# INSEAD EURO-ASIA CENTRE



# BASF in China:
# The Marketing of Styropor®

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This case was written by Jocelyn Probert, Research Analyst at INSEAD Euro-Asia Centre, and Hellmut Schütte, Professor of International Management at INSEAD. It is intended to be used as a basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation.

The news, when it came, was not a complete surprise. In early 1998 the largest customer in China for BASF's imported expanded polystyrene (EPS) packaging material decided to switch to a local producer who could deliver more quickly and cheaply. Christian Fischer, styrenics department manager of BASF China in Hong Kong, and Alice Wong, marketing manager of the department, needed urgently to overcome a fundamental problem: how to differentiate their product in what was essentially a commodity market suffering from significant over-supply. The over-supply of packaging grade (P-grade) EPS had become apparent in 1997, and would become much worse by the year 2000.

BASF itself would open an EPS production facility in Nanjing in October 1998. The imported P-grade product it had been selling so far was especially suited to high speed vacuum-moulding machines and therefore carried a premium price. BASF was the clear market leader in this segment. The problem was that most of the moulders in China transforming EPS into packaging material for consumer goods were still using manual or automatic machines, which did not need to use high performance material like BASF's. Could BASF serve this less sophisticated, but much larger, market without compromising the positioning of its EPS as a premium product?

BASF's plant in Nanjing would also supply flame retardant (F-grade) EPS for insulation use in the construction industry. The future of this product in China was equally uncertain. In 1998 the construction industry in China was only a small user of this material. The BASF product offered premium value in a market where cheaper alternatives were available. How could BASF position its EPS as the product of choice in the construction industry?

## BASF in China

The BASF Group, headquartered in Ludwigshafen, Germany, had sales of 55.8 billion deutschemarks (approximately US$ 31 billion) in 1997, and profits before tax of DM 5.3 billion (Exhibit 1). Its products ranged from natural gas, oil and basic chemicals, through intermediate chemicals, to specialities, high value-added chemicals, crop protection products and pharmaceuticals. The core businesses were divided into five segments (Exhibit 2). BASF's long term strategy was based on the *Verbund*, or integrated petrochemical site linking production, research and logistics. The Ludwigshafen *Verbund* was the world's largest chemical complex; BASF had other *Verbunds* in Belgium, Spain and North and South America, and three more were planned or under construction in Asia (in Kuantan, Malaysia; Mangalore, India; and Nanjing, China). Existing smaller operations all over Asia plus the three new large projects, made BASF one of the largest western investors in the region. The Asian crisis which erupted in July 1997 did not seem to have a negative impact on BASF's expansion plans.

BASF net sales in the Asia Pacific region in 1997 amounted to DM 5.2 billion, 9% of the group's total sales. About 30% of the products sold there were produced locally. BASF planned to raise that share to 70% by 2010, and to double its market share. In China 1997 sales were DM 1.1 billion, of which approximately 10% was contributed by products from local BASF joint ventures. Sales and the share from local production in China were expected to grow rapidly as new operations came on stream.

BASF's interests in China had expanded rapidly during the 1990s. As well as a Hong Kong company, which had responsibility for the marketing, sales and distribution in China of imported products produced by the company's plants around the world, by 1998 it boasted five representative offices (in Beijing, Shanghai, Guangzhou, Nanjing and Dalian), a holding company in Beijing with branch offices in Shanghai and Guangzhou, and ten joint ventures (Exhibit 3). By far the largest capital expenditure plan, still under negotiation in 1998 and worth some DM 5 billion, related to the joint construction of the *Verbund* in Nanjing with Yangzi Petrochemical and Sinochem. The centrepiece of this plant was a steamcracker to provide backward integration for many of BASF's China manufacturing activities.

BASF already had a relationship with Yangzi Petrochemical, via a joint venture in Nanjing formed in 1994 called Yangzi BASF Styrenics (YBS). It was 60% owned by BASF. This plant began producing ethylbenzene, styrene and polystyrene in late 1997. The EPS facility which Fischer and Wong expected to come on stream in October 1998 would be part of the YBS joint venture.

