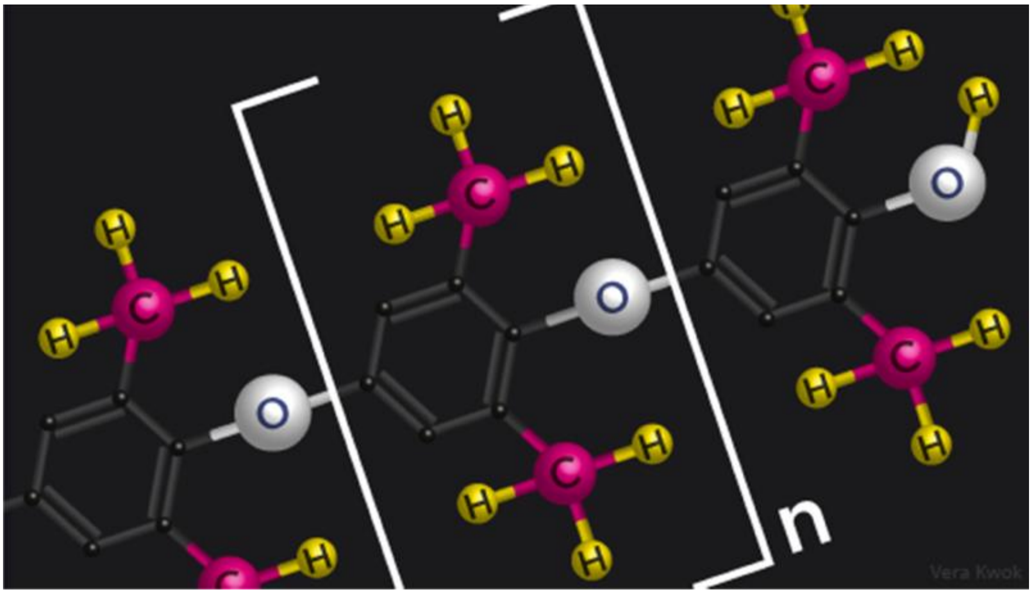
# Catching Up: The Use of Engineering Plastics in China’s Auto Applications Industry is Growing




This is the second in a series of three articles on China's plastics sector. For the first article on how China increases self-suffiency in commodity plastics, click here.

While the bulk (more than 90 per cent by volume) of plastics produced and consumed in China are of the commodity type, these materials have limitations regarding mechanical properties or thermal stability. This leaves a substantial market for higher-value engineering plastics, which are much less cost driven but primarily utilised for specific performance characteristics.


As the infographic above shows, engineering plastics have a much higher price than commodity plastics. Polyvinyl chloride (PVC), the cheapest of the commodity plastics, currently trades at around RMB 8,000 per tonne (RMB 1 = approx. 0.156 USD) while ABS (acrylonitrile butadiene styrene), the most expensive within this group, currently costs around RMB 17,000 per tonne, with polyethylene (PE), polypropylene (PP), and polystyrene (PS) somewhere in between.

By contrast, engineering plastics generally cost around RMB 30,000 per tonne or more. Given the higher price of engineering plastics, they are utilised only in those applications in which their superior mechanical and thermal properties are required, with key examples including:

- Appliances (air conditioners, hair dryers, mobile phones, printers, etc.)
- Automotive (interior, exterior, power train, under-the-hood, chassis)
- Electrical and electronic (E&E) components (connectors, switches, sockets, fans, etc.)
- Power tools (electric drill, electric saw, electric screwdriver, etc.)
- Other (eg, fluid handling, IT, telecommunication, luggage, pumps, toys, etc.)
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**Advantages of Engineering Plastics**

In these applications, engineering plastics not so much replace commodity plastics but rather expand the range of plastics applications by substituting other materials such as metal or wood. The utilisation of plastics can bring substantial advantages.

Frequently, the aim of weight reduction is a major driver for the substitution of metal. Often, plastics can actually reduce the costs, particularly in applications where a single complex plastics part can replace a number of metal parts (though for small lot sizes, plastics tend to be more expensive than metals due to the costs for the moulds). Plastics also allow for a greater flexibility of design, and may have advantages with regard to recycling, though this depends on the existing recycling infrastructure.

A final, major advantage of plastics is their easy customisation. As plastics are mixtures of one or more base polymers as well as many different additives and fillers, it is relatively straightforward to fine-tune materials according to specific requirements. For example, Kingfa, a major Chinese plastics distributor, offers more than 3,000 different types of plastics.

Depending on the specific modification of each type, each material can be selected according to a number of mechanical properties (such as compressive strength, flexibility, hardness), stability (eg, light stability, heat stability, UV stability, moisture stability, chemical stability, biological stability), processing properties (flow of the molten material, moulding shrinkage, melting temperature, etc.) as well as various other properties (eg, electrical properties, density, colour, flammability).

