ITISPO-100-T202

2011 TAIWAN INDUSTRIAL OUTLOOK

ITIS Program Office　著

委託單位：經濟部技術處
執行單位：ITIS 專案辦公室

Preface

China, which leads the emerging economies in the post-financial crisis era, is increasing its important role and influences on the global economy. The signing of the Economic Cooperation Framework Agreement (ECFA) accelerates the business integration between Taiwan and Mainland China, directly promoting Taiwan's overall economy power. Nevertheless, ECFA also triggers the pressure for Taiwan to adjust its industrial structure portfolio, indirectly reflecting the enormous potential business opportunities and challenges. Taiwanese government needs to aggressively approach other nations for the similar bilateral economic agreements, developing the new business cooperation opportunities. The government should also continue building the industrial intelligent information service system through the mechanism of its industrial policy, which can facilitate the process of industrial transformation and upgrading to create a more competitive advantage position in the global market.

Department of Industrial Technology (DOIT) under Taiwan's Ministry of Economics Affair has been using its sponsored Industry & Technology Intelligence Services (ITIS) Program to integrate the island's research resources from the most major non-profit professional institutes of "think-tanks" to conduct a series of industrial research focusing on the technology & market studies, new business opportunity explorations and governmental policy. Facing the rising emerging markets, the research directions of ITIS Program should not only cover the needs of Taiwanese industries, but also enhance the research on Chinese market as well as other emerging regions. Applying the intelligent service function through the diversified media channels can quickly share the knowledge and provide the industries with the needed information. Only helping the industries to stay in the right track of the industrial trends can assure that Taiwan is ready for the next wave of economic cycles.

To the year of 2011, ITIS Program is publishing "2011 Taiwan Industrial Outlook". This report does not only cover the industrial data/major events of year 2010 and the analysis on the future trends/business strategies, but also include the special overall discussion analyzing the domestic/global economics and major industrial issues. The book has 17 chapters focusing on the industries in which each chapter has its own targeted manufacturing sector addressing its current status, the industrial technology/market outlook, and major events. The special preliminary research reports on the six emerging industries, namely LED Lighting, Photovoltaic, Wind Power, Electric Vehicle, Green Building and Cloud Computing, are also added. This book is very helpful to learn Taiwan's industrial development and its international competitiveness, which can be a plus to be used to develop a better marketing position worldwide.

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ITIS Program Outline

The Program's Purpose

The Industry & Technology Intelligence Services (ITIS) Program was initiated by the Technology Division of the Ministry of Economic Affairs (MOEA) for the purpose of enhancing industrial competitiveness and assisting in upgrading industry. The program focuses on electronics and information industry, the mechanical and metals industry, the chemical industry, and the biotechnology and pharmaceutical industry. These are considered the four main fields for industrial technology and information research.

Through knowledge network building, the formation of industrial think-tanks, undertaking in-depth research, and using an e-platform for the integration of research achievements, the ITIS program aims to provide a complete industrial knowledge service for Taiwan.

Work Sphere

There are seven departments cooperating on the ITIS program, namely the Industrial Economics & Knowledge Center, the Market Intelligence Center, the Metal Industries Research & Development Center, the Development Center for Biotechnology, the Food Industry Research and Development Institute, the Taiwan Textile Research Institute, and the Taiwan Institute of Economic Research.

Service Channels

The ITIS program services are disseminated via all information channels to offer diversified choices. Permanent services include regular publications of research achievements, including survey reports, annual investigations, analytical reports, e-commentary and industry reports. Moreover, ITIS cooperates with the media on a special column for prompt industry information coverage. ITIS regularly organizes seminars, forums, customer consultancy, and special sub-contract research in order to build good communicative relations with customers and fulfill the task of facilitating information flow. ITIS has been re-building it's website (www.itis.org.tw) recently by collating its achievements to promote the integration of its research resources and to provide the most complete industry knowledge via a knowledge service platform.

Published by
ITIS Program Office
Department of Industrial Technology
Ministry of Economic Affairs
6F, No. 51, Chung-Ching S. Rd., Sec. 2, Taipei, Taiwan 100, R.O.C.

First published 2011.4

Price
New Taiwan Dollar 2,000 (NT$ 2,000)

 # ITISPO-100-T202

ISBN：978-986-02-7587-2

Macroeconomic Overview

- Outlook of Global Economies
- Outlook of Taiwan's Economy
- Major Developmental Issues of Taiwan's Manufacturing Sector

Chapter 1 Outlook of Global Economies

ITIS Program, TIER

Chia-Yen Yang; Hui-Ping Lee; Min-Yu Wu; Bo-Chin Chang; Jen-Chieh Tseng

Major Developmental Trends and Issues of Global Economies

US Second Quantitative Easing Monetary Policy Stems the Outflow of Funds

The Fed launched its second round of quantitative easing monetary policy (QE2) under various doubts. The amount, at USD 600 billion, was slightly higher than the market had expected. At the same time, many countries around the world injected huge amounts of money into their economies in order to stimulate economic growth in the wake of the global financial crisis. This brought global money supply to stand at an unprecedented high level.

Many market participants, specialists and scholars argue that the huge amount of money that has been injected into the financial system may not be beneficial for real economic activities like private consumption and corporate investment. The excess money could flow anywhere and cause unexpected violent fluctuations in the financial markets, asset bubbles and future inflation. In this way, loose monetary policy will have a negative impact on real economic recovery. Although the weak dollar is beneficial to US exports, the aid to economic recovery is an utterly inadequate measure. Therefore, many people seem to have a conservative attitude as to the benefit of QE2 for the US.