Sales of EPS handled in the BASF China office in 1997 totalled HK$ 280 million (about US$ 36 million).

## Styropor®: BASF's Expandable Polystyrene

Expanded polystyrene foam is the familiar white, lightweight foam used for example as shock-absorber and to hold a home appliance in place in its cardboard delivery carton. The packaging industry worldwide is one of the two major users of EPS. The other is the construction industry, which uses it as insulation material against cold and heat.

EPS was invented by BASF engineers in 1950, patented by the company, and trademarked with the name Styropor. By the 1980s the production process was no longer under patent, and EPS was produced by several, mainly European, petrochemical groups. BASF remained the world leader in EPS, and its Styropor boasted a 25% global market share. BASF produces EPS, the raw material from which moulders produce in two steps EPS foam products via EPS foam beads.

To manufacture EPS styrene monomer is polymerised into polystyrene in the presence of finely dispersed pentane gas. Special grades of EPS beads for various fields of application are produced by altering formulations and adding treatment processes. An alternative low technology process involves adding pentane gas directly to purchased polystyrene. This is the method used by countless backstreet garage operations in developing countries across the world. Moulding companies buy the EPS beads from either source and physically expand them in a two-step process (a bit like making popcorn). In a first step they expand the EPS with steam to produce prefoamed beads. In a second step the prefoamed beads are put into a confined space in a mould where they fuse together into the shapes required by the end-users. The end-users may be home appliance and computer manufacturers or construction companies.

Styropor, like other packaging and construction materials, is combustible. F-grade Styropor, therefore, is treated with a special flame retardant agent to reduce its flammability and the

spread of flames. This is what distinguishes construction-use F-grade EPS from the P-grade material generally used by the packaging industry.

## The EPS Market in China

During the mid-1980s the market for EPS in China totalled just 20,000 metric tons (mt) per annum, for packaging use only. BASF was the market leader with a share of 60-70%, the remainder being delivered by Japanese producers. BASF supplied the EPS in drums with a six-month shelf life since it took three months to ship the product from Germany to China.

In 1988 Taiwanese firms began supplying the China market. Although the Taiwanese product was of lower quality, the paper bags it came in were cheaper than the corrugated drums supplied by BASF. On the other hand EPS packed in bags had a guaranteed shelf life of one month only, compared with six months for the drums. At the end of the 1980s BASF came under pressure in Europe to demonstrate the environmental acceptability of EPS - which it did successfully. In China, EPS moulders were not prepared to pay a premium for an environmentally sound product, although their customers were quick enough to demand from BASF documentation proving the recyclability of EPS if they were exporting consumer durables from China.

By 1992 Taiwanese quality had risen sufficiently to challenge BASF's Styropor business; four years later, the Taiwanese company Honest had become the market leader in China.

In 1997 the packaging industry represented 80% of total Chinese EPS demand and the construction industry 20%, the reverse of demand patterns found in Europe.

Market demand from both industries for EPS that year totalled approximately 200,000 mt, after growth averaging 12% per annum between 1990 and 1996. Wong and Fischer believed that demand would be significantly slower in the period 1998-2000 as the economy slowed in the wake of the Asian financial crisis suggested, and would average 7% per annum between 2000 and 2005. Within this 7% average, construction industry demand would grow by a faster 10% as the market developed compared with 6.5% for the packaging industry, which was roughly in line with GDP growth.

Industrial growth was higher than total GDP growth, but Wong's market intelligence indicated that packaging growth would not match it because of the substitution of EPS by other packaging materials, particularly for small items, and attempts by multinational firms to reduce the weight of packaging they used. One Western multinational in China, for example, expected to use 1 kg of moulded EPS to protect the new model of its product compared with the 2.5 kg required for the previous model. EPS producers were also likely to come under attack from producers of alternative packaging materials, such as paper, who would claim their material was more environmentally friendly. Fischer and Wong knew that EPS had been shown in Europe to be 100% recyclable and to use fewer chemicals than paper. In China consumer education on such issues was not yet well developed.