**Chinese Market and Producers**

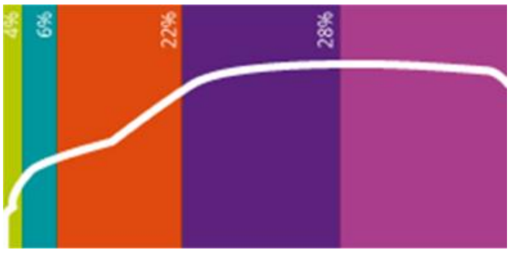
In the Chinese market, the most important engineering plastics are polycarbonate (PC), polyamide (PA), polybutylene terephthalate (PBT), polyacetal = polyoxymethylene (POM), and polyphenylene oxide (PPO). According to some industry estimates, automotive applications account for about 33 per cent of engineering plastics utilisation, followed by electrical/electronic applications (26 per cent) and home appliances (19 per cent). The market for engineering plastics showed strong annual growth of about 15 per cent in the period from 2005 to 2010, and for the period until 2015 further – though slightly slower – annual growth of about 10 per cent is forecast. While Chinese producers are important players in commodity plastics, the market for engineering plastics is still dominated by multinational companies, particularly in the higher-end automotive application. None of the multinational chemical companies produces all of the five engineering plastics listed above – rather, different companies have different strengths:

- PA has a number of strong multinational players including BASF, DuPont, Lanxess, Rhodia, and DSM, all of whom benefit from the strong demand for PA – particularly from the Chinese automotive industry.
- Polycarbonate has three major players – Teijin, Bayer, and Sabic (formerly GE Plastics) – though other companies such as Styron (formerly Dow) and Mitsubishi also participate.
- In PBT, the market leaders are BASF, Toray, Sabic, and Ticona.

- POM is dominated by DuPont and Ticona, leaving only smaller shares for companies such as Mitsubishi, Polyplastics, and KEP
- In PPO, there are only two major players: Sabic and Asahi Kasei.

So far, domestic companies can only supply low-end engineering plastics and thus do not play a major role in engineering plastics for the automotive industry. However, this is likely to change in the future as the quantity produced by domestic companies and the quality of the material improve.

**Plastics in China's Automotive Industry**
In the recent past, the utilisation of plastics in cars has increased strongly – in particular in the more demanding under-the-hood applications. The infographic below illustrates which automotive components are made partly or completely of plastics.




The total plastics weight of 170 kilogrammes shown in the infographic above is for a typical car produced by a Chinese-European joint-venture. Interestingly, purely Chinese models have a much lower plastics content of only about 110 kilogrammes while a model imported from Europe may contain as much as 210 kilogrammes of plastics. That difference means plastics are expected to increase their penetration in the automotive industry, particularly in domestically produced cars. The ambitious government goals regarding electric and hybrid vehicles may also push the market further as weight concerns are even more important for these vehicles than for traditional passenger cars. And of course, the simple increase in the number of vehicles sold in China per year will also boost demand for plastics in cars (despite the slowdown in sales growth in 2011 compared to 2010).

Most of the expected growth is in PA rather than in the other engineering plastics. As a consequence, several multinational companies have expanded their capacity recently. For example, in early 2011 BASF announced that it would more than double the compounding capacity of engineering plastics at its Pudong site in Shanghai. Rhodia announced that after a 25 per cent sales increase in 2010 and a 15 per cent growth forecast for 2011, compounding capacity at its Shanghai facility would be expanded by 40 per cent by July 2011. And Lanxess just inaugurated a new production line for PA and PBT at its site in Wuxi, expanding the plant's annual capacity from 40,000 tonnes-per-year to 60,000 tonnes-per-year. At the same time, domestic company Kingfa just raised capital by issuing 250 million new shares in order to start a high-performance automobile-purposed polymers project focusing on PA, PC, and ABS.

**Moving Towards Plastics**
The shift from metals towards plastics will not be without complications however. The key issue is that the infrastructure requirements for use of plastics in cars are very different from the ones currently needed for metals usage. Replacement of metals by plastics requires extensive retraining of automotive engineers who as a group have worked with metal for more than a century but have very limited experience with polymers (not surprising as, for example, still more than 80 per cent of the weight of US cars is taken by steel, iron, and aluminium).

A shift from thinking in metals to thinking in plastics is necessary, and this shift will only occur if plastics suppliers grab the initiative. Instead of simply providing plastic materials, they and their partners need to provide a package comprising both a physical product and extensive services. These comprise the development and establishment of new technologies including moulding, performance of (possibly customised) tests, and other add-ons such as painting, design calculations, recycling pathways, etc.

In this endeavour, indirect support is likely to come from government regulation. Increased safety, fuel, and environmental standards will be easier to comply with via the utilisation of plastics. For example, it is estimated that an increase of the polymer content of a car from 4 per cent to 8 per cent of total weight corresponds to fuel savings of 750 litres over the lifetime of a car (100,000 miles – or 160,934.4 kilometres – of distance driven).

Government-driven consolidation of the car industry will also support a shift towards plastics as plastic usage is more economical for the mass production of cars. These factors will result in automotive plastics consumption likely increasing faster than car production itself.