

Application Status and Development Trend of Plastics in China's Electricity Industry

Electric equipment industry is devoted mainly to manufacturing of power generation, power transmission/distribution equipments, industrial electric equipments and special electrical equipments, etc. In China, the electric equipment industry is a key element of equipment manufacturing industry, and electric power is a "lifeline" of modern industry and a pioneer of economic development. China has increased investment on power construction since the reform and opening-up. At present, China is the second largest country with respect to the installed capacity and annual power generation. In recent years, annual installed capacity of newly added power generation equipments in our country is kept over 90 million KW, and the associated power grid increases rapidly by a double-digit rate. Investment on power construction in 2008 reached RMB576.329 billion, of which power grid construction accounted for 50.05%. Thanks to excellent overall performance, engineering plastics is extensively applied to electric equipments in replacement of metallic and non-metallic inorganic materials. So plastic has become an integral part of electric products. The statistics show that, the production of insulation products in electric equipment industry only amounted to 1 million tons in 2008. Electric equipments are closely interrelated to plastics. Development of plastics industry in our country strongly supports rapid and sustainable development of electric equipment industry, and new engineering plastics provide a strong guarantee to the upgrading of electric products, technological and independent innovation in this industry.

1. Application Status of Plastics in Electric Equipment Industry

The power transmission& distribution industry closely related to plastics mainly encompass transformers, electric wires& cables, high-/low-voltage electric equipments, power capacitors, high-/low-voltage switchgear assemblies, relay protection devices and automatic control systems. Today, there are 1200 transformer manufacturers in domestic power transmission& distribution industry, with the generating capacity of transformers in 2008 up to 105.6 million KVA, an increase of 28.91% over the same period last year; nearly 1000 high-voltage switchgear manufacturers, with an estimated output in 2008 about RMB420.7 billion; 9800 wires& cables manufacturers and 3645 above designated size, with its output in 2008 up to RMB556.7 billion. The main business income of wires& cables industry occupies the biggest portion of the

electric equipment industry, e.g. the main business income registered 26% of gross income of domestic electric equipment industry in 2008. The main raw materials of wires& cables industry include: rubber and plastics in addition to copper. In 2008, the total yield of electric wires registered 18.5169 million meters, an increase of 40.43% over the same period last year. Low-voltage electric equipment industry is also a major consumer of engineering plastics. There are over 1500 low-voltage electric equipment manufacturers certified with “3C”, and their output in 2008 registered RMB38 billion, of which including: 0.6 million low-voltage universal circuit breakers, 26 million molded circuit breakers, 350 million small circuit breakers and 68 million AC contactors. Plastic parts of low-voltage electric products generally account for over 20% of the total spare parts. The annual consumption of engineering plastics for molded circuit breakers amounts to 27,820 tons, and that of small circuit breakers amounts to 128,450 tons. New engineering plastics have been extensively applied to electric equipment industry in line with the fast-changing plastic industry.

2. Prospect of Engineering Plastics in Electric Products Market

Electric switchgear is a widely used important product requiring strict technical requirements and higher safety and reliability as it involves directly with the safety and reliability of nationwide power generation, transmission and distribution networks and households. Amongst the electric switchgears, plastic products are important insulating parts that present higher electrical insulation properties(CTI value), namely, higher electric insulation, dielectric strength, surface/volume resistance and certain mechanical strength. Also, these parts must feature outstanding stability under certain humidity, temperature, electric field and mechanical force, namely, low water absorption, excellent flame retardance and arc resistance, higher temperature tolerance and weatherproofing. China’s plastic industry has provided numerous plastic materials for innovative development of our electric equipment industry. The plastics for electric switchgear can be categorized into thermoset and thermoplastic ones, of which the commonly used thermoset plastics include: phenolic moulding plastics, amino molding plastics and BMC/SMC; and commonly used thermoplastic plastics include: nylon PA6, PA66, PA46, flame-retardant PA, PBT, PE and ABS.

Wide application of plastics in electric equipment industry is attributable to satisfactory processibility of engineering plastics, especially for

new-generation engineering plastics featuring high fluidity and low contraction. Such characteristics allow for one-time processing of complexly shaped, thin-wall and high-precision plastic parts, thus providing a guarantee for technical innovation of small-sized, thin-wall, modular, intelligent and high-performance equipments. The plastic parts for electric switchgear mainly include: switches' pedestals, covers, casings, arc-extinguishing chambers, handles, coil frames, release levers, spindles, high-voltage insulating parts and wire holders. Such plastic parts are formed generally by means of thermoset extrusion, thermoset injection and thermoplastic injection equipments. Thermoset injection technologies have been widely promoted and utilized in China, helping to increase efficiently the quantity and output of thermoset plastic products. Some electric equipment factories over designated size even introduce injection molding equipments with centralized pipeline feeding, fully automatic control and robot reclaiming. Recently, injection molding machines have been used in some electric equipment factories with introduction of hot runner molding technology and electro-hydraulic mixed power& all-electric drive system.