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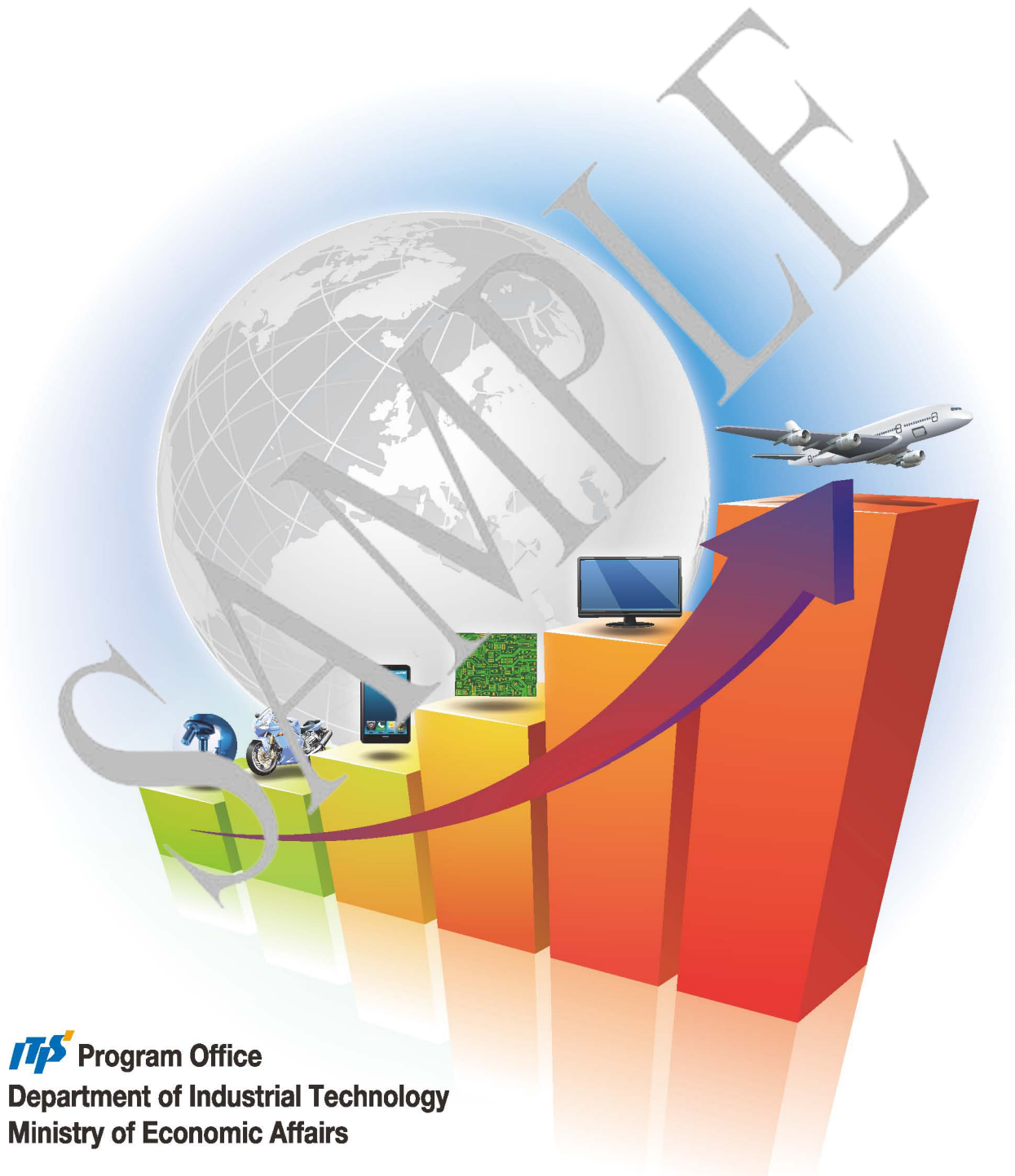
2012 TAIWAN INDUSTRIAL OUTLOOK



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 # ITISPO-101-T302

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Preface

Taiwan, an export oriented nation under the pressure of industrial upgrading, is now facing the challenge of global economic recession plus the impact from the EU debit crisis. The government needs to aggressively approach other nations for the free trade type bilateral economic agreements, developing the new business cooperation opportunities worldwide. Industrial upgrading to enhance Taiwan's competitiveness can be achieved by promoting the technology & science innovation. The government therefore needs to 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 Industrial & Technology Information 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 the emerging regions such as China and India. Applying the intelligent service function through the diversified media channels such as internet, publications and conferences 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 2012, ITIS Program is publishing "2012 Taiwan Industrial Outlook". This publication does not only cover the industrial data/major events of year 2011 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 in which each chapter has its own targeted industry addressing its current status, the industrial technology/market outlook, and major events. On the top of 17 industries, the special observatory 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 current industrial development and its international competitiveness. As such, Taiwan's global market position can be identified.

