

Global Zero-Carbon Trend

Impact Analysis on Fastener Industry



EU carbon border tax hasn't included fasteners but still concerns Taiwanese fastener companies

1. Carbon border tax turns into a bargaining chip that advanced countries scramble for trade dominance

The current implementer of carbon fees with the most concrete actions is EU which officially announced the plan for **Carbon Border Adjustment Mechanism (CBAM)** in which **Carbon Footprint Verification will be effective by 2023**. **By 2026, Carbon Credits will have to be purchased for products imported into EU to prevent carbon leakage, which literally means regulated parties will have to pay carbon fees, or carbon border tax. The first phase will only cover 5 major industries including cement, steel, aluminum, fertilizer and electricity.** These industries with a carbon emission of around 45% of EU's carbon trade market share are more likely to leak carbon. The coverage will continue to expand and eventually include all imported products by 2036.

The CBAM-impacted HS code that is closest in relation to the fastener industry is code 73 series (including 7301 to 7311). 731600 is steel anchors, 4-claw anchors and parts thereof, and 731700 is steel nails and similar articles. Fastener products start within the HS code 7318 series. EU is the second largest export destination for Taiwan. Even if fasteners are yet to be included in the list, it still concerns many Taiwanese fastener companies targeting the EU market.

China, Russia, India, Brazil, Australia are against CBAM because they think the Paris Agreement allows contracted parties to have differences in paying the responsibility for carbon reduction, which they think is a measure of trade protection. The U.S., UK, Japan and Canada are in discussion to follow suit and they think CBAM is of utmost importance. The U.S. even rolled out a draft for carbon tax that is planned for implementation by 2024, earlier than the EU version. Thailand, S. Korea, Philippines and some other countries express concern over CBAM which they think must comply with WTO regulations, while questioning that EU cannot set a unilateral standard on other countries.

2. Business owners are advised to web search "carbon emission factor" to prepare for certification

Taiwan Executive Yuan has approved the Guidelines for Sustainable Energy Policy back in 2008. In 2009, Taiwan rolled out the "Carbon Label". It is the 11th country to have pushed forward the label and actively established a carbon footprint labeling system as well as a website for product carbon footprint allowing to search for carbon emission of the fastener industry and display carbon emission factors for reference. CO₂e (carbon dioxide equivalent) is a standard



unit of carbon footprint measurement. Spheroidized wire rods, for example, had a CO₂e of 2.91Kg in 2013. In 2016, spheroidized and electroplated screws had 3.37 Kg. These values could come in handy for fastener companies in preparation for carbon emission certification.

Green Production and Development of Taiwan Fastener Industry

1. Green Certification

Fasteners are a fundamental product for global manufacturing, and therefore any changes in industrial policy in advanced countries like the U.S. and Europe will draw attention from Taiwanese fastener companies. Carbon emission is an example. A little more than a decade ago, the U.S. and Europe started a carbon reduction initiative, which led to stipulation of ISO 14000. In 1993, 50 countries formed a technical committee which came up with ISO 14001: 1996 to determine the environment factors involved in the process from material handling to waste discharge, control these factors via necessary preventative measures, and do the best to reduce damage to the environment.

Through the ISO 14001 (environmental management systems), companies can convey a message that their stakeholders are aware of the environment. It isn't compulsory to acquire ISO 14001, but the certification process is done under Eco-Management and Audit Scheme (EMAS) since ISO 14001 is in reference to EU Environmental Law. Acquiring the ISO 14001 is an act of following the law.

The ISO 14001 branched out into ISO 14001 (product carbon footprint) and ISO 14064-1 (greenhouse gas check at the organization level, with the former as the carbon footprint standard and the latter as the standard for quantification and reporting of greenhouse gas at the organization level). The former has the original version formulated in 2013 and the latest version in 2018; the latter has the original version formulated in 2006 and was reprinted in 2018. In fact, each version change literally adds another expense on fastener companies to renew certificates. As long as the policies are not compulsory and clients don't request for certificates, only few fastener companies exporting to EU will apply in order to respond to clients' demand and increase competitiveness.

After advanced countries announced their zero carbon emission targets, apparently there have been more Taiwanese companies inquiring about carbon emission. Figure 1 shows the versions and applicable years of Carbon Footprint Verification standards in Taiwan. ISO 14064-1 2018 and 14067 2018 become valid since January 1, 2022. ISO 14064-2 2019 becomes valid since May 1, 2022.