Less than a month later, the US Federal Reserve Chairman announced that if US economic recovery was not as fast as expected, they would not rule out the possibility of a third round of quantitative easing. In this case, the implementation of a QE3 would be necessary to bridge the gap between the recovery of income and consumption. The current level of US imports is still over two hundred billion US dollars lower than it was at its peak before the financial crisis. Even though Asian emerging economies are actively expanding their domestic market, the increased demand is still unlikely to make up for the reduction in US consumption. In other words, the global consumer market is still shrinking not only in the US, but also in other export-oriented countries. In order to secure a bigger market share, most export-oriented countries have a strong incentive to lower the

Chapter 2 Outlook of Taiwan's Economy

ITIS Program, TIER

Chia-Yen Yang

Domestic Economic Climate and Trends Overview

The recession derived from the financial crisis reached the bottom in mid-2010, and subsequently major economies have shown mild recovery trends. According to the forecasts from the Directorate-General of Budget Accounting and Statistics (DGBAS) in late November 2011, Taiwan's real GDP growth rate was revised upward again to 9.98%, the highest level for nearly 20 years. However, a lower comparative baseline as well as strong export growth in the first three quarters are the main reasons.

With continuing economic recovery, Taiwan's GDP growth rate decreased quarter by quarter reflecting the increasing comparative baseline. The real GDP will be NTD 1.41 billion in 2010, and the growth rate will be 9.98%. The GDP growth rate in the first three quarters was 13.59%, 12.86% and 9.8%, respectively and is forecast to be 4.7% in the fourth quarter.

The following economic performance review presents a detailed examination of consumption, investment, interest rates and exchange rate sides in 2010, and the trends and outlook for 2011.

Table 1-2-1 Expenditure on Taiwan's Gross Domestic Product, 2009-2011

Chapter 3 Major Developmental Issues of Taiwan's Manufacturing Sector

ITIS Program, TIER

Hui-Ping Lee; Chia-Yen Yang

The global financial crisis exposed Taiwan's industrial structural problems of its economic growth model, in particular, that the export market is too focused on the European and American markets, and the excessive concentration on export of information technology and electronic products. This resulted in Taiwan suffering a more serious shock from the financial crisis than the United States. The export product structure and market adjustment is indeed an important subject for future industrial development in Taiwan.

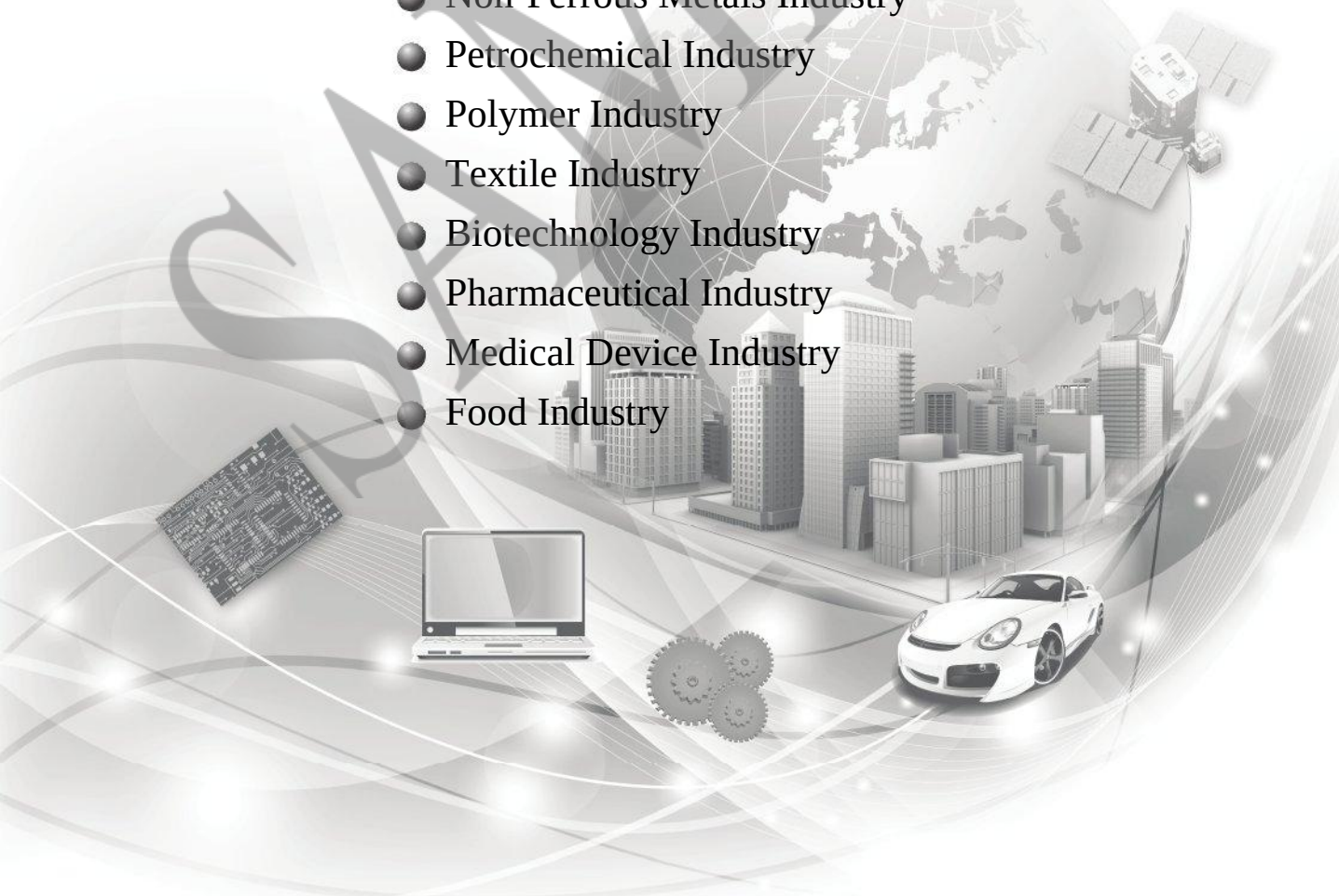
After the most serious recession since World War II, global economic order is facing some important adjustments. Asian emerging economies have become the engine of world economic growth, and from this rapid economic growth, the rise of the middle class and a huge consumer population will present the business opportunities that will be the source of Taiwan's new export growth. We should use this chance to correct the structural problems of excessive concentration of export markets and products.