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Macroeconomic Overview

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Chapter 1 Outlook of Global Economies

ITIS Program, CIER

Meng-Chun Liu; Su-Ling Peng

Faltering Pace of Global Economic Growth

The world's economy began to show signs of slowing in the second half of 2011 due to problems resulting from the European debt crisis. As a result, major international organizations have adjusted their projected economic growth of major countries and the rest of the world downward. For example, the economic projections released by Global Insight in January 2012 put the global economic growth in 2012 at 2.7%, slightly down from the 3.0% growth of 2011. The IMF has also revised their estimate for global economic growth in 2012 to 3.3%, down from the 4.0% figure released in September 2011.

With the 3-year refinancing provided by the European Central Bank, European banks have received an injection of EUR 489.19 billion (USD 641 billion) and various relief programs, e.g. joint efforts by six central banks, and there seems to be a glimmer of light at the end of the tunnel with respect to the debt crisis situation. In the U.S., automobile sales grew by more than 11% in January 2012, the highest growth in two and a half years. January data shows that the Eurozone PMI and the U.S. ISM reached their highest levels for 5 months and 7 months, respectively, which suggests that the risk of a second recession for Europe and North America has been significantly reduced. The January PMI data released by the Chinese government and HSBC Bank also indicate a rebound for two consecutive months. This shows that the economic growth of major countries may have been better than previously expected.

First of all, various quantitative easing policies (such as the QE3 that is widely expected to be implemented) may be accompanied by a large quantity of hot money and speculative activities on raw material prices, which may lead to stagflation. Secondly, signs of a reverse in China's macroeconomic policy have appeared. In addition to the slowing growth in China's economy, concern of an asset bubble is a constant theme. Thirdly, geopolitical unrest, including the crises in Iran and other areas in the Middle East as well as the political succession issues in North Korea, has shrouded the international economic landscape and there is no relief in sight. Lastly, according statistics released by Eurostat, the average

Chapter 2 Outlook of Taiwan's Economy

ITIS Program, CIER

Meng-Chun Liu; Su-Ling Peng

Overview of Taiwan's Economic Growth

Although the global economy rose and fell in the first half of 2011, the economy in Taiwan grew steadily at a respectable rate of 5.54%, on average. However, the growth slowed in the second half of 2011 following the eruption of the debt crises in Europe and the U.S. and the economic slump that ensued. For example, according to data released by the Directorate General of Budget, Accounting and Statistics (DGBAS) of the Executive Yuan in November 2011, Taiwan's economic growth fell to 3.42% in the third quarter, and even the seasonally adjusted figure was negative (-0.6%), an indication of the volatility of the nation's economy.

Economy remains sluggish in Taiwan

According to current economic indicators, it is unlikely that Taiwan's economy will recover very quickly in the short term. In the economic overview for December 2011 released by the Council for Economic Planning and Development (CEPD) at the end of January 2012, the economic monitoring indicator was downgraded from yellow-blue to blue; this being the second time in two months that the blue light has appeared. Among the nine composite indicators, Direct and Indirect Finance changed from green to yellow-blue and customs-cleared exports changed from yellow-blue to blue; other indicators remained unchanged. With composite indicators updated, seasonally adjusted and long-term trends retrospectively removed and revised, the six-month smoothed annualized rate of change of the leading indicators reversed from the downward trend in September 2011 and began to rise. Meanwhile, the 7 composite indicators were down compared with the previous month after the long-term trends were removed. Although currently the economy is at a low point, the leading indicators continue to rise, which shows signs of a rebound for Taiwan's economy.

The industrial production index in December rose by 0.74% over the previous month, but industrial production was down by 8.15% compared with that over the same period from the previous year; there was a negative growth for two consecutive months. Affected by the

Chapter 3 Major Developmental Issues of Taiwan's Manufacturing Sector

ITIS Program, CIER

Meng-Chun Liu

Introduction

With the strategy of capitalizing economically on the country's great power, China's 12th 5-Year Plan calls for a substantial development of its domestic market and the creation of economic opportunities. The country's growth potential is therefore quite considerable. Based on the priorities and growth rate of China's economic development, the International Monetary Fund (IMF) has estimated that in 2015 China will account for 16% of the global consumption market, second only to the U.S. The IMF further predicts that in 2020 this percentage will grow to 21%, and China will surpass the U.S. to become the world's largest economy. Consequently, Taiwan-based enterprises in China, which have focused primarily on exports in the past, will have to readjust their strategies and business models as well as market positioning and resource deployment strategies in order to address the demand in China's domestic market, which will be both a challenge and an opportunity.