Wong could see from the database of moulders that her team had built over the previous two years which areas of China had the strongest demand for EPS, and drawn conclusions about

future patterns of demand. She estimated that there were about 350 moulders for the packaging industry and 100 for construction-use, many of which were very small. Although her database did not include every moulder in the country, she was confident that she could gauge fairly accurately the entire market size. The market was transparent, so new EPS suppliers to the moulders did not remain unnoticed for long.

She could see that the major consumption areas for P-grade packaging were in Guangdong, particularly around the Pearl River delta which was the base for many export-oriented manufacturers (mostly Hong Kong and Taiwanese transplants), as well as in Jiangsu Province and Shanghai. These southern and eastern areas of China were likely to continue to drive demand for packaging materials.

In contrast, demand for the insulating properties of F-grade EPS would be greatest in northern China, followed by eastern China. Wong forecast 13% growth for construction-use EPS in northern China between 2000 and 2005, but from a much lower base than P-grade.

## The Packaging Industry: P-Grade EPS

Moulders in the packaging industry were segmented according to the type of machine they used to process EPS. By far the largest segment, occupying three-fifths of production capacity in 1997, was occupied by manual machines which were Chinese-made and operated at slow speeds. Labour costs in China were low and many moulders did not worry how much time it took to produce orders. Automatic machines were faster than the hand-operated machinery, and occupied 15% of the market.

Vacuum machines, which occupied the remaining one-quarter of the market, were the most sophisticated. This was the segment targeted by BASF products since all European and North American moulders used these machines. Vacuum machines required high quality EPS beads to operate with maximum efficiency and at fast cycle times, thereby saving on energy and steam costs. One vacuum machine could produce twenty times the volume of EPS packaging produced by a manual machine.

Most of the vacuum moulders were Hong Kong transplants based in Guangdong. Only a few packaging plants in Eastern China used vacuum machines, although that was changing as more joint ventures between Chinese and multinational companies came on stream in the Shanghai area. In the north hardly any packaging firms used vacuum moulding machines. The Hong Kong market 15 years ago had also been heavily dependent on manual machines, but the majority of moulders there had switched to vacuum machines within five years. Fischer and Wong expected mainland Chinese moulders to upgrade their equipment too, but at a slower pace because of the rather poor financial situation of Chinese companies and a general slowdown in foreign investment in China. There was likely to be a lengthy transition phase as manual moulders graduated first to automatic machines.

BASF's Styropor was the market leader in China for this premium vacuum machine segment, with a 50% share. It sold very little to the automatic and manual moulders. In the vacuum segment BASF was competing with Korean imports, as well as the Taiwanese company Honest and the Arco joint venture, Jinling, both of which produced EPS in China.

The product supplied by BASF to the packaging moulders was imported from its wholly-owned Styropor facilities in Malaysia. It took up to 30 days for delivery, from the moment the letter of credit was opened. Transplant factories in Guangdong were prepared to wait because they recognised the advantages of the BASF product: superior fusion rates, pre-expansion and density; stable quality of the product; and fast cycle times leading to energy and investment cost savings. Since the Guangdong transplants were processing for the export market these moulders did not pay import duties. Non-export oriented moulders, on the other hand, had to pay import duties of 16% which made the price of Styropor unattractive compared to local producers' EPS. Transportation costs from Malaysia also made it uncompetitive for Wong and her team to sell imported P-grade Styropor to moulders in North and East China.

Relatively few automatic machinery moulders were prepared to pay premium prices for BASF's product. Only those who were particularly skilful at operating their machines at fast cycle times and within narrow processing parameters could justify the higher price. It was hard to argue to state-owned companies, which in any case did not pay market prices for electricity, that BASF's product was cheaper in the long run. "Only modern-minded Chinese moulders will believe the potential savings on energy and steam, so we have to look for these customers", explained Andy Lu, who until recently had been sales manager for China. There was no point at all in manual moulders using the BASF product. Economic conditions also had a role to play. If the moulders were not operating at full capacity, they were not interested in the fast cycle times of BASF's high performance product. Even vacuum moulders would then buy cheaper EPS beads from somewhere else and run their machines at a slower pace.

