



TAIWAN

Smart Machinery

Key Innovative Industries in Taiwan

Information
Security

Next-Generation
Vehicle

Communications
Industry

Circular
Economy

Green
Energy

Biopharmacy
Industry

**Smart
Machinery**

Semiconductor
Industry

Internet
of Things

International Logistics
and E-commerce



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Policy Initiatives — Smart Machinery Industry Promotion Program

In response to the massive changes brought by IoT, 3D printing, AI, and robot technologies to life and industries, Taiwan implemented the "Smart Machinery Industry Promotion Program" in July 2016, in hopes of upgrading the precision machinery industry into the smart machinery industry. Taiwan aims to increase the output value of the machinery industry through cultivation of professional talent and overall industrial upgrading and transformation, so as to expand international cooperation and market opportunities.

1 | Smart Machinery Promotion Office |

The Smart Machinery Promotion Office was established in February 2017 to help create a new ecosystem for Taiwan's smart machinery industry. Developing various solutions based on Taiwan's precision machinery and ICT industries, such as "digitalization of production management, from Industry 2.0 to Industry 3.0," "establishment of a public platform as a service (PaaS)," and "development of software as a service (SaaS) modules for different industries," to help key industries get engaged in smart manufacturing. The Smart Machinery Promotion Office can help foreign companies participate in testing facilities or exchange platforms and establish supply chain and partner networks in Taiwan.

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2 | Smart Manufacturing Technology Test Site |

The Smart Manufacturing Technology Test Site is a national proofing center equipped with 100% domestically produced high-end machinery processing equipment. The site links digital product systems that are domestically developed and produced, develops machinery processing application service modules, and has realized 9 mixed-model smart manufacturing production lines for parts and components. As a domestic test site for smart manufacturing, this planning center demonstrates to industry the capabilities of domestic equipment in Industry 4.0 applications.

Since the site was opened in September 2018, more than 9,000 visits have been made, and 15 equipment demonstration sites have been created. It has also attracted major international system companies (Dassault Systèmes and Mitsubishi) and supported more than 100 projects, including the incubation of 18 SI companies, the creation of a professional support team, and projects in which 60 domestic automobile, motorcycle, aerospace, semiconductor makers upgraded and transformed 1,219 machine tools and units of semiconductor equipment. These efforts increased output value by NT\$2.845 billion.

Contact Information

Smart Manufacturing Technology Test Site

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3 | Smart Machinery Park |

In coordination with industry characteristics, requirements, and the locations of industrial clusters, the Taichung City Government has expanded

the hinterland of Fengzhou Technology Park in Taichung during Phase 2 development of the Park to build the Smart Machinery Park, which supports the transformation of traditional industries in Taichung City and the development of industries that support the Central Taiwan Science Park. Sales of Phase 1 of the Park have been completed. Applications for Phase 2 began in April 2021 and the area of development is 81 hectares.

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Overview of Industrial Development

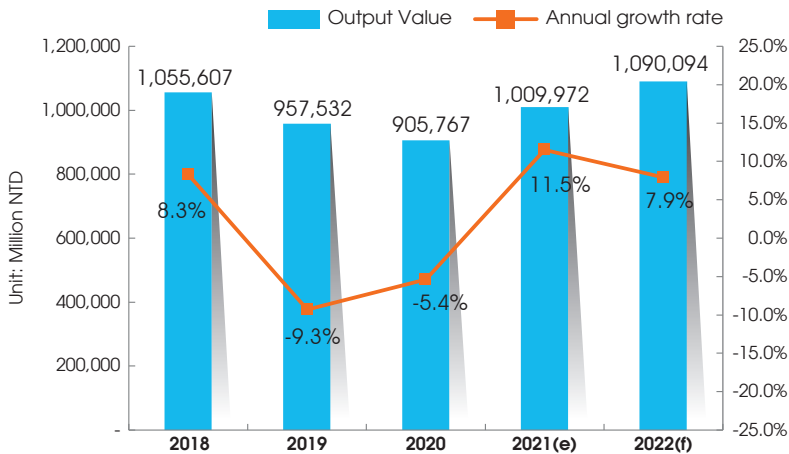
1 | Output Value |

The machinery industry is a key industry that has long played an unheralded role in Taiwan's industrial upgrading. In recent years the machinery industry has benefited from the rise of smart applications and value-added data services. As a result, observers are bullish on the prospects for further development of the machinery industry, which became Taiwan's third largest industry in terms of output value in 2017, after the semiconductor and panel industries.

