|---------|---------|------------|--|
| Unit: Metric Ton CO2e | 2021 | 2022 | Change (%) | Target |
| Scope 1 | 132,030 | 137,410 | +4.0 | Scope 2 carbon intensity down 5% by 2025. Net zero emission by 2050. |
| Scope 2 | 51,117 | 50,182 | -1.8 | |
| Sum | 183,147 | 187,592 | +2.4 | |

- Using geographic information systems (GIS) to map out the most efficient truck routes. Analyzing departure and arrival schedules to minimize delays caused by traffic in metro areas.
- Optimizing load configuration to minimize non-utilized capacity.
- Back-hauling freight from suppliers and also customers through third-party logistics service to minimize one-way or "deadhead" loads.
- Using telematics to monitor speed and, in turn, improve fuel efficiency as well as safety.
- Operating a RAM half-ton pickup that was fully converted from an internal combustion engine to electric power. Continuing to test and convert vehicles.
- High-density automated storage and retrieval systems (ASRS) equipped with conveyors and robotic cranes to increase throughput while optimizing space in distribution centers.
- Rolling out "sharing space". Using available space within the customer's facilities to provide dedicated staff and inventory for their operations. Consuming minimal additional energy and producing fewer additional emissions.
- Discontinuing the use of plastic shopping bags in public branches. Offering reusable tote bags or paper bags as alternatives.

World's 3rd Largest Aluminum Manufacturer The Alcoa Way:

| Alcoa Emission | | | | | | | |
|-----------------------|------------|------------|------------|------------|------------|----------------------|---|
| Unit: Metric Ton CO2e | 2018 | 2019 | 2020 | 2021 | 2022 | 2022/2021 Change (%) | Target |
| Scope 1 | 17,500,000 | 17,700,000 | 18,500,000 | 17,400,000 | 16,800,000 | -3.4 | Net zero by 2050. Scope 1 and 2 emission down 30% by 2025. Down 50% by 2030 (compared to 2015). |
| Scope 2 | 6,700,000 | 6,600,000 | 5,400,000 | 4,400,000 | 4,000,000 | -9.0 | |
| Sum | 24,200,000 | 24,300,000 | 23,900,000 | 21,800,000 | 20,800,000 | -4.5 | |

- Rolling out **ELYSIS™** to eliminate GHGs generated in the traditional smelting process and emit pure oxygen. Available from 2024 with commercial metal available approximately two years later.
- Rolling out **EcoLum™** aluminum, including wire rods, non-alloy high purity aluminum and P1020 aluminum. Three times lower carbon intensity than the industry average.
- Rolling out the world's one and only **EcoSource™ Aluminum oxide** with carbon intensity below the global industry average.
- Rolling out EcoDura™ aluminum containing 50% recycled materials.
- Currently, there is no technology available to process post-consumer scrap into a quality comparable with primary aluminum. To address this gap, Alcoa is developing **ASTRAEA™** to extract aluminum from non-ferrous metal alloys and turn millions of tons of scrap waste into high purity aluminum, which can be applied to the EV, aerospace and defense industries.

Precision Engineering Product (Fasteners and Parts) Manufacturer The TriMas Way:

| TriMas Emission | | | | | | |
|-----------------------|--------|--------|--------|--------|----------------------|--|
| Unit: Metric Ton CO2e | 2019 | 2020 | 2021 | 2022 | 2022/2021 Change (%) | Target |
| Scope1+ 2 | 86,493 | 85,293 | 83,023 | 82,096 | -1.1 | Scope 2 emission estimated to decrease 92.7 tons CO2e by 2023. |

- Natural gas is the preferred fuel source and is used wherever practical.
- Low-NOx combustion technology is considered when acquiring new equipment. TriMas Aerospace facilities use regenerative thermal oxidation technology to reduce VOC emissions from its surface coating operations by more than 95%.
- Replacing existing lighting with LED lighting.
- Converting TriMas Packaging injection molding machines to a “zero waste” process, in which the excess plastic from the mold runner is returned to the material feed system.
- Using 3-D printing to produce applicable tooling components rather than the conventional machining method, eliminating the waste removed from the feedstock.
- Converting to reusable containers for transporting products to customers rather than single-use cardboard boxes.
- Reducing energy consumption by establishing machine idling and leak tracking programs and processes. Lowering temperatures of certain processes.
- Training employees on energy-saving behaviors and sharing best practices across the organization.