It was clear that in the packaging sector BASF's imported Styropor was confined to a limited segment: vacuum moulders based in southern China. 'We have a Ferrari product', commented Fischer, 'which makes it difficult for us to penetrate the lower segments.'

**Production Capacity**

In October 1998 BASF was scheduled to begin producing P-grade EPS at its Yangzi-BASF Styrenics (YBS) joint venture in Nanjing, but it had become clear 18 months earlier that the China market was suffering from severe over-capacity.

Local capacity exceeded local demand of approximately 200,000 mt in 1997. However, 90,000 mt of P-grade EPS were imported into China by BASF and some Taiwanese and Korean firms. This meant that capacity utilisation at local plants was below 50%. "Importing EPS could be very difficult during the next few years", remarked Edmond Tam, division manager for plastics.

In addition to the 40,000 mt capacity of YBS, other companies were planning to start local production or expand capacity. Based on announced investment projects, Wong estimated that local production would outstrip demand by 50-70% in the year 2000, no matter what the volume of imports might be. She was also keenly aware of regional over-capacities. Annual production capacity in Taiwan was over 200,000 mt, yet domestic demand was less than 40,000 mt. Korean firms were also exporting to China.

In China the largest producer of EPS beads was the Taiwanese company, Honest. It had begun local production in 1995 and by 1998 had two plants with a combined annual capacity of 100,000 mt. This made it the market leader in China. Honest's product was suitable for

more or less all types of machine. Since 1997 it had begun to attack the vacuum segment. When BASF decided in 1995 to invest in an EPS plant in China, no-one had spotted the potential threat from the Taiwanese firm. The price of Honest's locally produced EPS was 1200 RMB, or 20% below that of BASF's Malaysian imports. Honest had managed to capture BASF's largest customer, which had bought additional vacuum machines, but was not using them at full capacity, reducing BASF's fast cycle advantage.

Other local producers included Xinghua (60,000 mt capacity), Pacific Ocean (30,000 mt), Mingda (another Taiwanese firm, 40,000 mt), Jiangmie (20,000 mt), and a mass of smaller facilities. All these firms were selling to the manual machine moulders. Xinghua dominated the manual segment in East China. Arco was reported to be expanding production at its Jinling joint venture by 28,000 mt in 1999. Except for Mingda and Pacific Ocean, which were in Guangdong, all other producers including BASF were located around Shanghai and Nanjing in East China. BASF justified its location in Nanjing because of the cost advantages from the plant's integration into the petrochemical complex.

There was no doubt that some of these EPS suppliers in China would not survive.

**Strategy at the YBS Styropor Facility**

It was obvious that due to the market situation in China the traditional products of BASF would not fit. Therefore BASF decided to design a completely new product for the Chinese market. The formerly imported Styropor from Malaysia provided good fusion and fast cycle times. The new product offered a shinier white surface after moulding, improved fusion as well as a wider and less sensitive processing window. Until now German engineers had concentrated only on the technological merits of the products.

High capacity utilisation was important to produce consistent quality. Styropor's current positioning in the China market was in the high margin vacuum segment, whose total demand was 40,000 mt in 1997. The YBS plant, though, had capacity of 40,000 mt. To obtain the necessary scale effect at YBS, BASF planned to manufacture EPS beads to different quality standards for positioning in the other market segments. They would be priced lower than YBS's premium product but above the price of competitors' EPS.

Wong and her team hoped to create a pull effect for their product by approaching the end-users of EPS packaging in China - companies like Sony and Philips - to convince them that they should specify use of Styropor to their moulders because of its superior attributes. At the same time she had to be careful not to cannibalise the market for the Malaysian-produced imports, which would upset BASF's regional production and marketing strategy. BASF China was to continue to source some P-grade EPS from Malaysia to service certain Hong Kong transplants. Other transplants and all the local moulders would be served by the Nanjing site.