In recent years, China's model of economic growth has changed from "Maintaining Economic Growth" to "Adjusting Economic Structure." The plan has been to improve the country's capabilities in innovation, research and development, high technology and service development through the momentum of its sizeable domestic consumption market. With the emphasis on "Adjusting Economic Structure" in the planning stage of the country's 12th 5-Year Plan, there are three main aspects to China's development objectives, namely "Driving economic growth with domestic consumption", "Development of emerging strategic industries" and "Development of modern service industry".

First, driving economic growth with domestic consumption. During the implementation of the country's 12th 5-Year Plan, China will strive to improve the income of its citizens across the society, allowing the majority of its people to increase their real income and enhancing the country's domestic consumption through economic growth, which is a strategic model to stimulate economic growth via consumption, investment and export.

Industry Insights

- IC Industry
- Electronic Components Industry
- Flat Panel Display Industry
- Electronic Materials Industry
- Telecommunications Industry
- IT Industry
- Machinery Industry
- Automotive Industry
- Steel Industry
- Fabricated Metal Products 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

Jui-Lin Yang; Mao-Jung Peng; Chin-Kun Tsai; Kuo-Chu Peng; Ling-Chun Chen

Introduction

Starting with the development of IC foundry production by TSMC, the Taiwanese IC industry has gradually expanded to create a comprehensive, vertically-integrated industry structure that incorporates both upstream and downstream segments. Moving from upstream to downstream, the Taiwanese IC industry includes IC design firms, IC manufacturing companies, IC assembly firms and IC testing providers. The IC manufacturing segment is mainly oriented towards IC foundry establishment and memory production. The flexibility, speed and low costs resulting from the combination of a vertically-integrated division of labor with highly developed industry clusters have given the Taiwanese IC industry a high level of international competitiveness. In 2011, Taiwan ranked number two in the world in terms of market share in the IC design segment, number one in the IC foundry segment, and number one in the IC assembly and testing segment.

The Taiwanese IC industry as a whole is estimated to have achieved an annual production value of USD 52.8 billion in 2011, 4.9% down on 2010. Estimated annual production value for individual segments within the IC industry in 2011 was as follows: IC design segment – USD 13.0 billion (9.4% down on 2010); IC manufacturing segment – USD 26.4 billion (5.7% down on 2010); IC assembly and testing segment – USD 13.3 billion (increased 1.5% from 2010).

Chapter 2 Electronic Components Industry

ITIS Program, IEK of ITRI

Tsu-Yu Chao, Meng-Hsien 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, optoelectronic components such as 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 passive component, LED, PCB, connector and the secondary (rechargeable) battery industries is provided in the following section.

Source: ITIS Program, IEK of ITRI (2011/12).

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.

In Taiwan, there are about 60 RCL passive component makers manufacturing a wide range of products.

Chapter 3 Flat Panel Display Industry

ITIS Program, IEK of ITRI

Chia-Tien Lee; Nancy Liu; Chin-Ching Yeh; Chia-Lung Cheng

Introduction

Flat panel displays (FPDs) refer generally to display monitors that are not based on cathode ray tube (CRT) technology. In terms of technologies employed in the products, the FPD category includes PDP panels, large TFT LCD panels, small/medium TFT LCD panels, TN/STN panels, OLED panels, micro-display panels and other types of panels, such as a vacuum fluorescent displays (VFD) and advanced displays (Table 2-3-1). The above classification is also adopted by the FPD industry. Since some advanced display technologies are still in their early stages of development, they are mentioned only briefly in this article.

In addition, from the perspective of the entire display panel industry, the development of key components for TFT LCD panels, i.e. glass substrates, color filter (CF), backlight units, and polarizers, are very important and therefore fall within the scope of FPD industry observation.

Although the range of FPD is quite extensive and encompasses a fairly broad range of technological development, technical experts are focusing on the goal of producing slimmer and lighter models in order to satisfy the demands of modern consumers. With consumer products becoming more widespread, the reach of flat panel display applications has expanded gradually as products have become more diverse. In addition, FPDs have also penetrated the domain of consumer products, such as mobile handheld devices and digital cameras; information technology products such as laptops, tablets and LCD monitors; displays for vehicle on-board entertainment devices, and other devices, all of which represent the principal market for FPD applications. In particular, the reduction of TFT LCD panel production capacity with respect to LCD TVs will produce tremendous opportunities and impetus for the development of display panels and key components in the future.

