

# Howden

Howden is an international applications engineer with a world-leading position in the design, supply and servicing of air and gas handling equipment. Its use of sub-contractors has risen over the past three years and Howden increasingly only manufactures components that are performance critical, protect its technology or maintain its markets.

Howden's core products include centrifugal and axial fans and air and gas rotary preheaters for the power generation industry. The fans and heaters are integral parts of the coal-fired boiler and emission control systems including the processes for flue gas desulphurisation and denitrification.

Howden also manufactures and supplies fans, turbo-blowers and compressors to a wide range of other industries including oil and gas, petrochemical, iron and steel, smelting of aluminium and other metals, mining, cement, nuclear, pulp and paper, transport and ventilation fans for tunnels. Howden derives approximately one-third of its revenues through aftermarket sales which benefit from its extensive installed product base.

Howden supplies products which are manufactured or assembled at its factories and other sites across the globe. Howden's principal operations are located in Europe, China, North America and South Africa.



Machining of a Variax™ variable pitch axial flow fan hub in Howden's Belfast facility

### 2005 highlights

	2005 £m	2004 £m	Increase %
Revenue	<b>345.1</b>	241.6	<b>42.8</b>
Order book	<b>304.0</b>	181.0	<b>68.0</b>
Adjusted operating profit,	<b>33.5</b>	14.2	<b>135.9</b>
Share of profits of associates (post tax)	<b>1.1</b>	1.2	
Capital expenditure	<b>3.6</b>	2.8	
Depreciation	<b>(2.6)</b>	(2.9)	
Adjusted operating margin,	<b>9.7%</b>	5.9%	
Employees	<b>2,804</b>	2,556	

<sup>1</sup> before exceptional

- Howden more than doubled adjusted operating profits to £33.5 million (2004: £14.2 million) and its adjusted operating margins improved from 5.9 per cent in 2004 to 9.7 per cent in 2005.
- Howden grew its year end order book to £304 million (2004: £181 million), an increase of 68 per cent.
- In China:
  - Howden more than doubled its sales to £97.1 million (2004: £48.0 million);
  - Howden won orders for 100 rotary heat exchangers for FGD plants (compared with a total of 40 worldwide in the previous decade);
  - Howden substantially expanded its capacity for heater element manufacturing and machining; and
  - Howden completed a new workshop to manufacture cooling fans.
- Howden achieved aftermarket sales of £122 million (2004: £103 million), an increase of 18 per cent.

## Overview of performance

Howden achieved excellent results in 2005 with sales of £345.1 million (2004: £241.6 million), an increase of 42.8 per cent, and adjusted operating profit of £33.5 million (2004: £14.2 million), an increase of 135.9 per cent. Net operating margins were increased substantially to 9.7 per cent (2004: 5.9 per cent).

The closing order book grew to £304 million (2004: £181 million), an increase of 68 per cent, with incremental orders being generated by Howden Hua (up £38 million), Howden Denmark (up £36 million), Howden UK (up £22 million), Howden North America (up £13 million), and Howden process compressor businesses (up £12 million).

The substantial increase in adjusted operating profit achieved by Howden in 2005 reflects the strong underlying demand for Howden products and the on-going operational and other benefits that Howden has derived from the restructuring programmes completed in recent years. Howden's global aftermarket business, where margins are generally attractive, has increased sales to £122 million (2004: £103 million), an increase of 18 per cent.

## Industries and segmentation

Howden's core products are used in many key industries and industrial processes.

Fans are used in industries where large volumes of air or gas are required to be moved at low pressures.

Rotary heat exchangers are used to transfer heat between air and/or gas streams, primarily in fossil fired power generation and petrochemical steam raising plants.

Compressors are used to supply specialised gases in a wide variety of industrial and petrochemical processes.

End user segmentation is strongly influenced by the availability of natural resources in particular regions. The global spread of coal, iron ore, oil and gas deposits provides Howden with a global customer base in a diverse range of industry sectors.

Governmental regulations stimulate demand for a number of Howden products, particularly in the environmental protection sector, where Howden supplies equipment for use in processes which reduce atmospheric pollution generated by industrial plant.