## The Construction Industry: F-Grade EPS

Fischer and Wong believed that China's economy would remain export-oriented for a long time, so the construction industry in China would not dominate demand for EPS as it did in western countries. However they did believe that prospects in China for flame-retardant EPS were positive as long as the merits of its use as insulating material were promoted in the right

places: at the Ministry of Construction in Beijing, at architectural design institutes, among property developers, and among the construction companies themselves. New floor space, which according to government data was around 130 million sq.m each year, was one way of estimating the potential demand for insulation material. Usage of EPS as insulation material in 1997 was less than 100g per capita of urban population. In Korea, which had a similar climate to that of Beijing, per capita consumption was 3kg. Insulation against cold was an easier concept to promote than insulation from heat, so BASF would concentrate on the northern provinces first.

The Chinese government was now paying attention to energy and investment costs and to environmental issues. A 1998 law required all new buildings in the year 2000 to achieve energy savings of 50% compared with 1986 energy requirements. The construction industry was preparing building regulations determining insulation standards. China was also embarking on a new affordable residential housing policy to cope with the shift towards private house ownership. EPS boards were not the only insulating material on the market, though. Rockwool was an alternative and there were plenty of other less possibilities around, including breeze blocks and simple cavity walls.

In 1997 Fischer brought experts from Germany to explain the advantages of F-grade EPS at a series of seminars for architects and government officials in cities around China. BASF China also developed and distributed a booklet explaining the various applications of EPS in floors, walls and ceilings. The EPS Association liked the booklet so much that it began copying and selling it to construction companies. BASF's efforts to transfer knowledge benefited all suppliers of F-grade EPS. A civil engineer in the Beijing representative office, Jason Guan, had the specific brief to develop F-grade EPS demand by offering solutions, not just products, to customers. As Guan pointed out, however, 'It is difficult to make customers in China realise that they should pay for this type of service'.

In 1998 BASF was the only significant importer of F-grade EPS, which it brought from a wholly-owned factory in Korea. Other firms had abandoned the China market in favour of North America, where demand was more developed. It was hard for importers to compete against Chinese-made products. BASF's position had been rather comfortable until 1995, but the entry of domestic producers was beginning to erode its market share which had fallen to 21%. Local F-grade producers included Huada in Shandong Province, Pacific Ocean, and Shanghai Dong Bei. Honest had launched an F-grade product in March 1998.

The F-grade EPS market was suffering from short term over-supply, principally because demand was so under-developed. Many construction companies used packaging-grade EPS for insulation despite the risks of using non-flame retardant material, and in East China some F-grade material was used for packaging. The issue for Fischer and Wong was how to differentiate BASF's F-grade beads to the moulders and influence the construction companies to specify Styropor as the insulation material of choice.

**Local Production**

BASF originally intended to continue to supply F-grade Styropor from Korea, but falling prices because of local Chinese production had cut margins and market share was being lost.

Traders did not want to hold stock or distribute the product in China for BASF because of price erosion between the time they placed orders and delivery in North China 35 days later.

Production at the YBS joint venture in Nanjing could be adjusted relatively easily between P-grade and F-grade EPS. The plant would begin making only P-grade Styropor and would later add F-grade. Capacity at the plant could also be ramped up easily and cheaply from the original 40,000 mt to 50-60,000 mt. This additional production was likely to be F-grade material. What was not clear was whether, given the efforts BASF China was making to develop demand in the construction industry, this supply would be sufficient to build the BASF brand name and maintain market share. Once local production of F-grade began, imports from the Korean plant to North and East China would cease.

As with the P-grade material, BASF did not sell its F-grade Styropor directly to the end-users, in this case the construction companies, but to the intermediate users, the moulders, who moulded the beads into boards or blocks of insulation material. Very few moulders served both the construction industry and the packaging industry. Many F-grade moulders were small and situated close to their markets because of the difficulty of transporting bulky insulation boards over large distances. Wong could see some possibility of continuing a little imported F-grade business in South China, since the product was brought into ports there, but demand generally in the south was low: apart from one customer requiring 500 mt of F-grade per year, the market was too fragmented to be served other than by traders. The country's largest F-grade moulder, purchasing 2,000 mt per year, was based in Tianjin.