Industrial Product (Fasteners Included) Distributor The MSC Way:

| MSC Industrial Supply Emission | | <ul style="list-style-type: none"> In the past six years, MSC saved 700,000 hours of machine hours, equivalent to more than 100 million kilowatt hours. Helping customers reduce consumption by approximately 1.8 million product units and reduced packaging waste by more than 300 million cubic inches of waste, equivalent of filling nine blimps. Recycling 3,320 pounds of corrugated cardboard, paper, plastic, glass, e-waste, scrap, metal and pallets, as well as more than 76,000 pounds of computers, printers, fax machines and phones. Rolling out vending recycling program. Refurbishing and shipping 587 vending units. |
|--------------------------------|--------|--|
| Unit: Metric Ton CO2e | 2021 | |
| Scope 1 + 2 | 14,468 | |



Further Reading: Dive into MSC's ESG Council Formed in 2021

- The council is led by Steering Sponsors, Executive Vice President & Chief Financial Officer, and General Counsel & Corporate Secretary.
- The council is composed of six overseeing multiple project teams, additional business executives and a variety of subject matter experts.
- Each captain is a leader with functional expertise and influence within the organization who has been selected to lead ESG actors within their designated workstreams.
- This guiding body is deliberately cross-functional to avoid silos and ensure enterprise-wide collaboration and alignment.



■ MRO Product (Including Fasteners) Provider The Grainger Way:

| Grainger Emission | | | | | |
|-----------------------|---------|--------|--------|----------------------|---|
| Unit: Metric Ton CO2e | 2020 | 2021 | 2022 | 2022/2021 Change (%) | Target |
| Scope 1 + 2 | 103,000 | 99,000 | 92,000 | -7.0 | Scope 1 and 2 emission down 30% by 2030 (compared to 2018). 26% reduction already achieved since 2018 with a target completion rate of 87%. |

Rolling out **KeepStock® inventory-management solutions** to help customers use inventory analysis and SKU and cost reduction to minimize excess inventory, number of orders and transportation needed while optimizing space usage, reducing environmental footprint.

■ Building Material, Anchor and Fastener Manufacturer The Simpson Manufacturing Way:

| Simpson Manufacturing Emission | | | |
|--------------------------------|--------|--------|----------------------|
| Unit: Metric Ton CO2e | 2021 | 2022 | 2022/2021 Change (%) |
| Scope 1 | 4,150 | 6,971 | +67.9 |
| Scope 2 | 15,360 | 11,422 | -25.6 |
| Sum | 19,510 | 18,393 | -5.7 |

Rolling out **solutions that help improve the resilience of homes and buildings to disasters**. Products include structural connectors, anchors and fasteners to keep structures safe and strong, ensuring structures remain intact and usable after certain disasters and mitigating economic, environmental and community impact.

The H1A Hurricane Tie provides a connection between the rafter and the wall that helps the structure resist wind and seismic forces.

\\ Visionary ! /

■ Steel Product and Fastener Manufacturer The Nucor Way:

| Nucor Emission | | | | |
|-----------------------|------------|------------|------------|---|
| Unit: Metric Ton CO2e | 2021 | 2022 | Change (%) | Target |
| Scope 1 | 7,100,000 | 6,500,000 | -8.4 | Scope 1 and 2 emission down 35% by 2030 (compared to 2015). |
| Scope 2 | 5,700,000 | 5,000,000 | -12.2 | |
| Scope 3 | 7,300,000 | 8,800,000 | +20.5 | |
| Sum | 20,100,000 | 20,300,000 | +0.9 | |

- Investing in a start-up company – NuScale Power – which is working to **develop the next generation of nuclear power – small modular nuclear reactors**.

- Investing in Electra to **develop a process to produce carbon-free iron**.



Fastener, Logistics, Assembly Service Provider The Bossard Way:

| Bossard Emission | | |
|-----------------------|--------------|---|
| Unit: Metric Ton CO2e | 2021 | Target |
| Scope 1 | 2,421 | Develop new materials for fastening products. |
| Scope 2 | 3,458 | |
| Sum | 5,879 | |

- **Increasing the recycled content of cardboard** to at least 86 percent across all sizes and the content of regranulated raw materials to almost 100 percent for the new flat bags, more than 1.1 tons of CO2 can be saved per year. This switch was even cost-neutral.
- Considering **changes in stretch films and filling paper** to be able to reduce even more carbon emission.