However, intensification of trade disputes between the United States and China and a significant decrease in demand for industrial machinery caused the output value in 2019 to decline by 9.3% from 2018 to NT\$957.532 billion. The COVID-19 pandemic and exacerbation of the trade war between the United States and China further reduced demand for machinery and equipment in

2020, and output value fell to NT\$905.767 billion. As the pandemic subsides, countries across the world are expected to attach greater importance to supply chain resilience. Changes such as the negotiations between the United States and China on trade disputes will increase global demand for machinery and equipment and promote positive development of Taiwan's machinery and equipment industry. The 2021 output value will move back toward the level of 2019 (Figure 1).

According to figures released by the Taiwan Machine Tool & Accessory Builders' Association, machine tool exports from Taiwan came to US\$2.154 billion in 2020, a significant decline of 29.7% from US\$3.066 billion 2019. Taiwan's main machine tool export markets were China (including Hong Kong), United States, Turkey, Russia, and Vietnam, which imported approximately US\$1.357 billion from Taiwan, thus accounting for more than 65% of Taiwan's global machine tool exports.¹



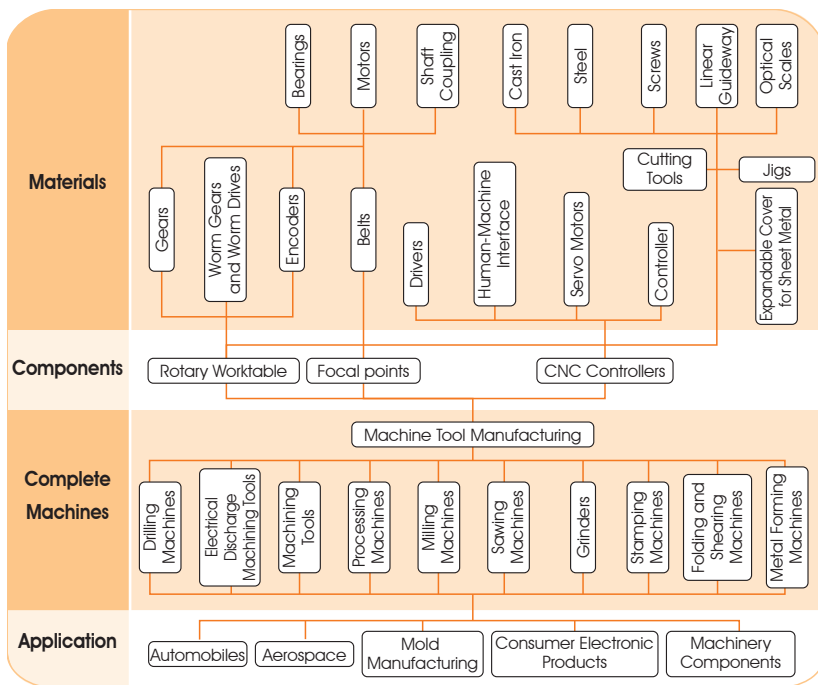
Source: Industry, Science and Technology International Strategy Center, ITRI (May 2021).

Figure 1 Taiwan's Machinery Industry Output Value, 2018-2022

1 https://www.tmba.org.tw/message_show.php?cid=1448863855&pid=1444897335.