Asian Emerging Economies Account for an Increasing Proportion of Taiwan's Exports

The easing of trade restrictions with China has meant that the trade effect derived from investment and economic interactions between Taiwan, China and Hong Kong have become increasingly active. The business model of "order to Taiwan, but produce overseas" has had a great impact on Taiwan's trade structure. As to exports, exports to the US accounted for 28.9% of total exports in 1992, but this has since decreased. Affected by the global financial crisis, the export ratio fell further to 11.7% in 2009. At the same time, exports to China (including Hong Kong) were increasing rapidly; only accounting for 18.9% of total exports in 1992, they increased to over 30% by 2003 and reached 40.1% in 2009. As to the changes of trade with other countries, the export share of Japan and European countries fell as well, but the degree was not as much as the US. Exports to India and ASEAN countries have increased significantly in recent years due to strong

Industry Insights

- IC Industry
- Electronic Components Industry
- Flat Panel Display Industry
- Electronic Materials Industry
- Telecommunications Industry
- IT Industry
- Machinery Industry
- Automotive Industry
- Steel Industry
- Non-Ferrous Metals Industry
- Petrochemical Industry
- Polymer Industry
- Textile Industry
- Biotechnology Industry
- Pharmaceutical Industry
- Medical Device Industry
- Food Industry



Chapter 1 IC Industry

ITIS Program, IEK of ITRI

Ling-Chun Chen; Juilin Ray Yang; Mao-Jung Peng;

Chin-Kun Tsai; Kuo-Chu Peng; Chieh-Wei Chen

Introduction

The scope of the Integrated Circuit (IC) industry consists of IC design, IC manufacturing, IC packaging and IC testing when viewed in terms of its sub-industries; if viewed in terms of its products then it consists of memory IC, MEMS IC, logic IC and analog IC.

In 2009 the global market for IC products was worth USD 190.3 billion. Logic was the largest market segment, accounting for 34.3% of the overall IC market. Memory accounted for 23.5%, MEMS for 25.4% and analog IC for 16.8%. Sales growth for the four main IC product categories was negative in 2009 with memory IC declining by 3.3%, MEMS IC declining by 9.1%, MEMS IC declining by 10.2% and Logic IC declining by 11.3%. The reason why memory IC experienced the least decline out of the four product categories was due to demand recovering faster than expected in the second half of 2009. Coupled with cuts in production by manufacturers, this led to demand outstripping supply and a jump in prices.

In 2009, semiconductor sales in North America amounted to USD 38.5 billion, an increase of 1.7% on 2008. North America was therefore the only region to see positive growth, emphasizing its importance once again. The European semiconductor market saw sales slump by 21.9% compared to 2008, making it the region to see the greatest decline in semiconductor sales in the world.

The Taiwanese IC industry declined by 7.2% in 2009 compared to the -9.0% for the global semiconductor market. The design industry, in particular, was worth USD 11.7 billion, a decline of 1.7% on 2008; the manufacturing industry was worth USD 17.4 billion, lower by 16.3% on 2008; the packaging and testing industry was worth USD 9.6 billion, down 13.5% on 2008; among these, the IC manufacturing industry experienced the greatest decline with 16.3%. The IC manufacturing industry consists mainly of the wafer foundries and DRAM manufacturers. While the wafer foundries declined by only 8.7%, DRAM manufacturing saw a drop of 18.8%, and this weighed heavily on the industry output for 2009.

Chapter 2 Electronic Components Industry

ITIS Program, IEK of ITRI

Tsu-Yu Chao; Yvonne Hsieh

Introduction

Electronic components are the foundations of the electronics industry and can be divided into five groups based on the materials used or their product characteristics. The five groups are Passive Components, Light Emitting Diodes (LED), Printed Circuit Boards (PCB), Connection Components and Energy Components (Figure 2-2-1). A brief overview of the makeup of the semiconductor component, passive component, PCB, connector and the secondary (rechargeable) battery industries is provided in the following section.

Figure 2-2-1 Scope of the Electronic Components Industry

Passive Components

As the name suggests, passive components do not play an active role themselves and must be connected to active components such as Integrated Circuits (IC). The main types of passive components include resistors, inductors, capacitors, filters and oscillators. Passive components can be further broken down into RCL (resistors, inductors and capacitors) and RF (radio frequency) passive components.