Innovative with R&D Capability ! Fastener and Parts Trader The Würth Way:

- **Developing 3D printing filaments made of recyclable carbon fibers or plastic** to transform the recycled material obtained as waste from the customer into functional 3D printing filaments ready for market. Developing a successful circular economy model in the field of additive manufacturing.
- **Implementing “material passport”** to ensure that product data management remains transparent. This passport contains important information about the material with regard to social and technical compliance, such as the material composition or compliance with environmental regulations. To create a material passport, it is necessary to disclose the product components and their material properties up and down the supply chain. The material properties can be verified using indicators such as origin, toxicity of constituents, and share of recycled materials.

| Würth Emission | | | | |
|-----------------------|----------------|----------------|----------------|----------------------|
| Unit: Metric Ton CO2e | 2020 | 2021 | 2022 | 2022/2021 Change (%) |
| Sum | 313,477 | 322,002 | 320,282 | -0.5 |

Industrial Fastener Manufacturer and Distributor The Trifast Way:

| Trifast Emission | | | | |
|-----------------------|-----------------|-----------------|-------------|---|
| Unit: Metric Ton CO2e | 2022 | 2023 | Change (%) | Target |
| Scope 1 | 1,723.20 | 1,963.65 | +13.9 | Scope 1 and 2 emission down 67.2% by 2035 (compared to 2019). Currently down 4.2% annually. 26.79% reduction already achieved since 2019. |
| Scope 2 | 4,251.46 | 3,942.73 | -7.2 | |
| Scope 3 | 324.61 | 256.91 | -20.8 | |
| Sum | 6,299.27 | 6,163.29 | -2.1 | |

- Working with leading automotive manufacturers in developing new products that are lighter, critically safe, and environmentally friendly.
- Using Footprint Manager, a software by Carbon Trust.
- **Prioritizing the use of manufacturing processes creating low waste**, which include cold forming. Recovering, filtering and reusing lubricants extensively within the manufacturing processes. Where possible, reusing bins, spools and packaging.
- Supplying fastenings in reusable plastic totes to many customers to reduce waste generation.
- Introducing the supplier sustainable sourcing & procurement charter and further developing the quality and sustainability agreement. Requesting that all potential key suppliers complete a supplier sustainability questionnaire to ensure that their ESG practices meet the expected standards.



Mechanical Fasteners and Precision Parts Manufacturer The SFS Way:

| SFS Group Emission | | | | | |
|-----------------------|----------------|----------------|----------------|----------------------|--|
| Unit: Metric Ton CO2e | 2020 | 2021 | 2022 | 2022/2021 Change (%) | Target |
| Scope 1 | 19,742 | 29,680 | 27,166 | -8.4 | Scope 1 and 2 emission down 90% by 2030. Scope 3 down 90% or less by 2040. 48.4% reduction already achieved since 2021 (compared to 2020). |
| Scope 2 | 85,080 | 87,201 | 67,834 | -22.2 | |
| Scope 3 | 192,071 | 411,417 | 620,185 | +50.7 | |
| Sum | 296,893 | 528,298 | 715,185 | +35.3 | |

Tool handles made of renewable raw materials:
SFS worked with material suppliers and plastic injection molders to find ways of replacing the ABS plastic in tool handles with biopolymers.

Mechanical Connector Manufacturer The Norma Way:

| Norma Emission | | | | |
|-----------------------|---------------|--------------|--------------|---|
| Unit: Metric Ton CO2e | 2021 | 2022 | Change (%) | Target |
| Scope 1 | 5,678 | 4,645 | -18.1 | Scope 1 and 2 emission down 19.5% by 2024 (compared to 2017). |
| Scope 2 | 37,771 | 234 | -99.3 | |
| Sum | 43,449 | 4,879 | -88.7 | |

Developing new products such as quick connectors and thermal management systems to tackle the challenges faced by clients such as weight reduction and lack of space, contributing to e-mobility.

Rail Fastening Component Manufacturer The Vossloh Way:

- Vossloh Fastening Systems operates with 25 percent greater energy efficiency than before by modernizing the washing plant for rail clamps with smaller and lower-temperature baths.
- Providing financial support for employees to purchase an e-bike for their commute to work.
- **Offering Cellentic components and rail fastening systems with a high plastic content that dampen structure-borne noise.**

| Vossloh Emission | | | | |
|-----------------------|------------------|------------------|--------------|-------------------------|
| Unit: Metric Ton CO2e | 2021 | 2022 | Change (%) | Target |
| Scope 1 | 19,655.1 | 27,829.4 | +41.5 | Carbon neutral by 2030. |
| Scope 2 | 15,935.6 | 28,937.9 | +81.5 | |
| Sum | 35,590.70 | 56,767.30 | +59.5 | |



Automotive Part and Fastener Manufacturer The Sundram Fasteners Way :

| Sundram Fasteners Emission | | | | | |
|----------------------------|---------------|----------------|----------------|----------------------|--|
| Unit: Metric Ton CO2e | 2021 | 2022 | 2023 | 2023/2022 Change (%) | Target |
| Scope 1 | 16,006 | 16,492 | 12,874 | -21.9 | Carbon neutral by 2045. Emission down 25% by 2030. |
| Scope 2 | 75,749 | 115,248 | 129,453 | +12.3 | |
| Sum | 91,755 | 131,740 | 142,327 | +8.0 | |

- **Improving furnace loading rate.** An auto loading cell was fixed in the furnace. The cell automatically opens the door and delivers products to the line. From an output of 50%, the furnace output was raised above 60%.
- Introduction of battery-operated forklift instead of diesel forklift.