2 | Industry Value Chains |

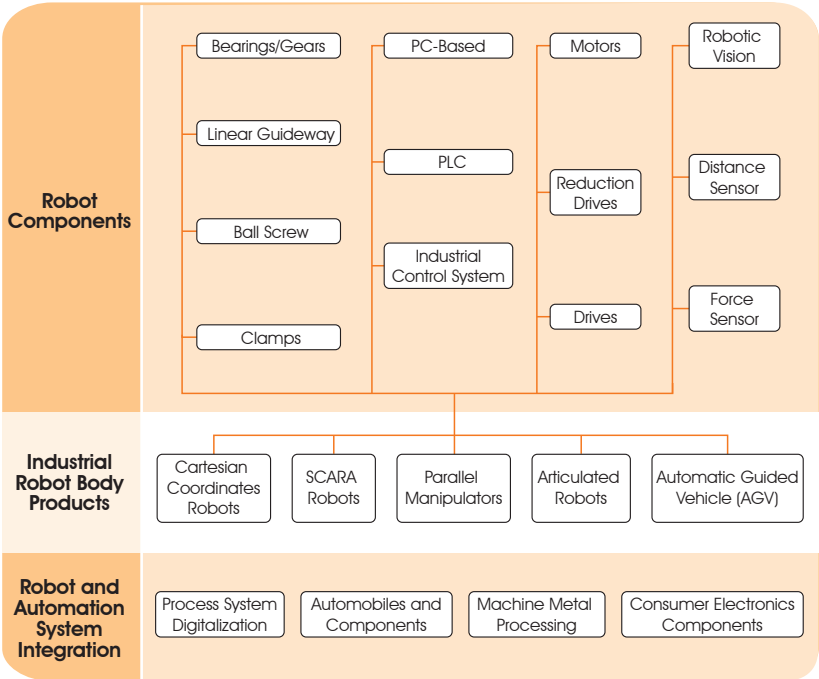
Taiwan has comprehensive industrial clusters for machine tools and accessories, with firms engaged in the production of materials, accessories, and complete machines that make their way into applications in such sectors as automobiles, aerospace, molds and dies, and consumer electronics (Figure 2). These companies have high production efficiency and flexibility that enable them to satisfy foreign companies' demand for machine tools and accessories.



Source: Industry, Science and Technology International Strategy Center, ITRI.

Figure 2 Machine Tool Manufacturing Industry Value Chain in Taiwan

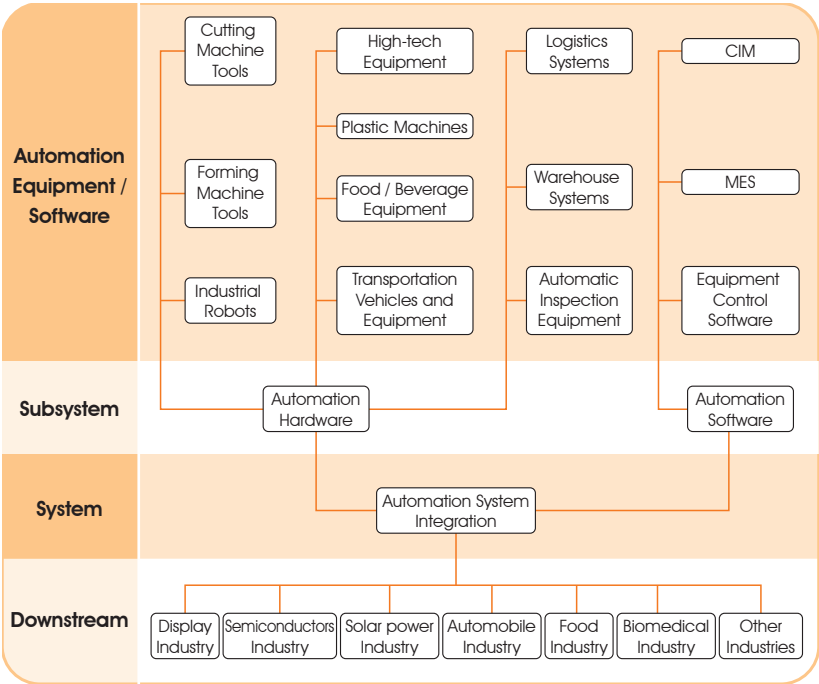
Taiwan's industrial robotics companies have been moving steadily forward in obtaining international quality certifications. They have also significantly increased their independence and formed an industrial cluster in Central Taiwan. The current industrial robot industry value chain includes components, robot bodies, and systems integration (Figure 3). Based on the development trends of human-machine collaboration and the industrial Internet of Things (IIoT), companies will continue to improve their customized engineering services.