Howden, which celebrated its 150th anniversary in 2004, is acknowledged as the global technology leader in its core air and gas handling product areas, focusing on key industries where quality and reliability are paramount. With a combination of technically advanced products and extensive applications engineering capabilities, it focuses on supporting its customers throughout the product life cycle, from project inception to decommissioning.

Much of the equipment supplied by Howden has an expected life of between 30 and 40 years, and provides significant opportunities for retrofits, spares and servicing by Howden.

The global end-user market segments and the products supplied by Howden include:

- power generation – fans and rotary heat exchangers for boilers, flue gas desulphurisation ('FGD') plant and denitrification processes; cooling fans for dry cooling systems;
- oil and gas – compressors and specialised fans for offshore platforms; cooling fans for gas pipelines and underground storage compression stations;
- petrochemical plant – fans and compressors for refineries, ethanol and methanol production, and other processes;
- iron and steel – heavy duty fans for iron ore beneficiation plant (sintering and pelletising), and for basic oxygen and electric arc furnace steelmaking;
- industrial processes – fans and compressors for a wide range of industrial processes including pulp and paper, cement manufacture, smelting and sulphuric acid; and
- mining – high integrity fans for coal, gold and other underground mining.

## Industry overview

Demand for new Howden equipment is strongly influenced by the construction of new coal fired power stations, environmental legislation, the consumption of steel and the production of oil and gas. These industries are all predicted to grow steadily. In addition, Howden's large, and growing, installed base of equipment around the world provides an ongoing demand for spares and services.

The slump seen at the turn of the century, in global orders for coal-fired plants, has been followed in the last few years by a spike in construction of such plants in China. The power industry world-wide is showing signs of stabilising at or above the average growth rate of 2.5 per cent per annum predicted by the International Energy Agency ('IEA').



## Business review (continued)

Industry sources estimate that around 60GW of new capacity was commissioned in 2005, some 90 per cent of which was in China.

The existing governmental programme to reduce the quantity of sulphur dioxide being emitted from power stations in China is expected to continue. The USA and, to a lesser extent, Europe will continue to develop as a market for this technology.

An increasingly tight supply and higher price of oil and gas is stimulating upstream and downstream plant construction, particularly in the refining sector. Forecasts for growth in exploration and production expenditures for 2005 were revised upwards during the year from 6 to 13 per cent and a similar double-digit rise is expected in 2006.

In China, the construction of new steel plants is expected to slow from the current unprecedented level, as production exceeds demand in the short term. However a programme to replace smaller inefficient plants by larger integrated plants will ensure that plant construction continues in that country. The IISI predicts that world-wide capacity will grow at 5 per cent per annum, and projects to increase the production of beneficiated iron ore are already evident in a number of areas including India and Brazil.

### Regional overview

Howden's principal markets are Europe, China, North America and South Africa. Sales in other regions, such as Asia (excluding China), South America and the Middle East are relatively small. Equipment is generally sold to customers in the regions in which such equipment is produced, although high levels of demand in countries such as China do, from time to time, result in product being exported inter-regionally within Howden.

### Europe

Revenue increased by 21.6 per cent to £96.7 million. This was driven by excellent performances from Howden UK, Howden Denmark and Howden's compressor companies.

Howden is seeing growing markets and improving market penetration in its markets in Europe.

In terms of market development, there are growing opportunities in Russia, currently in the mining and process gas sectors and, in time, also in the power market.

The illustration shows a research model of an axial fan under test. Howden's combination of research, design, development and production has contributed to record sales for the market leading Variax™ variable pitch axial flow fan in the global power generation industry.

### North America

Howden Buffalo Inc is headquartered in Camden, South Carolina and has four other main facilities, one of which is located in Mexico City.

Howden Buffalo's results continued the improvement seen in the second half of 2004 and it grew sales and returned to profit in 2005.

Howden Buffalo's aftermarket performance improved significantly due to incremental sales volume and better performance in field service and fan parts.

Howden Buffalo's operating margins have improved due to cost reduction initiatives. However, they remain below those achieved elsewhere by Howden in similar businesses, and therefore potential exists for Howden Buffalo to improve its operating margins.

