

Powder coating: A global value chain perspective

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Duke University's Center on Globalization, Governance & Competitiveness (CGGC) reviewed the technology and product market developments in powder coatings from 1950-2000. The study, sponsored by the Corporate Partnerships Program of the Environmental Defense Fund, used Global Value Chain analysis¹ to highlight important dynamics in the powder coating industry and how these affected the adoption of powder coating over time. Excerpts from the report on the powder coating value chain structure, the ability of key players to affect the industry, and some challenges of the Chinese powder coating market are provided in this article.

The powder coating value chain (Figure 1) consists of raw materials suppliers, powder coatings manufacturers, independent powder coating enterprises (coaters), and product manufacturers (original equipment manufacturers, or OEMs). Powder coatings manufacturing and application equipment manufacturers (and their component suppliers) enter the powder coating value chain at specific points. Other relevant organizations and institutions are trade associations, trade journals, private consulting organizations, and the regulatory environment. Powder coating was a \$6.5 billion industry worldwide in 2008. Powder coatings manufacturing was a \$5 billion industry worldwide in 2008. Equipment manufacturing was a \$704 million industry worldwide, while independent coating enterprises were an \$808 million industry in 2008¹. Powder coating as a whole makes up approximately 6 percent of the total coating world market and approximately 30 percent of coatings used in manufacturing and commercial applications². The powder coating value chain is most concentrated in the powder coatings manufacturing segment and least concentrated in the coating enterprises

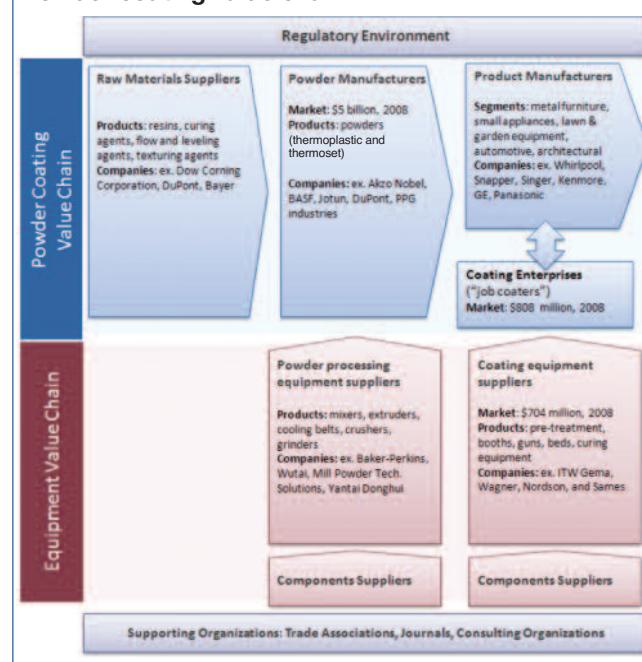
segment. Details on each segment of the value chain are provided below.

Raw materials suppliers. Raw materials suppliers provide the resins, curing agents, pigments, extenders, and additives necessary to produce powder coatings. Dow Corning, DuPont, and Bayer are examples of large raw materials suppliers.

Powder coatings manufacturers. Powder coatings manufacturing is the most concentrated portion of the powder coating industry, with the top 25 major powder coatings manufacturers accounting for 80 percent of the

FIGURE 1

Powder coating value chain



world powder coatings market. Some of the main players identified in the global powder coatings market are Akzo Nobel, BASF, Jotun, DuPont, PPG, and Rohm and Haas (being purchased from Dow by Akzo Nobel). (See Figure 2.)

All of these companies are multinational corporations producing both liquid and powder coatings. Their revenues from coatings (liquid and powder) are an important part of their total sales, especially for Akzo Nobel and PPG. These companies serve a globalized coatings market but have higher than average sales in Europe.

These companies commercialize different brands of the most common thermoset powder coating types: epoxies, polyesters, hybrids, and acrylics. Their broad product range and the high product quality allow them to supply customers in both the decorative and functional coatings product markets. A major challenge for companies is to extend the applicability range of powder coatings to wooden or plastic product surfaces.

In addition to these large multinational coatings companies, there are thousands of medium and small powder coatings manufacturing companies. These companies usually have a limited market area and may also sell powder coating equipment and accessories.

Product manufacturers. Product manufacturers, or OEMs, are consumers of powder coatings and are divided into specific product segments. The most important product segments for powder coatings have historically been metal furniture, household appliances, and functional products such as electrical wiring and pipeline protection. Product manufacturers in an ever-increasing set of products have adopted powder coatings.

Coating enterprises. Coating enterprises, or coaters, are outsourcing partners of manufacturers who do not have the technological expertise or equipment necessary to coat their products or pre-cut blanks in-house. There are thousands of job-shop coaters around the world, and they are usually small- and medium-sized companies that operate regionally. (Thomas Research reports 1,427 powder coating services of which 675 are defined as custom manufacturers.)