Chapter 4 Electronic Materials Industry

ITIS Program, IEK of ITRI

Yang-Jer Yeh

Introduction

The electronic materials industry is the upstream of the electronics industry and the very foundation of the electronics industry; to the chemical industry, electronic materials is part of the specialty chemical sector, while its market value is less than that of the petrochemical industry, its added value is high. The electronic materials industry may be deemed as the intersecting point of the chemical industry and the electronics industry.

The range of electronic materials is very wide. From the perspective of the application industry/field, it can include semiconductor materials, flat panel display materials, printed circuit board materials, battery materials, recording media materials, passive component materials, fiber-optic cable materials, and others. This paper defines electronic materials as the materials that apply to the industries in the manufacturing of semi-conductors, flat-panel displays (FPD), IC packaging, solar cells, and lithium batteries; with the main functions being those functioning as lighting, or those affecting the electrical properties of a product.

Table 2-4-1 The scope of electronic materials industry

Source: ITIS Program, IEK of ITRI (2011/12).

Chapter 5 Telecommunications Industry

ITIS Program, IEK of ITRI

Mei-Ling Chen

Introduction

Mobile telecommunications services remained Taiwan's largest telecommunications services in 2011, accounting for 59.2% of the industry's total revenue. The mobile telecommunications services has benefitted from service plans that incorporate smartphones and mobile Internet services, which resulted in increased revenues from both mobile Internet value-added services and smartphone sales.

Regarding the principal products of Taiwan's communications equipment industry in 2011, the mobile phone industry has increased substantially due to the complete lines of products offered by Taiwan's brand vendors as well as OEMs beginning to ship the latest mobile phones in the second half of the year. As for network communications equipment, driven by the push for IPTV services from telecom operators and network equipment upgrades from corporations, Ethernet LAN Switch, DSL CPE and IP STB have experienced significant growth compared with 2010.

Overview of the Telecommunications Industry in 2011

Telecommunications services

Total revenues for Taiwan's telecommunications services reached USD 13.2 billion in 2011, a 6.9% increase over the same period in 2010. The growth came primarily from mobile telecommunications and Internet and value-added services as telecom operators' smartphones sales continued to rise. As a result, revenues from mobile Internet value-added services and mobile phone sales have increased driven by service plans that incorporate services for smartphones and mobile Internet devices (currently monthly revenues from smartphone-based service plans are twice those of ordinary monthly plans). In addition, this has coincidentally offset decreases in mobile voice revenues.

Chapter 6 IT Industry

ITIS Program, MIC/III

Chris Hung; Wei-Hsiu Weng

Despite the overall economic uncertainties that had an impact on Taiwan's IT industry as a whole in 2011, the estimated production value of the IT hardware industry for 2011 exceeded USD 130 billion, a growth rate of 14.7%, driven up by bestselling emerging products such as the tablet PC. The IT software industry was estimated to be worth USD 4.778 billion in 2011, growing by 12.1% compared to 2010.

Section One: The IT Hardware Industry

Introduction

The IT hardware industry mainly consists of the computer systems industries, such as the notebook PC industry, desktop PC industry, motherboard industry, server industry etc.; however, computer use is generally supplemented by other peripheral products, such as LCD monitors, digital still cameras, and so on. Broadly speaking, in addition to the computer systems industry, the IT hardware industry also covers the aforementioned peripheral industries. For the scope and ecosystem of the overall IT hardware industry, see Figure 2-6-1.

Source: ITIS Program, MIC/III (2011/12).

Figure 2-6-1 Taiwan IT hardware industry ecosystem

Chapter 7 Machinery Industry

ITIS program, IEK of ITRI

Li-Lun Yeh

Introduction

The machinery industry is a basic industry covering a wide range of machine related applications. In its narrowest definition, the term "machinery industry" refers to any machinery and auxiliary equipment directly or indirectly used for making products or providing services. This includes metal processing machinery, industrial machinery, general machinery, power machinery and mechanical components, etc. For a more specific breakdown according to the different applications, the range of machinery can be divided into metal processing machinery, industrial machinery, special machinery, electronic equipment, general machinery, transportation and automation equipment, machinery and metal tooling, and key components.