Chapter 3 Flat Panel Display Industry

ITIS Program, IEK of ITRI

Nancy Liu

Introduction

Flat Panel Display (FPD) refers to displays based on non-cathode ray tube technology. Individual product technologies include Plasma Display Panel (PDP), large size (larger than 10″) Thin Film Transistor Liquid Crystal Display (TFT LCD), small and medium size (smaller than 10″) Thin Film Transistor Liquid Crystal Display, Twisted-Nematic/Super-Twisted-Nematic LCD (TN/STN LCD), Organic Light-Emitting Diode display (OLED) and Micro Display (Table 2-3-1). Vacuum Fluorescent Display (VFD) and pioneering displays can also be considered a part of the FPD industry. Pioneering display technologies such as Field Emission Display (FED), 3D display and flexible display are still in their infancy, so only a brief mention will be made here.

Developments in key TFT LCD components such as glass substrate, color filter (CF), backlight unit and polarizer play an important role in the display industry as a whole so are covered by FPD industry observations as well. Upstream chemical engineering materials, driver IC and associated manufacturing equipment are already covered by research into the chemical engineering, semiconductor IC and machinery industries so fall beyond the scope of this chapter. Nevertheless, related industry issues will still be examined here.

Table 2-3-1 Scope of the FPD Industry (by Technology)

Chapter 4 Electronic Materials Industry

ITIS Program, IEK of ITRI

Yang-Jer Yeh

Introduction

To the electronics industry, the electronic materials industry is its upstream supplier and cornerstone. To the chemical engineering industry, it is part of the specialty chemical industry; although the market value is inferior to that of the petrochemical industry, it has a high added value, and electronic materials can be considered as the point of contact between the chemical engineering and electronics industries.

Electronic materials is the general term used to cover a wide range of materials used in many different products. In terms of application or domain, they can be categorized as semiconductor materials, flat panel display (FPD) materials, printed circuit board (PCB) materials, battery materials, recording media materials, passive materials, and optical fiber materials, etc. This paper focuses on the electronic materials for semiconductor manufacturing, Flat Panel Display (FPD), IC packaging, solar cells, and lithium batteries, including functional electronic materials and electronic materials that affect the electrical characteristics of products.

Table 2-4-1 The Scope of the Electronic Materials Industry

Chapter 5 Telecommunications Industry

ITIS Program, IEK of ITRI

Hsin-Pei Yang

Introduction

The Taiwan telecommunications industry can be divided into mobile telecommunications services, local telephone, international telephone, long distance telephone, line/circuit rental, Internet, value-added services and MOD. Increased fiber conversion rate and MOD sales helped the Taiwan telecommunications industry increase its output in 2010 compared to previous years. The arrival of tablet PCs should see increased growth from mobile Internet and value-added services in 2011.

Key telecommunications products such as mobile phones, GPS, Ethernet LAN Switch, WLAN, DSL CPE and Cable CPE accounted for 87% of the total industry output for 2010. The telecommunications services and equipment markets also showed signs of recovery in 2010. Revived demand for telecommunications equipment such as enterprise network communications, operators' value-added services and management systems helped spur the demand for network communications products such as WLAN, Ethernet LAN Switch, DSL CPE and Cable CPE. The popularity of smart phones remained as high as ever and became one of the star products of 2010 in the telecommunications equipment market. On the other hand, this meant that PND products came under an increasing challenge, and this had a knock-on effect on the development of the GPS industry as a whole, making it the only product out of the big six likely to experience a decline in 2011.

Overview of the Telecommunications Industry in 2010

Telecommunications Services

IEK estimates put total revenues from telecommunications services at USD 11.89 billion in 2010, an increase of 1.49% on the same period in 2009. The relative scales of each segment in terms of telecommunications service revenues in 2010 were: mobile telecommunications (59.9%), Internet and data services (13.73%), local telephone (9.08%), line rental (8.67%), international telephone (6.07%), long distance telephone (2.22%) and MOD (0.33%).

Chapter 6 IT Industry

ITIS Program, MIC/III

Chris Wei; Wei-Hsiu Weng

Section One: The IT Hardware Industry

Introduction

The IT hardware industry is very wide in scope though the majority share consists of the computer system industry, which comprises notebook PC (NB), desktop PC (DT), motherboard (MB), and server (SVR). Various computer-related applications involve the use of other peripheral products as well. Examples include terminal applications in the display industry such as the LCD monitor (LCD MTR) and the digital still camera (DSC). Aside from the computer system industry, the IT hardware industry also includes the abovementioned peripheral industries as well. The Taiwanese IT hardware industry's ecosystem is shown in Figure 2-6-1.

Figure 2-6-1 Taiwan IT Hardware Industry Ecosystem

Chapter 7 Machinery Industry

ITIS Program, IEK of ITRI

Hsin-Hung Liu

Introduction

The manufacturing of machinery is a primary industry, and the economic growth in Asia has been a principal driving force behind Taiwan's machinery industry for more than a decade. Taiwan was the largest producer of machinery products imported onto the China market during the "reform and opening-up" period for many years. And yet China, as a market, has gained much attractiveness worldwide for its ongoing economic reform and explosive expansion over the last few years. However, as its industrial policy is geared towards self-sufficient manufacturing of machinery equipment, it threatens to reduce not only the domestic demand for machinery products from Taiwan, but also the growth prospects of Taiwan's machinery firms. As Taiwan is expected to better conform to international trends and meet the generally stepped-up market demand, it is more urgent than ever that the Taiwanese machinery industry develop advanced technologies, with industrial innovation and upgrading technology being the top priorities.

