

New Revolution in Energy Saving--Development and Opportunity of High-Efficiency Motor Industry in Taiwan (I)

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1. An Overview of Motor Industry

The motor industry in Taiwan has gradually evolved from the repairing and recycling of motors from scrapped ships. An entire motor industry has been built since the establishment of TECO, a factory specialized in motor building, in 1956. In the 1980s, Japanese enterprises relocated many manufacturing bases abroad in order to reduce labour costs, which then made Taiwan “a kingdom of small-motor-building”. It mainly develops brush motors, single phase induction motors, small AC-DC transformers, electromagnetic switches and so on, which are applied in household electrical appliances, toys and electronic products.

The motor is also widely applied in industry and consumption products with a stable demand in the world. The annual output of Taiwan’s motor (excluding micro and small motors) in 2011 amounted to 6.46 million units, with a value of about NTD\$16.3 billion. However, the annual output value of micro (small) motor (with a power less than 37.5 Watts) in 2011 amounted to NTD\$4.7 billion, with an output of 100 million units, which has slightly changed in recent years.

Since the manufacturing industry in Taiwan migrated abroad in recent years and manufacturers began to focus on expanding the market in Mainland China, a part of domestic manufacturers migrated to Mainland China, Thailand, Malaysia and other areas. Besides, as the IEA annual report in 2011 pointed out, the rating standards of motor energy efficiency in Taiwan lagged behind the United States by 7 to 8 years, which is a major hidden worry in the future of the motor industry. Nowadays, Taiwan is eager for a revolution in motor design, manufacturing, driving control and other related technologies, and research and development centres that are capable of testing and verifying, so as to improve the whole industrial competitiveness.

2. Industrial Supply Chain

The industrial supply chain in Taiwan covers the upstream raw materials of electromagnetic steel sheets, enamelled wires, magnets, pig iron, aluminium ingots and

so on, electromagnetic steel sheet stamping, wire winding, rotor and stator casing casting, drive units and motor assembling in the midstream, and motor distribution and application in the downstream.