Asia's economic growth has been the main driving force behind Taiwan's machinery industry for the past ten years, especially the Chinese market. During China's reform and opening-up period, Taiwan was the most important machinery products importing country for many years. Along with China's continuous economic reforms in recent years, the market size has undergone explosive expansion and has attracted the world's attention to focus on this market. With the implementation of self-sufficiency measures, the promotion of Chinese-made industrial machinery in the mainland market has shaken the dominant position of Taiwan's machinery and will also threaten the growth prospects of Taiwan's machinery industry. Looking ahead, Taiwan's machinery industry will follow the international scene more closely. In view of the demand for comprehensive upgrade, Taiwan's machinery industry has a pressing need to upgrade its technical development, and so industrial innovation and technological upgrade will be the primary focus for Taiwan's machinery industry.

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 a wide range of technologies, hundreds of suppliers and various industries.

Chapter 9 Steel Industry

Chien-Jen Chen

ITIS Program, MIRDC

Introduction

As defined in the "Standard Industrial Classification of the Republic of China", revised in May 2006, the steel manufacturing industry refers to those firms engaging in the production of steel ingots and slabs or other smelted and cast basic products, or those that produce basic steel materials including steel sheet, pipes, bars and rods made by further casting, rolling, extending, extruding and drawing, or other rough cast or rolled products. Figure 2-9-1 below shows the scope of the steel industry.

Source: Directorate General of Budget, Accounting and Statistics, Executive Yuan (2006/05).

Figure 2-9-1 Scope of the steel industry

In terms of the processing method of steel materials, the manufacturers of the local steel industry can be divided into blast furnace plants, electric furnace plants and rolling mills. As far as material composition of the products is concerned, steel materials can be separated into carbon steel and special steel. According to the results of the "Factory Scope

Chapter 10 Fabricated Metal Products Industry

Zhong-Yi Chen; De-Jin Huang; Guan-Zhi Hou; Yu-Rui Xu

ITIS Program, MIRDC

The fabricated metal products industry is upstream of a variety of consumer products, construction tools and materials. Following from the basic metal industries (including steel, aluminum, copper, magnesium, etc.), the fabricated metal products industry's principle operation involves the manufacturing of basic parts and components for electronics, semiconductors, transportation, home appliances, office machinery, watches/clocks and other hardware-related related products. According to the product characteristics, fabricated metal products can be categorized into metal hand tools, metal molds, metal structures and building components, metal containers, metal processing (metal forging, powder metallurgy, metal heat treatment and metal surface treatment), screws, nuts, rivets, metal springs, metal wire products, and other metal products.

In 2011, the production value of the fabricated metal products industry in Taiwan was USD 25.6 billion, the import value was USD 14.48 billion and the export value was USD 17.97 billion. Overall, Taiwan's production value of the main fabricated metal products showed a growing trend in 2011, wherein the output value of the hand tool industry was USD 2.05 billion, that of the mold and die industry was USD 1.67 billion, the fastener industry was USD 4.26 billion, and the surface treatment industry was USD 5.24 billion. The three main industries which showed a growing trend were hand tools (3%), fasteners (13%) and the surface treatment industry (11%).

Chapter 11 Petrochemical Industry

ITIS Program, IEK of ITRI

Chen-Cheng Fan; Shu-Fang Cheng

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 people's everyday lives, about 60~70% of hardware for industries, including the information, electronics and automotive industries as well as precision products, 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, there are lesser risks, and the recovery period is also shorter. In addition, the petrochemical industry is subject to cyclical business trends (Figure 2-11-1).

