

Current Conditions and Challenges of Aerospace Fastener Industry

航太扣件產業現況與挑戰 by Yi-Lang Liu, MIRDC

Current Conditions and Challenges of the Industry

Taiwan's fastener industry has the second highest production value among the metal product industries. According to the survey by MIRDC, in 2013 the industry's annual output amounted to NT\$ 123.9 billion with 1,275 manufacturers and 25,900 employees. The clustering of manufacturers is most evident in southern Taiwan as the plants are all set up around the neighboring China Steel Corporation. The fastener production in Gangshan District of Kaohsiung City takes up about 60% of the total production of Taiwan, adding impetus to the peripheral industries such as molding machines, molds, heat treatment and electroplating and forming an industry cluster with the highest density of manufacturers and the most complete fastener supply chain in the world.

However, the added value of Taiwanese fasteners is quite limited as the entry barrier into the industry is low. The relocation of manufacturers' factories to China and Southeast Asian countries since the late 1990s has caused the technology to be gradually transferred to the local makers in those regions. As a result, Taiwanese manufacturers gradually lost their competitiveness in the market of low-grade and standard products. In addition, with the global economic downturn, the market is shrinking despite the demand remains large and the competition becomes more intense. In response to the changing business environments, Taiwan's fastener industry began its efforts to transform and upgrade by reducing investment in traditional and mature markets and changing the focus to the development of products with small quantities but high added values such as special fasteners for automotive, aerospace, rail and other industrial sectors in order to overcome the current difficulties with advantages and create new niche markets. Led by China Steel Corporation, in 2005 the manufacturers began to produce auto fasteners, which have shown a growing trend in the percentage of fastener exports over the past, as evidenced in the unit price of fastener exports. The unit prices of the fastener exports in **Figure 1** show that except for the slight drop in the wake of the financial crisis in 2009, the unit prices of fastener exports have remained stagnant since 2008, an indication that the fastener industry needs products with higher values to boost the overall price level.

Although ignorable they might appear, fasteners are indispensable parts of various products. Therefore, the higher the degree of industrialization, the larger

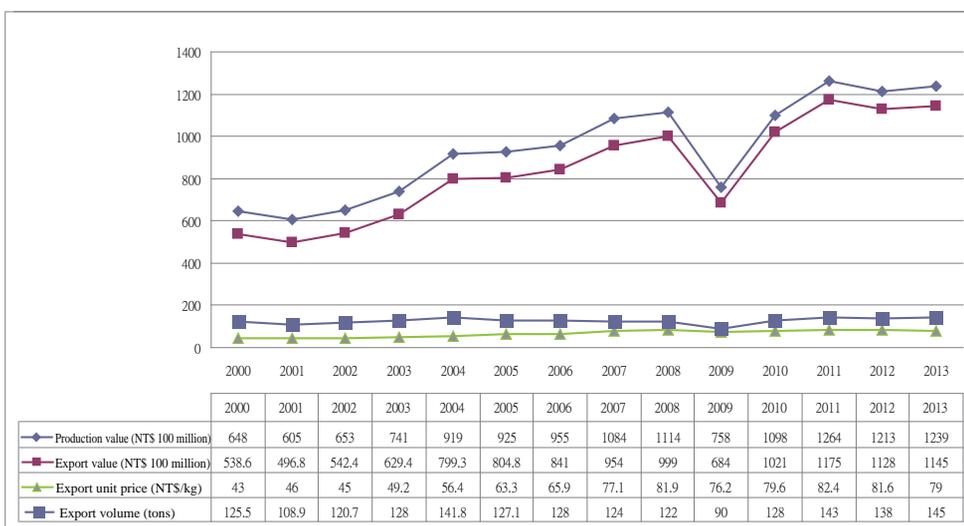


Figure 1. Fastener Production and Sales During 2000-2013

the demand for fasteners. The amount of fasteners being used is also an indicator of a country's industrial development. The main fastener exports of Taiwan are still fasteners used in the furniture, construction, electrical, electronics and machinery industries. Such fasteners still feature the standard items and prices are the primary competitive factor. In this case Taiwanese operators have found it hard to compete with the manufacturers in China and the emerging Southeast Asian countries. In view of their development trend in recent years, auto fasteners are likely to become the new mainstream of exported products. However, with the auto plants relocating to emerging countries, manufacturers in these regions are rapidly catching up from behind. This has put Taiwan's fastener industry on the crossroad of transformation. With the shift of the global economic momentum, European and North American countries are continuously releasing high value added orders to Asia, which is a very positive driving force for the transformation of Taiwan's fastener industry. The competition from China and Southeast Asia can be regarded as the stimulus for industrial growth. Therefore, the industry should shift from the past mindset of "mass production" of standard products to the idea of "fine production" of diversified products in small quantities with high added values.