Source: Industry, Science and Technology International Strategy Center, ITRI.

Figure 3 Industrial Robotics Industry Value Chain in Taiwan

Taiwan's smart automation systems can be divided into hardware and software. Hardware includes machinery and equipment while software consists mainly of CIM, MES, and equipment control software (Figure 4). These automation systems are integrated for use in such industries as displays, semiconductors, solar energy, automotive, food, and biomedicines. The importance of intelligent automation will continue to increase in the post-pandemic era. The effort to increase the added value of automation system services has become an important focal point of development for Taiwan's manufacturers.



Source: Industry, Science and Technology International Strategy Center, ITRI.

Figure 4 Smart Automation and Industrial Value Chains in Taiwan



3 | Industrial Clusters |

Taiwan's machinery industry mainly consists of SMEs. According to statistics from the Statistics Department, Ministry of Economic Affairs (MOEA), Taiwan currently has approx. 18,000 machinery companies with over 300,000 employees. Industrial clusters have formed in northern, central, and southern Taiwan, and these have fostered the establishment of many important companies.

1. Northern Taiwan

The northern Taiwan industrial cluster in New Taipei City, Taoyuan, and Hsinchu is especially active in the areas of precision sensing equipment, electronics and semiconductor production equipment, automated components and systems integration, industrial computers, and controllers.

2. Central Taiwan

An industrial cluster of firms in such areas as machine tools and accessories, integrated ball screws, linear guides, industrial machinery (carpentry, textiles, rubber and plastics machinery), smart robots, automation components, and systems integration has formed in Taichung and Changhua. As "Industry 4.0" becomes an important development trend in global industry, this

wave of unstoppable revolution in the machinery industry has also powered the active transformation of industries.

3. Southern Taiwan

As for Chiayi, Tainan, and Kaohsiung, there are industrial clusters for machine tools and parts and components, industrial machinery (screw forming and processing, and rubber and plastic machinery), semiconductor equipment, smart robots, controllers, and precision molds. Among the best known firms in these fields are "Tongtai Machine & Tool," "CCM," and "E&R Engineering Corp."

An overview of Taiwan's precision machinery industrial clusters is provided in the figure below:

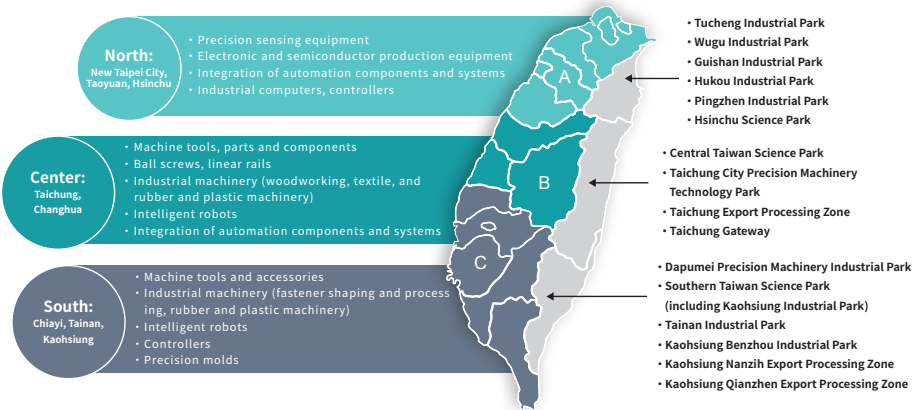


Figure 5 Taiwan's Precision Machinery Industrial Clusters



Potential Investment and Collaboration Opportunities in Taiwan

1

Joint Development of Smart Manufacturing Applications

Taiwan has developed complete industrial clusters in such sectors as semiconductors, ICT, metal processing, auto parts and components, and petrochemicals. The presence of diverse industries and a tightly knit machinery industry supply chain, as well as the government's active promotion of industrial parks and preferential taxes, means that foreign companies can find optimal sites for developing and verifying innovative smart manufacturing application projects. Due to the impact of the trade war between the United States and China and the COVID-19 pandemic, many countries now attach greater importance to industry supply chain resilience, and the manufacturing industry's demand for digital and intelligent applications has continued to increase. Taiwan has abundant R&D capacity and has already accumulated abundant results and experience in digital simulation and analysis, product life cycle management, big data analysis, machine learning, and AI. Taiwan is in a unique position to help foreign companies pursue opportunities for smart manufacturing in the post-pandemic era and is the best partner for foreign companies seeking to seize business opportunities in the development of smart machinery.

2

Cross-industry Supply Chain Collaboration Brings R&D Breakthroughs

The trade war between the United States and China and the COVID-19 pandemic has made supply chain resilience more important for companies. They have accelerated the redistribution of capacity and markets, and adopted a more



aggressive approach for digitalization and intelligent applications. These trends are expected to lead to additional growth in Taiwan's smart machinery industry. In terms of future development trends in industry, the integration and applications of machinery and equipment with robots have become common place. However, IoT and cloud applications, powered by 5G technologies, will strengthen intelligent applications and will be the key for the machinery industry to maintain its competitiveness. Taiwan has comprehensive machinery industrial clusters and supply chains, best exemplified by the rapid formulation of the "Disease Control Mask National Production Team" within a short period of time when the pandemic first struck. Taiwan's advantages in the ICT and semiconductor industries, robust R&D capacity, and ability to rapidly respond to customer needs and implement flexible adjustments will facilitate the efforts of foreign companies to set up cross-sector R&D or production sites in Taiwan and rapidly transform R&D results into products.

3

Exploration of the Continuously Growing Smart Machinery Market

Industry 4.0 has become an important trend in global industrial development. The trade war between the United States and China has also compelled companies to readjust production capacity. Supply chains that were previously concentrated in a handful of production sites have gradually become more regional and dispersed. The COVID-19 pandemic has forced industries to attach greater importance to supply chain resilience and risk management issues, prompted the industry to shift its mindset from "just-in-time delivery" to "assured supply," and led to the construction of new plants in different industries and the growth of demand for smart upgrades to existing machinery and equipment. It has also increased the demand for intelligent service robots, equipment, and integrated systems in sectors such as education, cleaning, and medicine. Foreign companies can seize business opportunities in Taiwan's smart machinery industry by investing in Taiwan or engaging in technical cooperation with related companies. These approaches will enable them to further expand into the future regional/global market.

Investment Incentive Measures

1 | Tax Incentives |

Taiwan's profit-seeking enterprise income tax rate is 20%. To encourage foreign companies to invest in Taiwan, support industrial innovation, and promote industry-academia collaboration, foreign companies are eligible for the following preferential taxes (Table 1):

Table 1 Preferential Taxes

Item	Preferential tax(es)
R&D and introduction of technology or mechanical equipment	<ul style="list-style-type: none">• Up to 15% of the company's R&D expenditures may be deducted from its profit-seeking enterprise income tax for current year; or up to 10% of such expenditures may be credited over three years against the profit-seeking enterprise income tax payable by the company.• Royalty payments to foreign companies for imported new production technologies or products that use patents, copyrights, or other special rights owned by foreign companies is, with the approval of the Industrial Development Bureau, MOEA, exempt from the corporate income tax.• Imported machinery which local manufacturers cannot produce are eligible for duty-free treatment.
Employee stock compensation	<ul style="list-style-type: none">• A company employee who has obtained stock compensation worth a combined total of less than NT\$5 million and continuously held the stock while remaining in the company's employ for at least two years may choose to be taxed on the market price of the stock at either the time the stock was obtained or the time the stock is sold, whichever is lower.