Overview of the Machinery Industry in 2010

Industry Output

The machinery industry in Taiwan has been growing at an impressive pace since the 1980s, with the output increasing from USD 2.0 billion to USD 23.8 billion, or a 12-fold rise, during the three decades between 1981 and 2010. That figure hit USD 24.9 billion in 2008 and was expected to surge further, although hopes were dashed when the global financial crisis broke out in late 2008. There was subsequently a severe decline across the machinery sector throughout 2009, and the output dropped to the 2003 level of USD 15.7 billion. Before the global financial crisis took place, it was predicted that Taiwan's machinery industry would see the output hit USD 33 billion in 2011. In comparison, the post-crisis estimate suggests a solid recovery with the output gaining 51% in 2010 to reach USD 23.8 billion. According to the same estimate, that figure would increase by 26.4% in 2011 to USD 30 billion (Figure 2-7-1) and probably meet the USD 33 billion target in 2013 or 2014.

Chapter 8 Automotive Industry

ITIS Program, IEK of ITRI

Teh-Chuan Sung

Introduction

Automobile Industry

Industry Definition and Scope

The automobile industry can be divided into ten sub-sectors (Figure 2-8-1); these being raw materials, car frame, interior, exterior, car integration, indirect materials, electronics, suspension & brakes, transmission and engine.

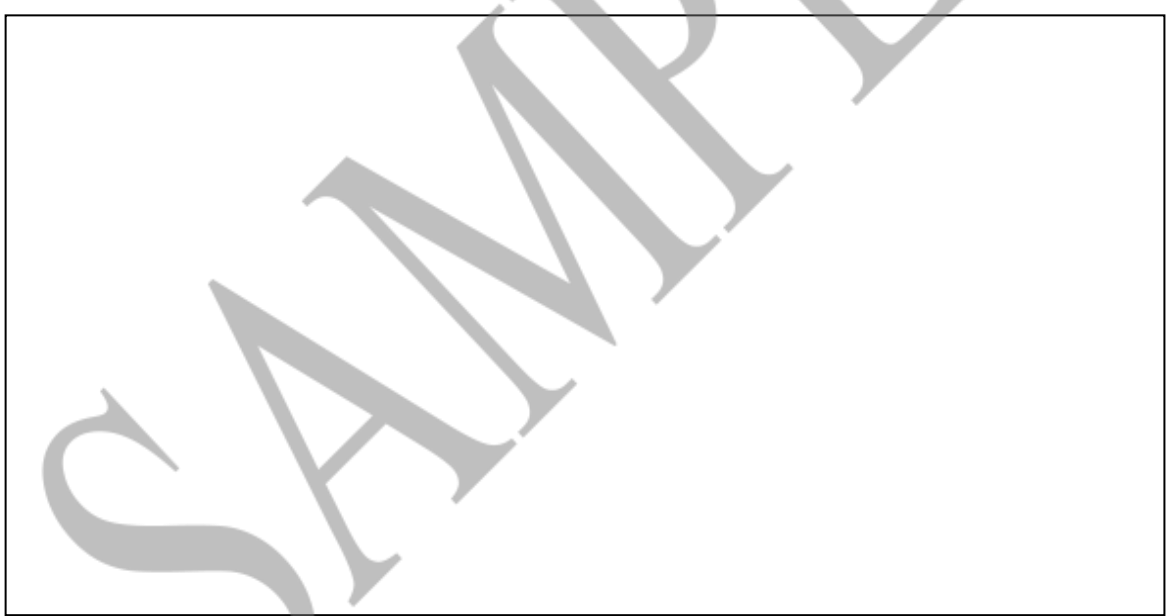


Figure 2-8-1 Automobile Industry Technical Relationship Diagram

Industry Characteristics

The automobile industry is a comprehensive industry that requires high precision, advanced technologies and a high degree of integration. The product has a long development cycle (approximately 3 to 4 years) from initial market research, product research and development to manufacture and final sales. Likewise, the manufacturing process is also highly complex, involving

Chapter 9 Steel Industry

ITIS Program, MIRDC

Chien-Jen Chen

Introduction

Scope of the Industry

According to the ROC Standard Industrial Classification (amended in May 2006), the iron and steel-making industry refers to economic activities for the production of steel ingots, steel slabs or other basic products for the smelting process; steel sheets, tubes, rods and wires and other basic materials that are processed by casting, rolling, extrusion and drawing; and other crude, cast and extruded products. Its scope is illustrated in Figure 2-9-1.

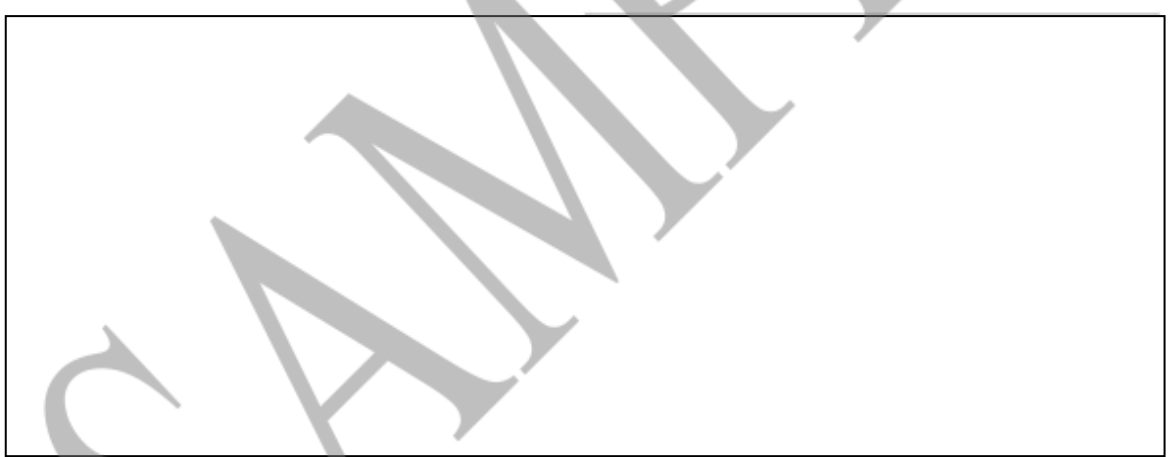


Figure 2-9-1 Scope of the Iron and Steel Industry

Structure of the Industry

Iron and steel manufacturers in Taiwan can be grouped into blast furnace plants, electric furnace plants and rolling plants by material processing method, or into regular steel and special steel by material quality. According to MOEA's *Manufacturing Plant Calibration and Operation Survey*, Taiwan has 687 iron and steel manufacturers, employing a total of 45,679 people.