For safety reasons, aerospace fasteners are subject to very strict standards in materials, processes and quality assurance tests. The aerospace fastener manufacturers must first apply to become qualified suppliers, namely obtaining certifications from governments or vendors, for example the U.S. Federal Aviation Administration (FAA) in the former case and the Boeing Company in the latter case. Taiwanese companies have experience in producing auto fasteners and are very familiar with the manufacturing process, testing, quality management systems, international standards certification or customer

certification systems. Moreover, the price of aerospace fasteners can be as high as NT\$ 5,000 or more per kilogram, quite suitable for becoming the mainstream product at the next stage for Taiwan's fastener industry.

Market Analysis

The aviation market includes new aircraft and maintenance sections. In terms of flight business, the market can again be divided into two major segments of passenger and cargo aircrafts. According to the forecast of Boeing in 2013, the global demand for new commercial aircrafts from 2012 to 2032 is 35,280 units valued at NT\$ 144 trillion in which the Asia-Pacific region takes up the highest proportion for 12,820 planes valued at NT\$ 56.7 trillion. In the next 20 years, the demand for new cargo planes is estimated at 850 units valued at NT\$ 7.2 trillion or so. Aerospace fasteners belong to the aircraft components market which consists of the components needed for new aircraft manufacturing, the spare components for old aircrafts operation as well as the components required for maintenance of the used for a ratio of about 55% (new aircrafts) : 45% (old aircrafts). The demand for new aircrafts will drive the demand for related components. A Boeing 767 takes about 1.8 million screws and nuts and a 787 model needs about 500,000 titanium screws and nuts. However, it is very difficult to accurately figure out the general output of aerospace fasteners. The method of estimation used in this article is based on the production value of the aviation market. The data of Flight International show that in 1998, the cost of fasteners accounted for about 1.5% of the total cost of a new aircraft. Based on this figure, it is estimated that the annual global demand for aerospace fasteners is worth about NT\$ 150 billion with an annual growth of 5% to 10%. Currently, Taiwan accounts for only 0.8 percent of the global aerospace fastener output, so there is still much room for growth as major manufacturers like Boeing and Airbus and their suppliers are moving their production lines abroad or looking for partners in the Asia-Pacific region for reducing the production cost and this is the best time for Taiwan to be involved in the development of aerospace fasteners.

History of Taiwanese Aerospace Fasteners

Taiwan's development of aerospace fasteners began in 1997 when a joint venture of AVIBANK (one of the top three U.S. aerospace fastener manufacturers) and local enterprises was established in Taoyuan County. However, its business operation did not go smooth. The Dassault Group later purchased shares of the company in 1999 and development funds were sourced from the Executive Yuan. The company was renamed to "National Aerospace Fasteners Corporation (NAFC)" and went public. However, the financial crisis ensued shortly after the public offering, forcing the company into restructuring. The ill-fated business remained off-track until 2007 when Mitac Group took it over and reformed the organization again. The business started to turn around a few years ago. On the other hand, with the effort by ITRI Aerospace Center, 5 traditional fastener manufacturers in southern Taiwan including Sanshing Fastech, Anchor Fasteners, Ying Ming Industry, Chun Yu, and Jau Yeou formed the "The Alliance for R&D of Aerospace Fasteners" in October 2002. This alliance received subsidies



Figure 2. Forecast Demand for New Aircrafts from 2012 to 2032

from the Department of Industrial Technology of the Ministry of Economic Affairs in 2004, which helped these five vendors receive the AS9100 international aerospace products security system accreditation, and each manufacturer had at least one product certified, allowing them to be qualified for the aerospace fastener market. Later, due to limited aerospace business, ITRI decided to withdraw from the R&D of aerospace business, as a result, the Ministry of Economic Affairs transferred ITRI Aerospace Fasteners Accreditation Laboratory and related businesses to the Metal Industry Research and Development Center (MIRDC). The history is shown in **Figure 3**. Currently, the aerospace division of MIRDC continues to help Sanshing Fastech and Ying Ming Industry of the alliance enter Boeing's supply chain through industrial cooperation programs. Jau Yeou invested in the "Rising Fast Technology Co., Ltd" for development of aerospace fasteners and aerospace components market, and has obtained the AS9100C accreditation under the National Aerospace and Defense Contractors Accreditation Program (NADCAP) for four special processes, a model of fastener manufacturers crossing into the aerospace sector from traditional production indeed.

Challenges of Aerospace Fastener Development

Despite the fact that the aerospace fastener market is quite attractive, operators often joke about it by saying "You can see it, but never get it". The reasons are summarized as follows:

- 1. High entry barriers of the supply chain-** Currently European and American firms still dominate this market and requirements on quality are very strict. Every part of the production from materials, special processes to quality system all need to be certified in order to enter the supply chain.
- 2. High investment risk-** Manufacturers will be responsible for huge compensation in case of serious aircraft accidents attributable to fasteners. Therefore, it is necessary to have insurance companies willing to insure for risk diversification. However, insurance on aerospace fasteners is not yet an established practice in Taiwan and this has affected manufacturers' willingness to invest due to high financial risk.

In addition, Taiwan's fastener industry still has three following challenges to be addressed before achieving a smooth business transformation.