Powder processing equipment suppliers. The equipment necessary to produce powder coatings has been specialized over time from manufacturing processes in the plastics, chemical, pharmaceutical, and even cement industries. Key standardized equipment suppliers are Baker-Perkins, Thermo Scientific, Wutai, Mill Powder Technology Solutions, and Yantai Donghui Powder Processing Equipment Co. These companies provide from “one to all” of the necessary equipment and the technical assistance to set up the plant. Finally, for big and customized plants there are specialized engineering and contracting companies.

Coating equipment suppliers. Some coating equipment is specific to the powder coating industry, while other equipment is sold for broader applications. For example, the washing systems or the curing ovens can be used in other industrial processes with minor modifications. Some equipment, however, is specifically designed for powder coating such as the electrostatic spray guns and powder application booths.

Two main categories of coating equipment suppliers exist, component sellers and system integrators. Component sellers provide customers with specialized equipment such as guns, booths, or ovens needed for a powder coating line. System integrators are service-oriented companies that usually buy components to build standardized batch or customized turnkey systems. In this market, some of the main companies are ITW Gema, Wagner, Nordson, and Sames.

Regulatory environment. The regulatory environment has been a key driver of powder coating adoption in some markets. Two types of regulations are relevant: air emissions standards limiting volatile organic compounds (VOCs) and solid waste regulations limiting the type and quantity of industrial waste that can be released by industry. In the US, the 1970 Clean Air Act and its amendments were an important force in powder coating adoption by industries using liquid and enamel coatings. The various solid and hazardous waste regulations adopted over the years (Resource Conservation and Recovery Act [RCRA], the Hazardous and Solid Waste Amendments [HSWA], and Superfund) were also important drivers for the adoption of the technology. Environmental regulations, however, are not a necessary condition for powder coating adoption. The European example indicates that powder coating adoption and diffusion among product segments can occur in weak air and waste emission regulatory environments.

Supporting organizations. Supporting organizations for the powder coating value chain consist of industry organizations, specialty trade journals, and private consulting organizations. These organizations provide forums for information exchange and provide a reservoir of technical knowledge in powder coatings for other actors in the powder coating value chain.

FIGURE 2

Some top powder coatings manufacturers

Name	Total turnover (bln \$)	Employees	Headquarters
Akzo Nobel nv	21.5	60,000	Europe
PPG Industries	15.85	44,900	US
DuPont Coatings & Color Technologies Group	30.53	60,000	US
BASF Coatings AG	87.22	96,924	Europe
Jotun	1.92	7,200	Europe

Source: CGGC research

Critical points in the value chain

Key leverage points exist in the powder coating value chain. By leverage points, we mean portions of the value chain over which specific actors have unequal power in influencing the conduct of the entire value chain. Leverage points by key actors in the powder coating value chain are summarized in Table 1.

Research and development. Powder coatings manufacturers conduct the overwhelming share of research and development (R&D) in the powder coating value chain. In the pre-1975 era, R&D tended to occur in the manufacturing and application equipment sector and by powder coatings manufacturers. After this period, innovation in the equipment value chain tended to be

TABLE 1

Powder coating value chain leverage points

	Input Powder manufacturers	Production Equipment suppliers	Product manufacturers	Retail sales Large retail companies
Research and development	Large powder manufacturing companies are continuously investing in R&D to maintain high profit margins in new products in an industry where older powder products have very low margins. Major areas of research are in higher quality (e.g. resistance to hostile environment, new aesthetic qualities) and lowering their customers' process costs (e.g. lower curing temperature).			
Customization and technical assistance	Powder suppliers collaborate with customers to develop a customized product, particularly for high value products or products for which the coating is an important part of the product (e.g. marine, automotive, architectural markets). This enhances the powder suppliers' bargaining power because it's more difficult for the customer to switch to another supplier. If the coating has a lower importance on the quality of the final product (e.g. basic functional requirements such as a car underbody), the product manufacturer can more easily switch suppliers and constrain them to compete on a price basis.	Equipment suppliers provide technical assistance to product manufacturers to customize and optimize equipment.		
Access to markets			Product manufacturers who own or control the distribution channels of their products can specify price and product specifications that best meet their retail and wholesale customers needs.	Large retail companies can dictate price and product specifications (e.g. type of coating used) to product manufacturers, particularly in product segments where branded manufacturers do not control distribution and sales networks.
Purchasing volumes			Product manufacturers who purchase large quantities of powder may receive discounts or preferential contracts from powder manufacturers.	Large retail companies can use their purchasing power to negotiate preferential contracts from branded and non-branded product manufacturers.
Brand name recognition			Companies with highly recognized brands (e.g. Whirlpool for white goods) may leverage this to increase bargaining power over retailers and maintain control of price and product specifications.	Large retail companies with well-known brands can use it to negotiate preferential contracts with branded and (especially) non-branded suppliers.
Economies of scale and scope	Large powder manufacturing companies have international product and sourcing networks, and have achieved economies of scale in producing powder coatings. This permits them to achieve market power in the powder coatings market.		Product manufacturers have international production and sourcing networks and are able to achieve economies of scale in manufacturing. This permits product manufacturers to reduce per unit costs and/or increase product quality.	Large retail companies can pressure product manufacturers to reduce costs and/or improve quality thus capturing the gains from manufacturer's economies of scale.

marginal, while powder coating chemistries became increasingly able to meet the needs of specific product markets. This ability by powder coatings companies to refine powder coating chemistries to meet the needs of specific applications, operating conditions, substrates, and product markets led to the growth of powder coatings.