Chapter 10 Non-Ferrous Metals Industry

ITIS Program, MIRDC

Wen-Hai Liu; Nai-Chi Shiue; Wei-Kai Lin; Jung-Ching Lu

Applications of non-ferrous metals as structural materials include the use of over a dozen metals, the most important of which are: Aluminum, Magnesium, Titanium, Copper, Zinc, Nickel, Lead, and Tin. Non-ferrous metal industries are highly knowledge and technology intensive, have relatively low energy dependence (compared to the iron and steel industry) and high added value. The non-ferrous metals industry has a high correlation with other industries, and consequently, it can help sustain the development of related industries and facilitate the upgrade and transformation of traditional industries. Demands for non-ferrous metals in Taiwan in descending order are Copper, Aluminum, Nickel, Zinc, Magnesium and Titanium.

Smelting and primary processing industries (excluding forging and pressing industries and finished products) of non-ferrous metals in Taiwan involve about 400 companies. Their production volume in 2010 totaled USD 7.93 billion, a 41% growth from 2009, of which copper accounted for USD 2.89 billion or 36%, aluminum materials and their forged products accounted for 24%, and other non-ferrous materials made up 32%. The CAGR over the past 5 years stood at 3.6%, which was mainly due to the rebound of raw material prices in the economic thaw after the world came out of the shadow of the global financial storm. Global copper price in particular soared again, with its spot price reaching a historical new height of USD 9,000/ton in Dec. 2010. Table 2-10-1 shows the trends in production value over recent years. Since non-ferrous metals cover a wide range of materials, this chapter will focus only on copper, nickel and zinc, the three materials that are crucial for Taiwan's industrial development, for an in-depth investigation into their current status and future prospects.

Chapter 11 Petrochemical Industry

ITIS Program, IEK of ITRI

Chen-Cheng Fan

Introduction

Industry Overview

The petrochemical industry is one of the fundamental industries for a country's development, and the development of the industry itself brings broad benefits to national economic development. In addition to the downstream products of the petrochemical industry which are widely used in livelihood purposes, about 60~70% of hardware for industries such as precision products from information, electronics and automotive industries, all come from the petrochemical industry. Examples of such products include components, hard cases, tires and chemicals. Therefore, the petrochemical industry is not only a nation's livelihood industry, but also an indispensable fundamental industry for the development of high-tech industries.

Industry Characteristics

The petrochemical industry is also known as the "industry of 3 intensives", i.e. "capital-intensive", "technology intensive" and "pollution-intensive"; the upstream part of the industry requires greater investment in equipment, more technology, and involves larger risks. The downstream on the other hand requires less capital investment, as the necessary technology is relatively simple, has lesser risks, and the payback period is also shorter. In addition, the petrochemical industry displays the features of a business cycle trend (Figure 2-11-1).

Chapter 12 Polymer Industry

ITIS Program, IEK of ITRI

Chih-Chung Liu

Introduction

The polymer industry is closely linked to the petrochemical industry and features highly-correlated and multi-level processing characteristics. The raw material, petroleum, undergoes refining and cracking to form the basic petrochemical raw materials, which are further polymerized and processed into various downstream products used in product manufacturing industries. Materials such as plastics, rubbers and synthetic fibers all belong within the polymer industry, as shown in Figure 2-12-1.

Figure 2-12-1 Polymer Industry Linkage Diagram

Chapter 13 Textile Industry

ITIS Program, TTRI
Kai-Fang Cheng; Chieh Min; Shu-Ting Wang; Hsin-Huang Lee;
Ya-Wen Lin; Yu-Cheng Liu; Chia-Yi Wu; Hsuan-Fu Chen

Introduction

Textile Industry Categories

The textile industry encompasses a wide range of products and processes, which can chiefly be classified as upstream production processes and downstream product markets. Upstream processes include raw materials used for textiles, spinning, weaving, dyeing and finishing; while downstream products can be classified in accordance with applications as the three categories of textiles for use in clothing, textiles used in home textiles, and industrial textiles. (Figure 2-13-1)

Figure 2-13-1 Textile Industry Categories

Chapter 14 Biotechnology Industry

ITIS Program, DCB

Yu-Chen Hsu

Introduction

The original form of "biotech"—"biotechnology", can be defined as "industrial technology that uses life sciences". The United Nations Convention on Biological Diversity gives biotechnology a more extensive definition: "any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for a specific use". Thus, it appears that unlike other industries, the biotechnology industry is not defined by the product, but by the product manufacturing technology. Biotechnology offers a wide range of applications, with products in the areas of biopharmaceuticals (also called: biotech drugs, biological drugs, biotech medicine), medical diagnostics, specialty biochemicals, agricultural biotech, food biotech, environmental biotech and biotech/pharmaceutical services (Table 2-14-1). It may be said that a country's strategic planning for the development of its biotech industry should be based on its needs and resources, and the major areas selected for biotech application should take advantage of its specific resources to develop niche products with a competitive edge in the world market.