1. Inadequate material supply capability-

Materials commonly used for aerospace fasteners mainly include aluminum, high-strength steel, alloy steel, nickel-based alloys, titanium, etc., which are mostly imported. For safety reasons, the standards for aerospace fastener materials are more stringent, such as high strength, high operating temperature, high resistance to fatigue and corrosion as well as lightweight in order to improve fuel efficiency. Currently the local materials vendors Gloria Material Technology Corp (GMTC), S-Tech Corp and China Steel Corporation have partial supply capability. Part of the materials of GMTC have been accredited, but the overall supply volume is still insufficient, and the cost remains higher than those of imported materials.

2. Inadequate process technology and talents-

Due to different materials and strict quality requirements, the production techniques of aerospace fasteners including mold design, molding, thread rolling, heat treatment, surface treatment and testing methods are different from the general industrial fasteners or auto fasteners. Currently, Taiwan's fastener manufacturers are not adequately familiar with the new materials and the process, in addition, they need to set up new process equipment and precision measuring instruments in order to meet the requirements of the aerospace industry. The huge investment amount with a long payback period will also affect the manufacturers' willingness to invest.

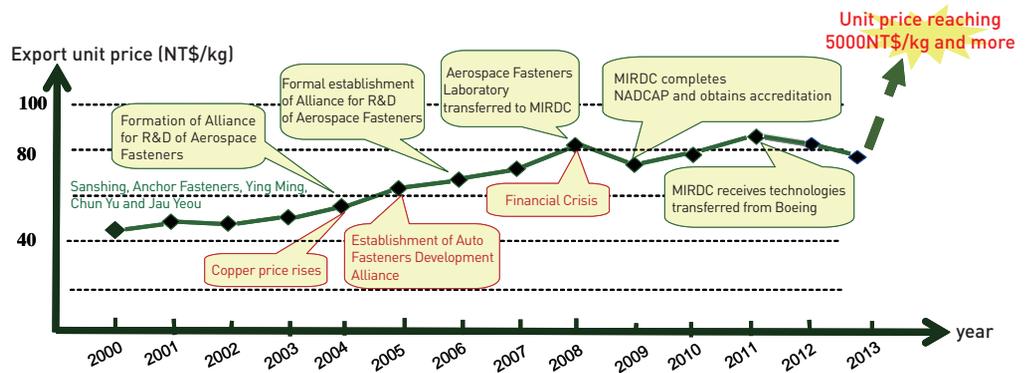


Figure 3. History of Taiwan's Aerospace Fastener Development

Source: Compiled by MII, MIRDC/2014.5

3. Quality accreditation has not been completed-

For manufacturers of aerospace components, getting accreditations is very important for winning clients' trust. Accreditations required by the aerospace industry include AS 9100 for quality management system and NACAP for special processes and materials. Currently, among Taiwan manufacturers, NAFC and Gloria Material Technology have obtained most accreditations while the rest of vendors still need to obtain many accreditations.

Suggestions of Development Strategy

Taiwan's fastener industry has a very good chance of entering the supply chain of aerospace fasteners in terms of its technology and managerial capabilities. However, proper strategic positioning and long-term planning are needed for a success. Based on the development history and the forecast of the the market demand, this article provides the following suggestions for reference for those who intend to enter the aerospace fastener market.

1. Using Taiwan as a foundation to expand business to Asia Pacific and European and American markets

Although the manufacturers of new aircrafts are concentrated in Europe and North America, the airlines or governments in the Asia-Pacific region will be the biggest aircraft buyers in the future. In recent years the Asian-Pacific countries have begun to demand a certain portion of industrial operation offset from the aircraft makers when they buy aircrafts in order to enhance their industrial technologies. One of the most concrete ways is to help manufacturers build their components manufacturing techniques and provide orders. In this case, Taiwan is no exception. The business is now handled by the Aerospace Division supervised by Ministry of Economic Affairs. It is advisable for operators to use this resource by applying the limited fund provided by the government for acquiring technologies from European or North American aerospace fastener manufacturers and negotiate on further technical cooperation in order to shorten the time to enter the supply chain of components. Taiwanese manufacturers can start from the local market for laying a solid foundation first. After accumulating sufficient experience and reputation, it will be easy for them to enter European or North American markets by capitalizing on the geographical advantages to form an important supply base in this region.

2. Gaining Clients' Trust in the Maintenance Market Before Entering the New Aircraft Market

Another demand for aerospace fasteners comes from the maintenance of aircrafts. The market forecast shows that in the future the fleets will continue to grow and so will the flight business. This, of course, will trigger the increase of demand in the aerospace fastener market. The volatility of the maintenance market is less than that of the new aircraft market, mainly because the maintenance market is unlike other markets vulnerable to fluctuations in the economy (such as the financial crisis) and political factors (such as wars). It is recommended that operators start from the maintenance market and work with local aircraft maintenance companies (such as Evergreen Aviation Technologies Corporation). It is important that they do not mind beginning from being a tier 2 supplier before becoming a tier 1 supplier; after that, they may have the opportunity to enter the new aircraft market. □