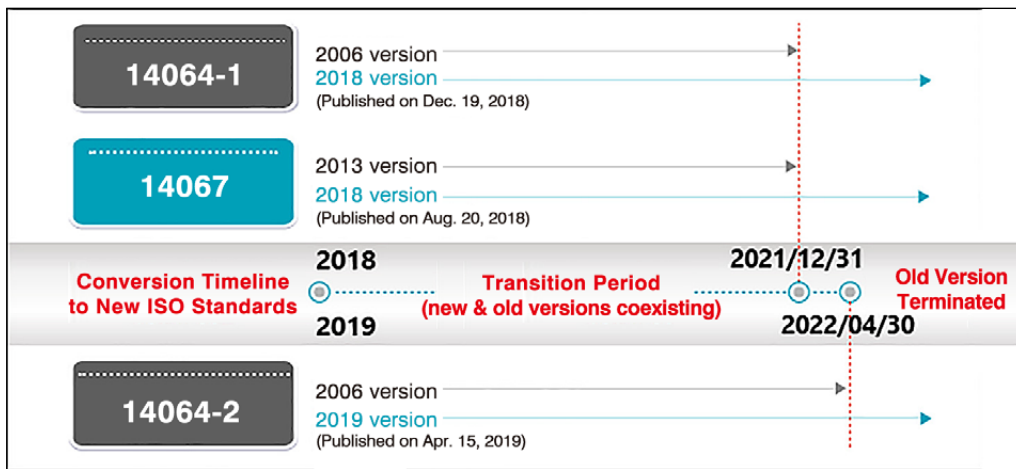


Figure 1. Applicable years of Carbon Footprint Verification standards for Taiwanese fastener companies

Source: Environmental Protection Administration of Executive Yuan, August 2018

ISO 50001 is an international standard for Energy Management Systems that allows factories to utilize documentation, systemization, and the Plan-Do-Check-Act cycle to improve energy efficiency and achieve continuous improvement. **To fastener companies, the biggest challenge about the ISO 50001 is how to thoroughly and systematically adjust production, replace old equipment, and use renewable energy. ISO 50001 can be taken as a necessary path because it can improve energy efficiency.**

International certifications have been elaborated above. Below I will examine carbon reduction regulations from EU, the second largest fastener export market for Taiwan.

Making the traffic and transportation industry the top target of carbon reduction is a global consensus. **EU has the End-of-life Vehicle (ELV) directive.** The directive has 3 targets: 1. to set up a mechanism for collection, processing and reuse to encourage reusing

components of scrapped cars; 2. to set the lowest technical specifications for handling automotive waste; 3. to limit the content of lead, cadmium, mercury and hexavalent chromium in passenger cars and trucks sold after July 1, 2003. This directive affects cars and car scraps, including the accessories, materials, spare parts, alternatives, manufacturing companies and material suppliers thereof. Fasteners are also included. It is regulated that the reuse and recovery of scrapped cars should at least reach 85% of a car's average weight per year.

High value automotive fasteners mostly have to go through electroplating or heat treatment which should be heeded more in selecting outsourced products such as coatings that are highly rust-free bright and transparent.

Electrical and electronic engineered products renew and replace themselves very fast. Especially in developed countries



with a high income, electrical & electronic engineered waste is a huge burden to the environment. It often contains hazardous materials that create problems in handling. Therefore, **EU targeted quantitative & qualitative integration management of electrical & electronic engineered waste, and developed a series of eco-friendly directives including WEEE, RoHS and EuP.**

In addition, construction fasteners used to comply with Construction Products Directive (a.k.a “CPD”). For a more stringent CE verification of construction products, **from July 1st 2013, Construction Product Regulation No.305/2011/EU (a.k.a “CPR”) announced by EU replaced CPD as a mandatory regulation.** It greatly raised the requirements on construction products in terms of resistance to fire, energy conservation, environmental protection, health and noise impact.

Companies not conforming to the requirements will find it difficult to have their products accepted within the EU. The European standards applicable to the CE verification of construction products mainly include hEN as well as European Assessment Document announced by EOTA. CE-certified construction products will have to meet their declaration of performance to have a CE label and circulate within the European Free Trade Association member countries.

2. Green Energy

In Paris Summit held in 2015, Ulrich Spiesshofer (CEO of ABB) said the best way to reduce carbon against climate change is to improve energy efficiency, which literally means the best energy is energy conservation. Taiwan fastener industry is not in the CBAM carbon tax list for now, but there are concerns that the industry may not meet the carbon emission standard. On the other hand, most Taiwanese fastener companies have not taken actions, waiting on EU to make the tax mechanism more complete. For one, they outsource most of their electricity-intensive manufacturing process. Two, they have followed the government’s call and switched from energy-consuming to energy-saving variable-frequency equipment. Plus, pure fastener manufacturing doesn’t consume as much electricity as the IT industry does, so there is already nothing more to conserve for most Taiwanese fastener companies having completed the conversion. And third, those that are able to produce green electricity by themselves have been selling the electricity back to Taipower, and a large chunk of electricity sold back to Taipower is bought by the IT industry. This is why the “Conference on Taiwan’s Approach and Strategy for Zero Carbon Emission by 2050” emphasized fair rationing of green electricity to SMEs. I suggest Taiwanese fastener companies take carbon reduction and pricing into consideration when investing in new plants and manufacturing equipment in the following decade.