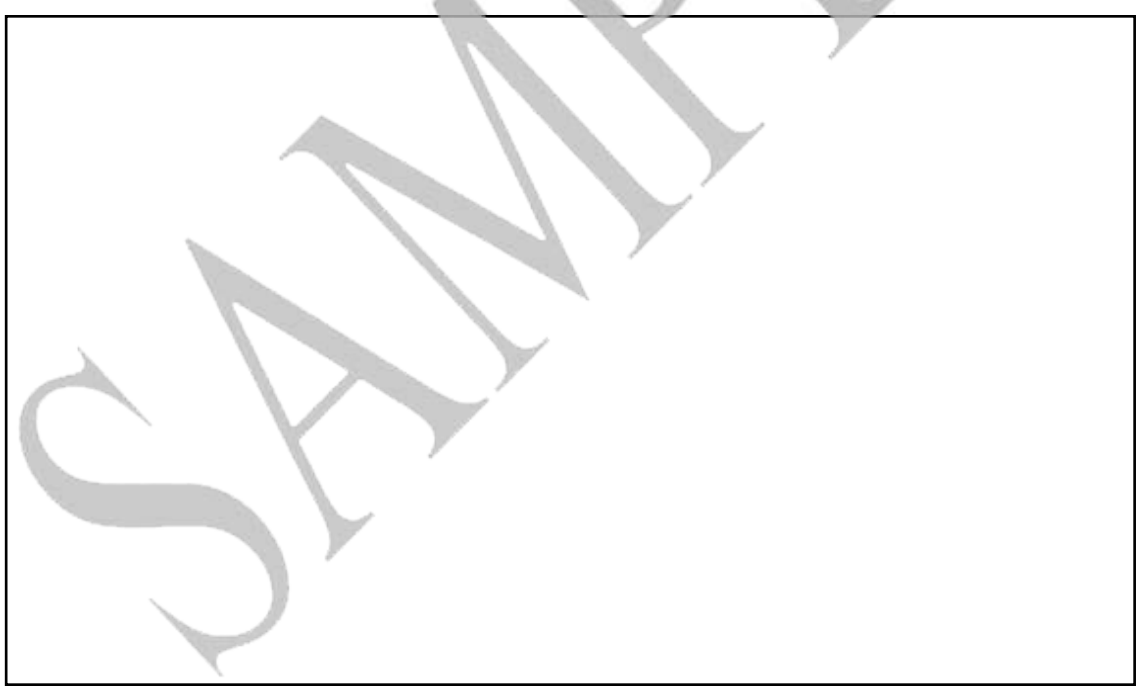
Chapter 12 Polymer Industry

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. Petroleum, the raw material, undergoes refining and cracking to form the various basic petrochemical raw materials, which are further polymerized and processed into various downstream products used in product manufacturing industries. Materials such as plastic, rubber and synthetic fiber all belong within the polymer industry, as shown in Figure 2-12-1.



Source: Petrochemical Industry Monthly Report; ITIS Program, IEK of ITRI (2009/11).

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

The current state of the Taiwanese textile industry – business environment

Since 2010, poor cotton harvests have led to a worldwide shortage of supply in the cotton industry; global cotton prices have risen to new heights. At the same time, the quantitative easing policy adopted by the U.S. government in an effort to stimulate domestic demand has exacerbated the rise in raw material prices, leading to skyrocketing prices not only for cotton, but also for chemical fiber materials such as PTA, EG, CPL and AN. Despite the negative effects of rising materials prices, the strong growth that the Taiwanese textile industry had enjoyed in the last few months of 2009 continued into 2010. As of 2010, the Taiwanese textile industry comprised 4,339 registered manufacturers, employing a total of 163,678 people, and with combined annual production value of USD 15.2 billion (28.7% up on 2009). This impressive performance was mainly driven by the upturn in the global economy, and by the boost that rising materials prices have given to the production value of the textile industry as a whole.

Overview of the Textile Industry in 2011

The global trade in textiles

Changes in the volume of global trade in textile products and garments

According to data compiled by the WTO, global textile product and garment exports in 2010 totaled USD 602.1 billion (Figure 2-13-1), representing an annual growth rate of 14.62% compared to 2009, and constituting the second highest global export total since 1990 (surpassed only by the figure of USD 618.3 billion recorded in 2008). Global exports of both textile products and garments grew strongly in 2010. Textile product exports rose to USD

Chapter 14 Biotechnology Industry

ITIS Program, DCB

Shih-Fang Huang

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

Mei-Chih Liao

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. In accordance with the various different regulations and 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

Source: ITIS Program, DCB (2011/12).

Chapter 16 Medical Device Industry

ITIS Program, IEK of ITRI

Tsz-Yin Chang; Hsin-Ju Wu; Yi-Hsin Lin

Introduction

The Medical Device Industry is a special industry encompassing a wide range of products. There is no common global definition. Even those leading countries in the field of medical devices, such as America, Japan, and European countries, have their own different views and definitions on the Medical Device Industry. The definition of a medical device used in Taiwan generally follows the definition that the U.S. sets as a reference. According to article 13 of the Pharmaceutical Affairs Law promulgated by The Department of Health, Executive Yuan, there are specific definitions for a medical device. Under the regulations of the Pharmaceutical Affairs Law, "medical device" means an instrument, piece of equipment, device, materials, implants, in vitro reagents, or other objects which include components, parts, accessories and software. The operation of medical devices is not limited to only a single item or combination of items, and the purposes are to achieve the prevention, diagnosis, treatment, and alleviation of diseases, or the auxiliary/prosthetic structure(s)/function of the body, etc. According to this definition, the products in medical devices include medical instruments and equipment and medical supporting products, with the exception of blood producing medication, serums, biological producing medications, and fitness equipment. This research refers to the definition from the Taiwan Pharmaceutical Affairs Law and "medical device classification and grade" announced by The Department of Health, and applies the classification by main "functions", and applies "use" and "structure" as supplements to classify medical devices into 5 main categories which are "diagnosis and monitoring", "surgery and treatment", "auxiliary and prosthesis", "in vitro diagnostic devices" and "others" (Figure 2-16-1).