BASF also had to watch the producers of competing insulation materials. Owen Corning was already manufacturing rockwool at several sites in China and was building an XPS plant in Nanjing. XPS was a highly impact-resistant form of expanded polystyrene especially suitable for roofs but in general it was too expensive for walls (thus significantly reducing potential market demand). BASF no longer imported its XPS, called Styrodur®, from Germany and had also given up the idea of producing locally. The price of an XPS board was five times that of an EPS board, market potential was limited, and the most suitable place to build would have been in northern China which was too far from its source of raw materials, the BASF operations in Nanjing.

**Enersave**

The Enersave agreement was one way for BASF to differentiate itself from other F-grade producers. Enersave was an American firm with a patented insulation system for external walls. A property developer specifying the Enersave system would require the construction company to procure and install flame retardant EPS boards on site, which Enersave engineers would then spray with a special coating material. Enersave guaranteed the system only if approved quality EPS boards - the one crucial part of the insulation it did not make - were used by the construction company.

Enersave had formed a joint venture in China to manufacture and apply the coating but, owing to concerns over the quality of locally-produced F-grade EPS, it appointed BASF as its exclusive supplier in China. BASF China would select and approve a certain number of F-grade moulders to make the boards using Styropor, and would provide a testing service on the output to guard against counterfeiting. The Enersave and BASF names would be printed by

the moulder on the boards, allowing easy on-site visual verification by engineers prior to the application of the coating material. BASF also added an invisible chemical tracer to the EPS beads to allow laboratory analysis of the material supplied to the construction company.

Enersave expected to be named in the construction industry's regulations as an approved supplier of insulation systems. In 1998, the first year of operation, its systems were forecast to demand 800 mt of F-grade EPS, rising to perhaps 2000 mt in the year 2000. Enersave and BASF were together successful in convincing the Ministry of Construction to approve this system in China and promote it by their own magazines for architects and construction companies. BASF needed to appoint approved moulders in all the large cities, especially in North China. In the interests of competition and to create sufficient capacity, Fischer decided to select two moulders in each locality. He also expected to make similar exclusive supplier arrangements with other multinationals in the construction insulation business, as this appeared to be a promising method of expanding the market as well as raising BASF's share.

For the moulders, the Enersave-related business could be an interesting opportunity. A typical Enersave site might require 50 mt of EPS board, equivalent to perhaps half the moulder's normal annual production. Margins on the Enersave board would also be slightly better than for regular F-grade board. BASF hoped to expand the volume of EPS beads it supplied to each appointed moulder above the amount required for the Enersave business. Fischer was considering how else he could tie in the moulders to BASF's F-grade business.

## Distribution

For both P-grade and F-grade Styropor, distribution was an issue BASF needed to resolve in the short term.

BASF China could bring imported materials only as far as the border, since the law required a Chinese import company to bring the product into the country and distribute it or pass it on to a trader or distributor. When YBS production began in October 1998 the joint venture would be able to handle sales of its output directly, eliminating the need for import company relationships. This in turn meant that BASF China would have greater direct contact with the moulders, and eventually their customers.

In 1997 BASF China had eight key accounts for EPS which represented around 70% of sales. These accounts had to be defended and new ones developed, especially in East China where so far it had only target accounts, i.e. moulders which were attractive in terms of size, value orientation and growth, and where BASF's position in terms of market share needed development. A moulder with demand for 500 mt per year was a medium-sized account for BASF China. Fischer and Wong wanted their staff to service such accounts directly, although in some instances a distributor would continue to handle the business. There could be a long-standing relationship between the moulder and the distributor, for example, or the financial standing of the moulder was doubtful so it was better for BASF China to share the risk with the distributor.