Customization and technical assistance. Powder suppliers collaborate with customers to develop a customized product, particularly for high-value products or products for which the coating is an important part of the product (for example, the marine, automotive, and architectural markets). This customization enhances the powder coatings suppliers' bargaining power because it is more difficult for the customer to switch to another supplier. If the coating has a lower importance on the quality of the final product (for example, basic functional requirements for the underbodies of cars), the product manufacturer can more easily switch suppliers and constrain them to compete on a price basis.

Equipment suppliers also provide technical assistance to product manufacturers to customize and optimize equipment.

Access to markets. Product manufacturers possess a large base of retail and wholesale customers for their products. These customers provide information to product manufacturers about their level of satisfaction with the product. In turn, product manufacturers decide whether the current technical specifications of their products—including the type of coating used—best meet the needs of their customers. As a result of this control, product manufacturers have the ability to determine product specifications and set the price of their goods. This control of access to markets by producers is characteristic of a producer-driven value chain.

The producer-driven value chain is contrasted with buyer-driven value chains in which buyers control access to markets. In buyer-driven value chains, producers manufacture according to buyer specifications and become price takers. Their base of customers narrows to a few wholesale customers, and they use the buyer's distribution network to access retail customers. This dramatic shift of power in product markets has resulted from the rise of large retailers—particularly in the US—with massive purchasing volumes able to take advantage of (and demand from) product manufacturers' economies of scale and scope to reduce prices. The shift in power from producers to buyers presents buyers with tremendous opportunities to shape value chains to meet their specifications and price levels. Buyers have the ability to be major players in technology adoption by fully exerting their leverage on value chains, particularly their leverage in market access, purchasing volumes, brand name recognition, and economies of scale and scope. A fuller discussion of the differences and consequences of producer-driven and buyer-driven value chains than can be offered here is available in Gereffi (1999)³.

Purchasing volumes. Product manufacturers purchasing large quantities of powder may receive discounts or preferential terms from powder coatings manufacturers. Large retailers may also use their purchasing power to negotiate preferential contracts from branded and non-branded product manufacturers.

Brand name recognition. Companies with highly recognized brands (for example, Whirlpool for white goods) may leverage this to increase their bargaining power over retailers, thus maintaining control of price and product specifications. Large retailers with highly recognized names may also negotiate preferential contracts with branded and (especially) non-branded suppliers.

Economies of scale and scope. Large powder coatings manufacturers have international product and sourcing networks and have achieved economies of scale in producing powder coatings. This permits them to achieve market power in the powder coatings market. Product manufacturers have international production and sourcing networks and are able to achieve economies of scale in manufacturing. This permits product manufacturers to reduce per-unit costs and/or increase product quality. Large retailers can pressure product manufacturers to reduce costs and/or improve quality thus capturing the gains from manufacturer's economies of scale.

Chinese powder coating market structure

The powder coating market structure in China differs from the market structure in the US and Europe. The most significant difference is that the powder coatings manufacturing industry is highly diffuse in China. More than 2,000 powder coatings manufacturers exist in China, and 98 percent of them are small manufacturing enterprises with production levels under 1,000 metric tons per year.

Only 40 companies in China produce more than 1,000 metric tons per year, of which the 10 large foreign firms produce 20 percent (142,000 metric tons) of Chinese powder coatings each year, with the largest three producing 100,000 metric tons per year. Other foreign-owned powder coatings firms sharing 42,000 metric tons of annual production are Valspar, PPG, Orica, BASF, Jotun, Rohm and Haas, Tiger Werke, and 3M. Foreign firms have also increased their Chinese market share through mergers and acquisitions (M&A). Nippon Paint and Dow Chemical are recent examples of M&A activity in the Chinese powder coating market⁴.

Very large manufacturing firms in China (both domestic and foreign) typically coat their items in-house rather than sending them to job coaters. However, an extensive network of job-shop coaters exists in China, typically used by small manufacturing companies producing for domestic consumption.

China also has a large and well-developed powder coatings manufacturing equipment market. Only 10 of the roughly 600 powder coatings manufacturing equipment

systems purchased annually during 2006 in China were imported from abroad⁴. Most of the powder coatings manufacturing equipment is produced in Yantai, Shandong Province. Domestic powder coatings manufacturing equipment suppliers include: Hkorl Machinery Co, Yantai Sanli Machinery, Donghui Powder Processing Equipment, and Yantai Ling Yu Powder Processing⁴. Some limitations exist, however, on technologically advanced components for manufacturing equipment.

Domestic production of powder coatings application equipment (booths, guns, integrated and automated powder lines) is more limited than the manufacturing side, particularly in the mid- to high-end application equipment that needs to be imported from overseas. Major suppliers are ITW Gema, Wagner, Nordson, and Sames. Domestic producers of medium- to low-end coating equipment are Yutung Engineering, Liush Machinery, and Fung Yu Group⁴.

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