Table 2-14-1 Taiwan's Biotech Sub-industries and Application Products/Services

Chapter 15 Pharmaceutical Industry

ITIS Program, DCB

Lee-Min Chen

Introduction

Taiwan's pharmaceutical industry focuses on medicines for human use, which can be divided as: raw materials, Western formulated medicines and Chinese medicines. The Western formulated medicines can be further divided into small-molecule drugs and biologics. Under current regulations with separate requirements for the evaluation and registration of clinical trials, Chinese medicines can be further divided into: traditional prescriptions, non-traditional prescriptions, and plant extracts. The main categories of pharmaceutical products in Taiwan are shown in Table 2-15-1.

Table 2-15-1 Main Categories of Pharmaceutical Products in Taiwan

Chapter 16 Medical Device Industry

ITIS Program, IEK of ITRI
Ging-Wen Cheng; Yi-Yang Li

Introduction

The medical device industry is associated with the provision of everyday necessities that are critical to human health. Medical devices are used in the prevention, diagnosis, treatment and rehabilitation of diseases to maintain and promote human health. As the medical device industry is characteristically different from other manufacturing industries, massive market volatility as a result of economic changes is less likely to occur. Following the demographic structure change and the disease pattern change from acute and contagious diseases to chronic diseases with the rise of the aging population in recent years, the demand for medical treatment and healthcare has been increasing, continuously driving the flourishing growth of the medical device industry.

Due to product diversity and extensive coverage, medical devices in Taiwan are defined with reference to the definitions used by the USA. Medical devices are clearly defined in Article 13 of Taiwan's Pharmaceutical Affairs Act. According to the Pharmaceutical Affairs Act, a medical device is an instrument, a device, a machine, a material, an implant, an in vitro diagnostic device (IVD) or other object, including components, parts, accessories and software, that can be applied to prevent, diagnose, treat, or relieve diseases, or to aid or compensate the structure and function of the human body. Therefore, the scope of medical devices covers all medical instruments, medical appliances and medical consumables, except for biological products such as blood products and serums, and fitness apparatus. With reference to Taiwan's Pharmaceutical Affairs Act and the Classification of Medical Devices announced by the Department of Health (DOH), medical devices in this study are classified into the following 5 categories: diagnostic and monitory devices, surgical and therapeutic devices, aid and compensational devices, in vitro diagnostic devices, and others, by function, application and structure (Figure 2-16-1).

Chapter 17 Food Industry

ITIS Program, FIRDI

Li-Ting Chen

Introduction

Despite the maturity of Taiwan's food market, the solid operating management and technical skills, sharp market observation, effective vertical integration of upstream and downstream, and division of labor model have established good characteristics and value for the long-term development of Taiwan's food industry. In the last 20 years, Taiwanese food manufacturers have continued to expand their business territory in Mainland China and Southeast Asia, mastering the international market trends and consumer demand. Leveraging the power to strengthen the overseas layout will be another important development opportunity for Taiwan's food industry, as the Taiwanese manufacturers gradually step from Mainland China and Southeast Asia to India and other emerging markets. In 2010, the government has included international Taiwanese gourmet food among the key development projects. Accordingly, extending service capability is also an important step for the development of Taiwan's food industry in the future.

Overview of the Food Industry in 2010

Food Output Increased 11.58%

The output value of Taiwan's food industry in 2010 was estimated to be USD 17.88 billion, which has increased 11.58% from the previous year (Table 2-17-1). At the same time, it also reached the highest level of the past 8 years. The major reason for the output value growth, in addition to being related to the increased international raw material price, is that manufacturers have been devoting themselves to the creation of new high value added products; another reason being the development of new markets in 2010.

The leading 6 subsectors of Taiwan's food industry (representing 60% of total output) were animal feeds (USD 2.45 billion, +9.97%), soft drinks (USD 2.08 billion, +15.45%), other miscellaneous foods (USD 2.07 billion, +22.45%), slaughtering (USD 1.82 billion, +11.86%), flour milling (USD 1.21 billion, +7.72%) and grain husking (USD 0.99 billion, -10.76%). Of these, only the grain husking industry presented a negative growth; other industries have all shown substantial

Emerging Industry Insights

- LED Lighting Industry
- Photovoltaic Industry
- Wind Power Industry
- Electric Vehicle Industry
- Green Building Industry
- Cloud Computing Industry

Chapter 1 LED Lighting Industry

ITIS Program, IEK of ITRI

Chih-Hsun Lin; Chih-Yin Lee

Introduction

The light emitting diode (LED) is a light emitting component made of semiconductor material. There is an electrode on each end of an LED. By applying a low voltage to the electrodes, a very small current flows through it causing electrons inside to recombine with the electron holes and releasing residual energy in the form of photons (light).

The history of LEDs can be traced back to the 1960s when it was mainly used in optical communication, aerospace and military fields. With advantages of low-cost and relative simplicity, it was often used as an alternative light source for laser diodes. As the application of LEDs diversified over time, it has found its own niche and become the main source for signboards and displays.

In earlier times, LEDs were made with gallium arsenide phosphide (GaAsP) in a ternary structure, and the wavelength of light produced by the LED was regulated from infrared to visible green light by controlling the arsenide-to-phosphide proportion. As the shortest wavelength achievable with arsenide phosphide (AsP) was only green light, the lack of blue light capability prevented the LED industry from being able to provide full-color technology. In 1993, the Japan-based Nichia Corporation developed the blue-light LED with gallium nitride (GaN) materials, giving it the capability to produce LEDs in the three primary colors (red, green and blue, RGB) within the visible light range, thus bringing LEDs to the full-color era.