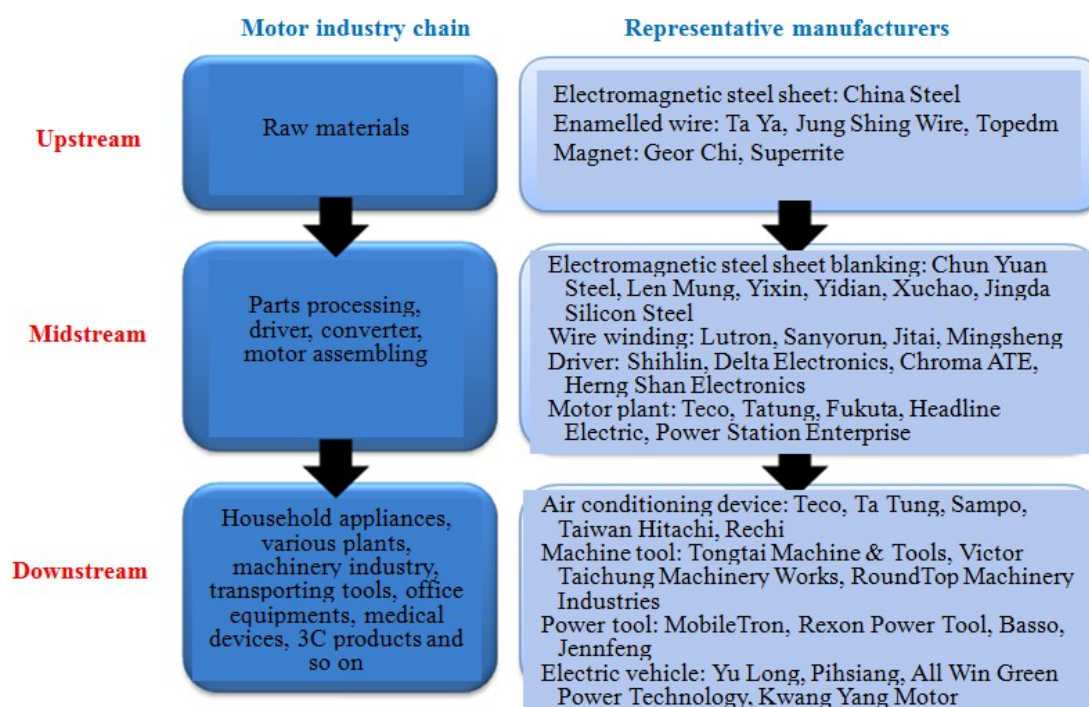


Figure 1: Supply Chain of Motor Industry in Taiwan

Data source: Metal Centre MII-by ITIS

As far as the raw materials in the upstream are concerned, the silicon steel sheet (electromagnetic steel sheets) is needed in large quantities, which is produced in Taiwan by China Steel Corporation only at present, and imported mainly from Nippon Steel, Baosteel and Wuhan Steel and so on. Besides, enamelled wire and magnet are also materials in the upstream. The copper enamelled wire is provided mainly by Taiwan's manufacturers such as Ta Ya, Jung Shing Wire, Topedm, and Xinlong, with a small amount of imports. However, the pure aluminium wire is mainly acquired through importation and then processed into enamelled wire at home, which has partially replaced the copper enamelled wire. The magnet is mainly imported from Mainland China. Although Tatung Company can provide alnico magnets, ferrite magnets, NdFeB magnets and other magnets, the rare earth materials are still acquired through importation from Mainland China.

The midstream manufacturers mainly include factories specialized in motor design and manufacturing, and peripheral parts processing, with Chun Yuan Steel, Len Mung, Leicong, Yixin, Yidian, Xuchao, and Jingda Silicon Steel providing electromagnetic steel sheet blanking, and Lutron, Sanyorun, Jitai, and Mingsheng providing wire winding. Manufacturers in Taiwan that are capable of designing and producing high power motors mainly include Teco, Tatung, Fukuta, Shihlin. Manufacturers such as Headline Electric, Power Station Enterprise, Motomax Electric, Furian, Jye Maw, Troy Enterprise, Hohsing, Suhder are capable of producing medium and small motors.

As far as the motor distribution and application in the downstream are concerned, agents registered in the Bureau of Standards, Metrology and Inspection, Ministry of Economic Affairs, include Dexineng, Cutes Corp., Snow International, Gearex Corp., Renxing Motors, and Grundfos.

3. An opportunity for the development of high-efficiency motor

Although its energy efficiency is lower than that of other motors, the normal induction motor is the most widely-used motor in the industry due to its advantages of low price, easy assembly and easy control. However, considering the common international standards of environment sustainability, and small differences in costs of the induction motor that meets the IE3 energy-efficiency standard and the permanent-magnet motor, as well as the advantages of permanent-magnet motor in size, rotating speed and load, in the future the permanent-magnet motor can replace the under-voltage induction motor as the mainstream in the market of countries that implement IE3 as the minimum energy-efficiency standard.

The brushless DC motor is a typical high energy-efficiency motor at present, which is characteristic of high efficiency, low power consumption, long service life, noiselessness, maintenance free, and precise torque control better than that of brush DC motor. However, its weak points include unstable control technology at low speed, high price and dependence on drive controller.

With the support from the Technology Division, Ministry of Economics Affairs, China Steel Corporation, a lead enterprise in Taiwan, takes the initiative in forming a research alliance in developing the integrating technology of high-power and high-efficiency motor, which is joined by the mid and downstream manufacturers such as Tatung, Teco, Fukuta, Hanbell, Jennfeng, Rechi, Chun Yuan, Yixin, and domestic universities and research institutes. Based on various high-quality electromagnetic steels developed by the China Steel in the upstream, the alliance is to coordinate efforts of the

mid and downstream manufacturers on developing high-power and high-efficiency motors. Specifically, with the technological development in motor magnetizing and wire winding of permanent-magnet brushless drive compressor, a growing capability in producing the DC inverter compressor independently in Taiwan is expected to diminish the importation of inverter compressor, expand its application in refrigeration air conditioner, electric vehicles, electric scooters, household inverter appliances, and bring about the energy and opportunity for a new wave of industrial upgrading.