Item	Preferential tax(es)
Investment in smart machinery / 5G	<ul style="list-style-type: none"> • Smart machinery: Automatically scheduled, flexible, or mixed-model production lines that utilize big data, AI, and IoT. • 5G: Related investment projects include 5G communication systems, and new hardware, software, technology, or technical services. • For investments of no less than NT\$1 million and no more than NT\$1 billion, either "5% of investment spending deducted from profit-seeking enterprise income tax (current FY)" or "3% of investment spending deducted from profit-seeking enterprise income tax, if total spending spread over three years" may be selected, but the total amount deducted may not exceed 30% of corporate income tax that year. • The applicable periods are January 1, 2019 through December 31, 2021 (smart machinery) and January 1, 2019 through December 31, 2022 (5G).
Foreign special professionals	<ul style="list-style-type: none"> • Foreign special professionals who meet criteria are eligible for a 50% deduction of total income tax for amounts exceeding NT\$3 million.
Setting up operations in industry parks	<ul style="list-style-type: none"> • Companies that set up operations in export processing zones, science industrial parks, or free trade ports are eligible for exemptions on import duties, commodity tax, and business tax for the import of machinery and equipment, ingredients, fuel, materials, and semi-finished products for their own use.
Others	<ul style="list-style-type: none"> • Companies that use undistributed earnings to engage in substantive investments may exclude the amount when calculating their profit-seeking enterprise income tax.



2 | Subsidies |

1. The Global R&D Innovation Partner Program

Some foreign companies have a high degree of complementarity with Taiwan's industries, so we encourage them to come to Taiwan to plan and develop forward-looking technologies more advanced than those that Taiwanese firms currently possess, as well as key technologies or integrated technologies. By engaging in R&D work on such technologies in cooperation with Taiwanese firms, they could exert a key influence on Taiwanese industry by: (a) spurring R&D work on industrial technologies as well as the establishment and development of supply chains; (b) improving R&D efficiency; (c) accelerating the timetable from R&D to production; and (d) contributing actively to expansion of international markets. Foreign companies that achieve such things, after gaining approval from the MOEA, will be eligible for subsidies of up to 50% of total R&D expenditures.

2. Program for the Development of Pioneering Companies

The purpose of this program is to build Taiwan into a high-tech R&D center and encourage leading international manufacturers to establish cutting-edge R&D bases in Taiwan so that they can work here on forward-looking technologies and link up with the Taiwan supply chain, thereby creating a division of labor in the areas of research, co-creation, and development, with an eye to strengthening the technological competitiveness of Taiwan's leading industries and accelerating the formation of clusters in emerging industries. Program funding of up to 50% of total expenditures may be granted for any project that has been approved by the Ministry of Economic Affairs.

3. Taiwan Industry Innovation Platform Program

The MOEA Industrial Development Bureau is running the "Taiwan Industry Innovation Platform Program" to guide industries to develop toward greater value, and to encourage companies to enter high-end product application markets to increase industry's overall added value. For companies owning R&D teams in Taiwan, the program provides 40-50% of the funding required for theme-based R&D projects, and up to 40% of funding for R&D projects proposed by companies.

Leading Taiwanese Companies

1 | Machine Tools |

1. Fair Friend Group

Fair Friend Group, headquartered in Taipei, has three business divisions – Machine Tools Division, Industrial equipment, and Green Energy Division. The company has 37 brands and 50 production bases in total and has actively promoted smart manufacturing in recent years. It has worked with NexAloT on a smart machinery production line for Industry 4.0 to create a smart processing system.

2. Tongtai Machine & Tool

Besides developing cutting machine tools and conducting application research, Tongtai Machine & Tool expanded to advanced processes for ultrasound assisted processing, laser processing, and metal 3D printing to provide customers with one-stop services for smart machinery.