Local production would allow BASF to keep distribution points at key locations in North and South China well supplied, and although traders would be involved in the physical handling

of the product BASF China staff could promote the product from the distribution points. There could even be a case for establishing distribution points next to major customers, to permit just-in-time delivery. YBS would handle distribution in East China. In North China Fischer was contemplating appointing a dedicated distributor who would set up a full distribution facility and work with regional traders to cover areas BASF China staff could not reach. Business in Beijing and Tianjin, the major areas of demand for F-grade, would be handled directly by BASF China.

This was the position in August 1998, a few weeks before local Styropor production was due to start. Over-capacity was the big threat. "Our biggest challenge now is to get others out of business. Local producers are killing each other at the moment. We were not hurt so badly even though it was difficult to import. But as an importer we cannot influence the development of the market, so we have no choice but to produce locally. The more we sell, the more profitable we can be. We have to find ways to penetrate the market better, for P-grade and for F-grade, and we have to do it without destroying our premium position. This is our big challenge", reflected Fischer.

**Exhibit 1a**

*BASF Group - Recent Sales and Earnings Data*

| *(DM Million)* | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|---|---|---|---|---|---|---|
| Sales | 41,933 | 40,568 | 43,674 | 46,229 | 48,776 | 55,780 |
| Income from operations | 1,311 | 1,032 | 2,149 | 4,023 | 4,293 | 5,342 |
| Profit before taxes | 1,239 | 1,058 | 2,111 | 4,128 | 4,414 | 5,331 |
| Net income | 613 | 761 | 1,170 | 2,423 | 2,839 | 3,205 |
| Employees at year end | 123,254 | 112,020 | 106,266 | 106,565 | 105,589 | 104,979 |
| Net income per share (DM)* | 10.8 | 14.9 | 21.5 | 40.5 | 4.54 | 5.22 |
| Cash flow per share (DM)* | 78 | 80 | 93 | 104 | 11.07 | 11.85 |
| Return on sales before tax & interest expense (%) | 4.3 | 3.8 | 6.0 | 9.9 | 10.0 | 10.4 |
| Return on assets before tax & interest expense (%) | 4.7 | 3.9 | 6.5 | 11.2 | 11.4 | 12.6 |
| Return on equity after taxes (%) | 4.2 | 5.2 | 7.6 | 14.3 | 14.8 | 14.6 |

* From 1996, based on shares with a nominal value of DM 5

*Source:* Annual Report

**Exhibit 1b**

*Net Sales by Region 1997*

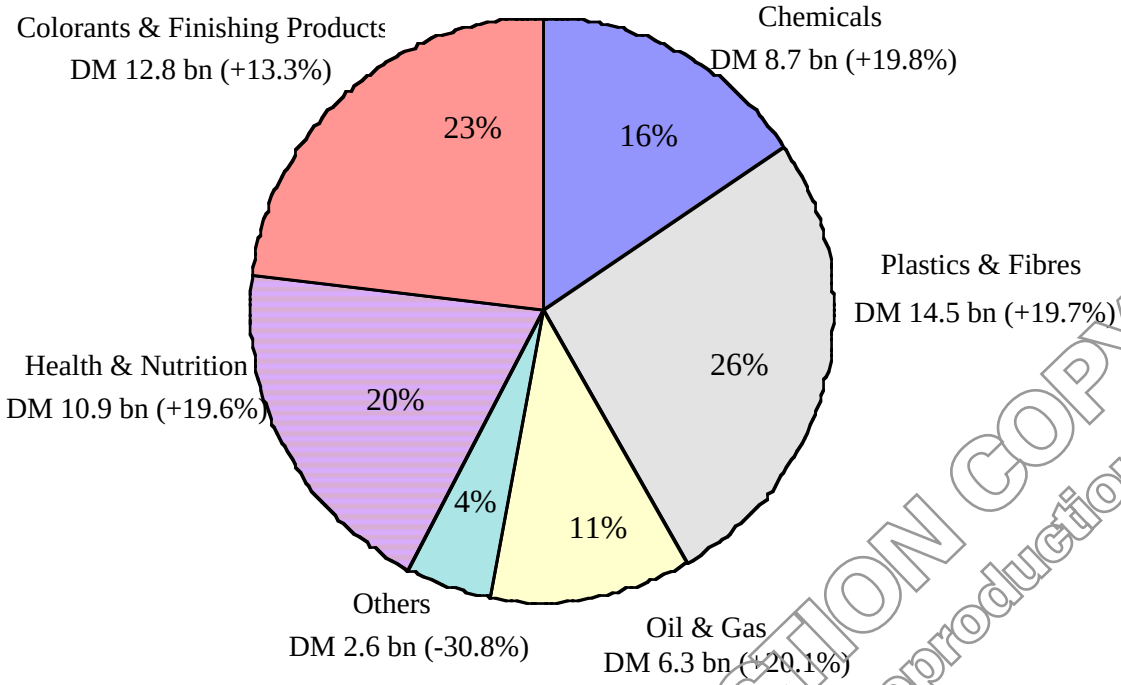
| | Sales DM million | Year-on-year Growth % |
|---|---|---|
| Europe | 34,112 | 10.6 |
| *(Germany* | *14,380* | *10.9)* |
| NAFTA | 11,668 | 22.2 |
| Asia, Pacific, Africa | 6,722 | 17.8 |
| South America | 3,278 | 21.8 |