- Conversion of LPG fired sintering and continuous annealing furnaces to electrical heated furnaces.
- Installing programmable temperature controllers in pit annealing furnaces.
- **Increasing waste heat recovery and utilization rate in furnaces.**
- Replacing GI roof sheets with transparent Polycarbonate sheets for maximum daylight utilization.
- Upgrading pumps with higher efficiency motors (IE4).
- Using brushless direct current motors which consume low power due to lower frictional losses.



\\ Creative in Manufacturing Process Improvement ! /\

■ Screw, Assembly Machine, Inspection Equipment Manufacturer
The Nitto Seiko Way:

| Nitto Seiko Emission | | | | | |
|-----------------------|--------|--------|--------|----------------------|--|
| Unit: Metric Ton CO2e | 2019 | 2020 | 2021 | 2021/2020 Change (%) | Target |
| Scope 1 + 2 | 30,553 | 26,826 | 30,036 | +11.9 | Carbon neutral by 2050. Emission down 12% by 2025. Down 30% by 2030. |

- Waste alkali accounts for approximately half of Nitto Seiko's waste, thereby developing the "Waste alkali recovery" equipment.
- Drying up the electroplating sludge to reduce weight and volume.
- Compressing the volume of waste plastics to 1/6 of the original size, and reducing shipment to the RPF (solid fuel recycled from waste plastics) processor from six times to once per year.
- Rolling out new self-clinching stud bolts to replace welded bolts. Introducing lightweight screw locking machines to reduce power consumption.

- Developing a running status detector to minimize idling in the threading process, increase productivity, and save energy.

■ Plastic Connector Manufacturer
The Nifco Way:

| Nifco Emission | | | |
|-----------------------|--------|----------|------------|
| Unit: Metric Ton CO2e | 2021 | 2022 | Change (%) |
| Scope 1 | 617 | 629.7 | +2.0 |
| Scope 2 | 17,591 | 19,160.8 | +8.9 |
| Sum | 18,208 | 19,790.5 | +8.6 |

Providing lightweight materials and high-performance plastic products to reduce carbon emission and tackle air pollution.

Canary in a Coalmine— Asia Clawing Its Way up to Catch up with the U.S. and Europe

We can observe 3 characteristics from the carbon reduction measures of the 16 iconic companies above. One, companies falling under the fastener product category put their focus on optimizing the “manufacturing process” (including threading, forming, heat treatment, packaging), “logistics/transport”, “inventory”, and “customer service”, while steel, aluminum and wire rod companies in the upper stream are locked on developing carbon-reducing material technology. Two, upstream material companies like Alcoa and Nucor emit over 10 million tons of carbon, while fastener companies fall between several thousand tons to several hundred thousand tons. Three, in my investigation of 43 listed companies from the U.S., Europe, Japan and India, I found that 13 companies (30% from the U.S. and Europe) release ESG reports annually. I could only find one Indian and two Japanese companies releasing the reports online. It is an indication that those who have scientifically verified the effectiveness of their ESG measures are still mostly European and American companies. ESG has yet to take the mainstream in Asia.

The EU and U.S. carbon taxes are coming up close and poised as a threat to Asian and Taiwanese fastener companies. Some American and European companies have already done Category 1 and 2 a few years ago, and some of them are working on Category 3. The fastener leaders in India and Japan have completed Category 1 and 2. As far as Taiwan is concerned, with its one-of-a-kind inter-collaborative domestic supply chain, a mutually-beneficial approach could be for Taiwan Industrial Fasteners Institute (TIFI) and Taiwan Fastener Trading Association (TFTA) to set up a "Shared Platform of Carbon Reduction Intelligence and Technological R&D". This could be an online sharing platform or a physical forum, where Taiwanese fastener experts gather to extract the technological essence of the aforementioned 16 iconic companies, brainstorm and refine into carbon reduction technologies suitable for Taiwan. That is the way to catch up with the big trends around the world. ■