3. Yeong Chin Machinery

Yeong Chin Machinery Industries Co., Ltd. was founded in 1954 and is one of the few machine tool makers in Taiwan with in-house casting facilities. It is a machine tool manufacturer that can fully promote integrated production operations including casting, machining, machine assembly, inspection, packaging, and shipping. Yeong Chin Machinery relies on intelligent equipment, automation, production management, software development, numerous patents, and a complete product line. to provide customers with a full range of automated and customized services.

2 | Industrial Robots |

1. HIWIN

HIWIN specializes in research, development, and production of precision integrated ball screws, linear transmission components, and industrial robots. In coordination with industrial development trends, HIWIN is gradually transitioning from individual parts and components to system development, and is actively investing in medical devices, solar power, wind power, semiconductors, ICT, and precision machine tools to aid the development of Taiwan's industries towards smart manufacturing.

2. Delta Electronics

Delta Electronics has the capacity for the production, research, and development of smart machinery applications, including inverters, servo drive systems, power management, sensors, logic and motion control, industrial robots, SCADA software, and industrial information management systems.

3. Techman Robot

Techman Robot was founded in 2016 as a subsidiary of Quanta Group, one of the largest computer and laptop manufacturers in the world. It is also the first collaborative robot manufacturer in Taiwan. The company has become the collaborative robot brand with the second largest market share in the world. It provides collaborative robots with built-in vision systems, smart factory management software, and solutions.



3 | Smart Automation |

1. Advantech

Advantech is a leader in comprehensive system integration and design services in Taiwan. It offers products and solutions such as remote I/O modules, industrial communication equipment, automation controllers and I/O, embedded automated industrial computers, industrial tablet PCs, smart factory cloud integration, and smart equipment automation.

2. Mirle Automation Corporation

Mirle Automation Corporation was founded in 1989 and it has become a major manufacturer for automation engineering services in Taiwan. It provides automation production and process application equipment and products such as integrated touch panel conveyor systems, clean room automatic material handling and storage systems, robot applications, computer network equipment services, and industrial controllers.

Examples of Successes Achieved by Foreign Companies

1 | Production and Technologies |

US-based Energid and Taiwan's NEXCOM International Co., Ltd. jointly developed a 7-axis industrial robot. NEXCOM's subsidiary NexCOBOT Taiwan will continue to develop and expand its markets. Applied Materials invested in a manufacturing center in Taiwan for equipment used to produce displays. Yaskawa Electric Corporation invested in a robot R&D and exhibition center in Taiwan.



2 | Cross-industry Collaboration |

In January 2020, Keysight Technologies, a leading test and measurement equipment provider from the United States, and MediaTek, a semiconductor maker in Taiwan, announced a technology cooperation partnership for business opportunities in the future 5G market. With Keysight Technologies' 5G simulator solution and mmWave technologies, MediaTek can establish appropriate network connection formats for various innovation and R&D requirements. It is expected to effectively increase the R&D testing capacity and provide access to business opportunities in 5G applications.

3 | Cooperative Testing Facilities |

Dassault Systèmes established an R&D center in Taiwan and formed an alliance with the Fair Friend Group to seize business opportunities related to smart factories. It also signed an MOU with the city governments of Taoyuan and Taichung to collaborate in projects relating to IoT, startup ecosystems, and innovation and R&D hubs under the "Asia Silicon Valley" program.

4 | Cooperation on Talent Development |

Germany-based Bosch and National Cheng Kung University jointly established a smart manufacturing innovation center to cultivate Industry 4.0 talent. Rockwell Automation of the US and Feng Chia University signed an MOU to form an industry-academia alliance. Besides introducing smart equipment and offering courses on smart machinery, it also established a "corporate IoT application laboratory" which serves as a training classroom, and a "smart manufacturing laboratory" which serves as a demonstration venue to assist in the cultivation of middle to high level talent for smart machinery in Taiwan.



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