Chapter 2 Photovoltaic Industry

ITIS Program, IEK of ITRI

Meng-Chieh Wang

Introduction

The photovoltaic (PV) industry comprises a wide range of loosely-related, highly diverse technologies. A PV product can be loosely defined as any device that generates electricity by activating the flow of electrons with sunlight.

PV products available on the market now can be divided into flat-plate and high concentration types. Typical products of the flat-plate type are: silicon, silicon thin-film, compound thin-film (both CdTe and CIGS technology based), and the more recent organic products (dye sensitized and organic thin-film cells). The silicon products now play a major role in the flat-plate type PV product sector, with its bigger market size and more complete industrial chain structure. Figure 3-2-1 shows the various segments of the PV industry, from upstream to downstream: polysilicon, crystal ingot/wafer, cell, module, and system.

Figure 3-2-1 Scope of the PV Industry

PV products first appeared in 1960, and the thin-film PV products were first adopted by consumer electronics, such as calculators for instance, in the late 1980s. The recent rise of the PV industry was initiated by the applications of silicon PV modules, promoted by the Sharp Corp. in the 1990's. These PV modules were initially adopted by household users to save on electricity bills.

Chapter 3 Wind Power Industry

ITIS Program, IEK of ITRI

Han-Yi Tsai

Introduction

In 2009, the accumulated capacity for wind power totaled 160,084 MW globally, up from 122,158 MW in 2008, representing an increase of 31%. During the previous five years from 2004 to 2009, the yearly composite growth rate of accumulated installed capacity for wind power was 27.3% and that of annual installed capacity was 36.1%. By the end of 2009, the U.S., China and Germany were the three countries with the largest capacity of wind power generation in the world, with installed capacities of 35.2 GW, 25.9 GW and 25.8 GW respectively. When calculated with the capacity of new installation, China, America and Spain were the top three in global installed capacity in 2009 of which, the capacity added in China and America was 13,750 MW and 9,922 MW respectively, accounting for 62.1% of that for annual installations throughout the world.

Since the beginning of the 21st century, the application of renewable energy has become the direction promoted by the government of Taiwan. By the end of 2010, the commercialized capacity of wind turbines in Taiwan will have reached 475.85 MW.

Overview of the Wind Power Industry in 2010

On June 12, 2009, the "Renewable Energy Development Code" was enacted in Taiwan specifying that the government could implement a purchase mechanism, reward system, and relax regulatory laws to enhance and develop the incentive for renewable energy in order to add 6.5 GW to 10 GW more capacity of renewable energy power generation in Taiwan over the next 20 years. According to an announcement by the Ministry of Economic Affairs (MOEA) on December 18, 2009 regarding the purchase of electricity generated from renewable resources for 2010, the wholesale rate for 1 kW to 10 kW wind energy will be NTD 7.2714/WH (USD 0.230/WH); that over 10 kW, NTD 2.3834/WH (USD 0.075/WH); and that for offshore wind power, NTD 4.1982/WH (USD 0.133/WH).

Chapter 4 Electric Vehicle Industry

ITIS Program, IEK of ITRI

Wen-Jen Chen; Hsueh-Lung Lu

Introduction

Broadly speaking, vehicles that use electricity as the source of driving power can be classified as electric vehicles. Based on differences in their power systems, they can be further classified into four major categories (Figure 3-4-1): hybrid electric vehicle (HEV), plug-in hybrid electric vehicle (PHEV), battery electric vehicle (BEV), and fuel cell electric vehicle (FCEV).

Figure 3-4-1 Classification of Electric Vehicles

Chapter 5 Green Building Industry

ITIS Program, IEK of ITRI

Su-Chin Lin

Introduction

The report issued by the USA's USGBC examines and identifies the environmental impact of buildings from design and construction to demolition and waste recovery. It finds that ordinary buildings in the USA account for 72% of the overall electricity consumption nationwide; 39% of the energy consumed by the entire nation; 40% of all materials consumed; 38% of CO_2 emissions; 14% of total water consumption; and 30% of trash produced in the entire nation (Figure 3-5-1). From this it is clear that buildings are very high energy consuming products, so more concern should be placed on addressing energy saving and waste reduction. In view of this, plans have been developed by major countries to minimize this unnecessary waste of energy and resources through the introduction of 'green buildings'.

Source: USGBC (2009); ITIS Program, IEK of ITRI (2010/12).

Figure 3-5-1 General Building Energy and Resource Consumption in the USA

Green Building Evaluation Indicators

In this regard, evaluation indicators for the green buildings have also been established in Taiwan and can be divided into the following four major groups: (1) Ecology, including biological diversity, greenery scale and site water conservation; (2) Energy saving, including the daily energy saving indicator; (3) Waste reduction, including the reduction of CO_2 and waste; (4) Health,

Chapter 6 Cloud Computing Industry

ITIS Program, MIC/III

Cheng-Chieh Huang

Introduction

The cloud computing industry is very broad in scope and encompasses industries such as IT hardware and IT software services. If the data center for providing cloud services is used as a reference point then it can be divided into two sectors: one is the "Cloud Technology" industry that helps the data center enable data services; the other is the "Cloud Service" industry that uses the data center infrastructure to provide services to businesses or consumers.

Generally speaking, the cloud computing industry can be considered to be technologies and services that enable the user to access IT resources and services over the network. The scope and links of the cloud computing industry are shown in Figure 3-6-1.

Figure 3-6-1 Relationship Diagram for the Taiwan Cloud Computing Industry

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