Medical devices need to be legally managed or registered with the health authority, and they put special emphasis on safety, reliability and effectiveness. The process of development usually needs to be tied to clinical studies to provide real evidence of safety and effectiveness. Therefore, overall development time and funding are often higher than the development of

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 expanding 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.

Overview of the Food Industry in 2011

Food output value increased 15%

The output value of Taiwan's food industry in 2011 was estimated to be USD 20.27 billion, which has increased 15% from the previous year (Table 2-17-1). At the same time, it also reached the highest level of the past 9 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 New Taiwan dollar revaluation in 2011.

The leading 6 subsectors of Taiwan's food industry (representing 60% of total output) were animal feeds (USD 2.89 billion, +18.89%), other miscellaneous foods (USD 2.43 billion, +16.07%), soft drinks (USD 2.23 billion, +19.68%), slaughtering (USD 2.10 billion, +13.71%), flour milling (USD 1.39 billion, +16.05%) and grain husking (USD 1.09 billion, +15.68%). The bigger production value growth rate of primary processed food was due to the dependence on imported raw materials and the rising prices of raw materials.

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

A light emitting diode (LED) is a light emitting component made with semiconductors. There is an electrode on each end of an LED; by applying a 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).

Figure 3-1-1 History of LED development

In earlier times, LEDs were made with a gallium arsenide phosphide (GaAsP) in a ternary structure, and the wavelength of the 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 the arsenide phosphide (AsP) was green light, the lack of blue light capability prevented the LED industry from being able to provide full-color

Chapter 2 Photovoltaic Industry

ITIS Program, IEK of ITRI

Meng-Chieh Wang

Introduction

The photovoltaic (PV) industry is an industry based on various loosely-related technologies. In general, a PV product can be any device that generates power based on sunlight-driven electron flow.

There are two types of PV products: flat and concentration types. The flat type is dominating the market now. Traditional PV products are based on the technologies of silicon, thin film silicon, compound thin film (both CdTe and CIGS oriented), as well as the more recent organic products based on dye-sensitized solar and organic thin-film cells. Out of these technologies the silicon PV industry is not only of larger scale, but also a more integrated industry chain. See Figure 3-2-1 for the segments of the PV industry chain, from upstream to downstream, of silicon, ingot/ wafer, cell, module and system.

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

Figure 3-2-1 Scope of the PV industry

Even though PV products debuted in the 1960s, the PV industry's fast growth came in 2004, after the Renewable Energy Grants Act was amended by the German Parliament in setting up a comprehensive mechanism for determining the Feed-in Tariff (a premium rate paid for electricity fed back into the electricity grid from a designated renewable electricity generation source) of the power generated by renewable energy. This resulted in the booming

Chapter 3 Wind Power Industry

ITIS Program, IEK of ITRI

Chih-Chien Kang

Introduction

Wind power industry categories from upstream to downstream are raw materials, components/sub-systems, wind turbine systems, wind farm development, wind farm operation and maintenance, respectively.

Amongst raw materials, steel and resin account for the largest proportion of cost. The components/sub-systems category includes blades, gearboxes, and towers. Wind turbine systems can be divided into large wind turbines and small wind turbines; currently wind power generation worldwide primarily utilizes large wind turbines, accounting for over 99% of installed capacity, small wind turbines make up less than 1%. Large wind turbines can be further divided into land based wind turbines and offshore wind turbines according to installed location.

Raw materials, components/sub-systems, and wind turbine systems are part of the manufacturing industry. Wind farm development, wind farm operation and maintenance belong in the service industry category. During wind farm development, participation by companies such as engineering consultants, engineering construction, etc., is necessary, while offshore wind power requires an additional maritime engineering company. Once wind farm development is complete, follow-up participation by wind farm operation and wind turbine maintenance companies are necessary.

Global accumulated wind power nameplate capacity for 2010 was 199.5 GW, amounting to 24.7% growth compared to 160.0 GW in 2009. Newly installed capacity for 2010 totaled 39.4 GW, amounting to 3.4% growth compared to 38.1 GW in 2009. As of the end of 2010, China, the United States, and Germany were the world's three foremost nations in terms of accumulated installed wind power nameplate capacity, generating 44.8 GW, 40.3 GW and 27.4 GW, respectively. When calculating newly installed capacity, China, the United States and India were the three foremost nations in newly installed capacity worldwide for 2010; of the three, China and the United States saw new increases of 18.9 GW and 5.1 GW

Chapter 4 Electric Vehicle Industry

ITIS Program, IEK of ITRI

Chih-Yang Chen; Hsueh-Lung Lu

Introduction

In general, vehicles that are powered by electricity can be referred to as electric vehicles. Based on the power system adopted as well as the type of energy supplied, electric vehicles can be further categorized into Hybrid Electric Vehicle (HEV), Plug-in Hybrid Electric Vehicle (PHEV), Battery Electric Vehicle (BEV), and Fuel Cell Electric Vehicle (FCEV) as shown in Figure 3-4-1.