*Source:* BASF Facts and Figures - Charts 1998

**Exhibit 2a**
*BASF Core Businesses*

| *Operating areas* | *Products (examples)* |
|---|---|
| **Health & Nutrition** | Pharmaceuticals, fine chemicals especially vitamins, fertilizers and crop protection products |
| **Colorants & Finishing Products** | Dyes, pigments, finishing products, process chemicals, dispersions, paints, coatings, printing systems |
| **Chemicals** | Basic chemicals, catalysts, industrial chemicals, plasticizers, solvents, glue resins, impregnating resins, intermediates, specialty chemicals, detergent raw materials, automotive chemicals & additives |
| **Plastics & Fibres** | Styrenic polymers, engineering plastics, polyurethanes, PVC, fibre products, polyolefins |
| **Oil & Gas** | Crude oil, petroleum products such as heating oil and automotive fuels, natural gas |

**Exhibit 2b**
*BASF Core Businesses*




*Source:* BASF Facts and Figures – Charts 1998

**Exhibit 3**

*BASF Joint Ventures in China*

| Name | Partner(s) | Founded | BASF stake | Products |
|---|---|---|---|---|
| Shanghai Gao Qiao-BASF Latex | Shanghai Gao Qiao Petrochemical Corp | 1988 | 50 | styrene butadiene dispersions for coating paper and carpeting |
| Shanghai Gao Qiao-BASF Dispersions | Shanghai Gao Qiao Petrochemical Corp | 1993 | 50 | polymer dispersions |
| Shanghai BASF Colorants and Auxiliaries | | 1994 | 75 | organic pigments and cationic textile dyes |
| Yangzi-BASF Styrenics | Yangzi Petrochemical Corp | 1994 | 60 | ethylbenzene, styrene, polystyrene; expandable polystyrene (1998) |
| NEGPF-BASF (Shenyang) Vitamins | North East General Pharmaceutical Factory | 1995 | 70 | vitamins and vitamin blends for animal feedstuffs |
| BASF Shanghai Coatings | Shanghai Coatings Co | 1995 | 60 | coating products, especially for autmobiles |
| BASF-JCIC Neopentylglycol | Jilin Chemical Industrial Corp | 1995 | 60 | neopentylglycol |
| BASF Hua Yuan Nylon | China Worldbest Group Corp | 1996 | 70 | nylon 6 for carpet fibres |
| Shanghai Interface Carpet | Interface Asia-Pacific, Shanghai China Textiles Internat. Science Technological Industrial City Dev't Co | | 5 | carpet tiles |
| BASF Headway Poly-urethanes (China) | Headway Group | 1997 | 70 | polyurethanes |

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