3. Green Production

In the whole fastener manufacturing process from material (wire rods) handling, production, secondary processing (electroplating, heat treating) to post-production (inspection, packaging), the most electricity-intensive process is energy consumption by equipment, as well as heat treating and electroplating. However, the latter two are mostly likely to be outsourced, and therefore, may not be included into carbon footprint calculation.

The green production of the fastener industry can initially be discussed in two aspects, with the first being the concept of creating a high yield rate to reduce consumption, and the second being the concept of adopting new products to improve factory environment.

A. The 4th “R”: Increase Product Reliability

Conventionally, the 3 “Rs” refer to “Recycle, Reuse, and Reduce”. Opinions vary regarding the 4th R. Some people think it is “Replace”, while others think it is “Recovery”.

**The 4th R:
Replace
or
Recovery**

Regarding green production, MIRDC collected perspectives from many fastener companies and came to a consensus that Taiwan as a long-time fastener OEM country can truly change the environment by designing and manufacturing durable and reliable products. It is the defective products that cause more waste and higher energy consumption, while a fine and reliable product does not need frequent replacement. Therefore, if Taiwan fastener industry is to put true significance of green production into reality, they will have to increase product reliability.

In this concept, a critical role is traders and distributors who in fact are not purely just as simple as taking orders, directing out orders and taking money after shipment. Some of them have to do full product inspection for clients. Given their thorough understanding of clients’ demand, I suggest asking them about the most suitable materials and machines. Otherwise, fastener manufacturers could end up with weak metal materials or miss out on manufacturing equipment which assembles faster or is with a longer service life. Besides turning to traders’ and distributors’ knowledge to create more reliable products and reduce waste, we can also use their logistics and inventory service to reduce factory energy consumption.

B. Use New Surface Treatments to Increase Energy Efficiency

With the world raising concerns about environmental protection and energy conservation, machines become more compact, less weight and operate with higher performance and eco-friendly efficiency. Motors are the most electricity-intensive in industrial electricity consumption. Over 40% of electricity is consumed by equipment, of which motors take the vast majority.

**Nano-lubricant
is by far
a ground-breaking
product for metal
surface treatment.**

One of the reasons that motors consume energy is their full continuous output that consumes energy outside of work hours. The second reason is that when a motor outputs energy for metal processing, around 30-45% of the energy is consumed by the friction between metals.

Therefore, one of the best solutions for factory carbon reduction is to improve metal surface treatment, reduce metal-to-metal



friction, avoid unnecessary energy consumption, and improve energy efficiency.

Nano-lubricant is by far a ground-breaking product for metal surface treatment. It is currently under experiment in many fastener companies. Using nano-water-lubricant with machines and shot peening on dies for surface modification can reduce friction, lower temperatures, and effectively reduce smoke. It comes with 3 benefits: 1. improving the production environment, less grease and smoke, and a better workplace; 2. as smart equipment usually requires high precision and is highly sensitive, reduced grease and smoke will effectively prevent sensor detection issues and damage. 3. nano-lubricant and surface modification by shot peening will increase dies service life and reduce waste. Based on engineering calculations, the cost-effectiveness grows 150-200%.

C. Digital Transformation is the Prerequisite for Zero Carbon Transformation

The reactions by benchmark automotive fastener companies concerning about EU's carbon tax is to roll out green products without being heat treated, saving as much as 50% energy consumption and reducing around 30% CO2 emission. The heating process is the most energy consuming step in carbon steel fastener manufacturing, because most of the energy goes to heating up the oven to keep it warm and heat up fasteners that need hardening. The process uses cold-forged steel which goes through temperature-controlled rolling and combines with alloys. Through meticulously calculated deformation and hardening, the steel attains the strength (around 800-1000 MPa) on par with those heat treated, completely without heating or cooling. The biggest challenge in rolling out green production lines is to convince clients to trust the benefits of this technical change. It will just be a matter of time before clients become attracted to green products, because most of them are facing the pressure of environmental protection driven by global climate change. Sooner or later clients will have to purchase green products.

There have been some overseas fastener companies using bamboo carbon credit to achieve carbon neutrality as well as dedicating to reducing waste during production. For example, using compressed air energy converter to reduce 40% energy consumption, and using emulsified lubricant to reduce up to 15% waste oil and water produced by machines, using recyclable cloths for paper rolls in the packaging process to reduce paper consumption from 207 tons to 50 tons per day, and completely switching to LED lighting to reduce electricity consumption.

The actions by these U.S. and European fastener companies clearly show that they believe carbon neutrality and environmental sustainability will have more impact on factories and they have to submit data proof. They have started to put those into practice. Their attitude toward carbon reduction and global climate change provides good reference for Taiwan fastener companies.



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No. 457-1, Wenxue Rd., Zuoying Dist., Kaohsiung City 813021, Taiwan
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e-mail: sales@laien.ltd
www.laien.ltd
www.fastener-world.com/en/supplier/laien



Article by **Kristy Chi**

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