Source：http://www.electricdrive.org/; ITIS Program, IEK of ITRI (2010/12).

Figure 3-4-1 Classification of electric vehicles

Chapter 5 Green Building Industry

ITIS Program, IEK of ITRI

Meng-Chiao Huang

Introduction

People spend most of their time in the buildings in which they live and work. For this reason, modern people are gradually focusing on buildings that provide a cozier living quality and that are compatible with the ecosystem. The so-called "Green Building" has emerged to meet this trend. In Japan, Green Buildings are also called "Environmental Symbiosis Buildings" while they are known as "Green Buildings" in the North American area. In this respect, the Green Building as defined by the Architecture and Building Research Institute of the Ministry of the Interior, refers to a facility combining ecological, energy saving, waste reduction and health-benefiting functions. The scope of such industry comprises four major parts, as per Figure 3-5-1.

Figure 3-5-1 Scope of the Green Building industry

Green Building application market

Based on their function, modern buildings can be divided into four categories, these being Public Buildings, including schools, government agencies, hospitals, sports centers and libraries, etc.; Industrial Buildings, including factories and manufacturing facilities which may vary greatly in size depending on the nature of the industry; Residential Buildings, which generally refer to the houses and apartments where the public live, and which are the most abundant of all buildings around the world; and Commercial Buildings, which are the working

Chapter 6 Cloud Computing Industry

ITIS Program, MIC/III

Wei-Hsiu Weng

Introduction

Frequent reports of global economic instability and catastrophic changes, energy and raw material price fluctuations, and increased labor costs have led to the formation of inevitable operating costs for enterprises and affected the corporate decisions of information technology investments. Meanwhile, cloud computing, having experienced the test of the market in its sprouting stage, gradually became an important operation for IT users. With this development trend, Taiwanese companies from different fields have gained entry into the cloud market. The cloud computing industry adopts system integration, data center, server, and the mobile device industry as its core and continues to combine external business resources and break new ground in the cloud computing market.

The cloud computing industry is broad in scope and encompasses industries such as IT hardware and IT software services. Using the data center for providing cloud services as a reference point, it is 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.

The cloud computing concept has had a major impact on the products, services and business models of the IT software and hardware industries. Cloud computing has therefore become the emerging concept and technology that has drawn the most attention from the IT software/hardware industries in the wake of the 2008 financial crisis. The sheer scope of the industry, as well as the fact that it spans both the enterprise and consumer markets, has led to much discussion on its future business potential as well. Nevertheless, cloud computing technologies, services and business models as well as the new products, services, competition and alliances that arise as a result of an emerging market are well worth monitoring.

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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 six 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, and the Taiwan Textile Research Institute.

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.

The Organization of ITIS

ITIS Program of MOEA — Department of Industrial Technology MOEA

ITIS Program Office

Fields for Information Service \ Execution Unit		Industrial Economics & Knowledge Center, ITRI	Market Intelligence Center, III	Metal Industries Research & Development Center	Development Center for Biotechnology	Food Industry Research & Development Institute	Taiwan Textile Research Institute
Electronics & Information Industry	1. Semiconductor	◎					
	2. Communications	◎	○				
	3. Flat Panel Display	◎	○				
	4. Electronic Components	◎					
	5. Information Hardware		◎				
	6. Software		◎				
Biotechnology & Pharmaceutical Industry	7. Pharmaceutical/Traditional Chinese Medicine & Herbal Medicine	○			◎		
	8. Biotechnology	○			◎	○	
	9. Medical Devices/ Health Care	◎					
	10. Food				○	◎	
Mechanical & Metal Industry	11. Mechanical	◎		○			
	12. Automobile	◎		○			
	13. Energy	◎					
	14. Steel/ Nonferrous Metal			◎			
	15. Metal Fabrication			◎			
Chemical Industry	16. Petrochemicals	◎					
	17. Polymer	◎					
	18. Specialty Chemicals	◎					
	19. Electronic Material	◎					
	20. Textile						◎

◎ Major responsible units ○ Participating units

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