There are also further opportunities to grow revenue. Pollution control legislation in North America tends to vary by state and on the financial strength of individual utility companies. Howden Buffalo has successfully targeted utilities that will need to make incremental investment and is seeking to develop mutually beneficial commercial partnerships. Howden Buffalo has the largest installed base for centrifugal and axial fans in North America and initiatives are being undertaken to increase Howden Buffalo's share of the aftermarket.

### South America

Sales more than doubled from £4.2 million in 2004 to £8.9 million in 2005 due to additional projects within the iron and steel industry and in particular CVRD in Brazil.

With national economic growth rates running at higher levels than in many West European economies, significant investment expenditure is foreseen in South America over the next 4-5 years, with oil and gas extraction, biofuels and iron ore beneficiation all expected to see major plant developments taking place during that period. Brazil, the world's biggest exporter of iron ore, is significantly expanding its capacity to produce iron ore pellets, used throughout the world as a blast furnace feedstock. These factors provide future opportunities in the region for Howden.



Howden, founded in 1854 in Glasgow, UK, has grown into an international organisation with operating companies in 13 countries and a network of agents covering a further 80.



- Howden's manufacturing facilities
- Howden's engineering and service facilities
- Howden's associates' manufacturing facilities

#### Howden: revenue by destination

	2005 £m	2004 £m	Growth %
China	<b>97.1</b>	48.0	<b>102.3</b>
Europe	<b>96.7</b>	79.5	<b>21.6</b>
North America	<b>60.6</b>	52.7	<b>15.0</b>
South America	<b>8.9</b>	4.2	<b>111.9</b>
Rest of world	<b>81.8</b>	57.2	<b>43.0</b>
<b>Total</b>	<b>345.1</b>	241.6	<b>42.8</b>

## Business review (continued)

### China

Sales in China amounted to £97.1 million (2004: £48.0 million), an increase of just over 100 per cent.

During the year, Howden Hua won orders for some 100 rotary heat exchangers for FGD plants, an exceptional achievement given that over the previous decade Howden had supplied a total of 40 of these gas heaters across the rest of the world. Howden Hua's share of the Chinese market for its core fan and heat exchanger product ranges is estimated at between 20 per cent and 30 per cent.

During 2005, Howden Hua completed its expansion project, commenced in 2004, thereby significantly increasing its capacity in relation to heater element manufacturing and in machining activities in China. In addition, a network of qualified sub-contractors was established in many provinces to serve the growing levels of demand.

Howden Hua also launched and completed a dedicated workshop of 2,500 square metres close to Howden's existing factory in Weihai to manufacture cooling fans. The market for cooling fans in China has grown significantly as certain Chinese provinces restrict water supply for air conditioning thereby necessitating the use of air-cooling by steam condensers. The new cooling fan product was launched in August 2005 and during the final quarter of the year this new unit received orders ahead of target, and, as a consequence, by the year end, it moved into profit.

While it is felt that China's economy will continue to grow at an annual 9-10 per cent until at least 2008, the year of the Beijing Olympics, the extraordinary growth in the country's power generation capacity experienced over the past two years is expected to ease off to around the rate of growth in the economy as a whole. China's generating capacity, of which some 80 per cent is coal-fired, has just reached 500 giga-watts ('GW') and is forecast to hit 700 GW by the end of the decade. However over the last 12 months alone, capacity has increased by around 65GW (equivalent to some three-quarters of the UK's total generating capacity) as China strives to eliminate power shortages and blackouts. About 80 per cent of China's power generating capacity is coal fired. Capacity is forecast to match demand levels this year.

During 2005 Howden Hua continued to grow in size to service the expanding Chinese power generation and steelmaking industries. A major factor in this success is that the company offers Howden's latest product ranges of fans and rotary heat exchangers. Its design and manufacturing facilities are equipped to the same standard as other Howden companies throughout the world.

Revenue at Howden Hua is expected to increase further this year due to its significant order book of some £100 million. Whilst, over time, new build bookings from the power industry in China will decline for the reasons mentioned above, it is expected that overall levels of revenue in future years will be protected by, first, the development of the aftermarket after almost a decade of new-build, second, opportunities to refurbish old stations, and, third, the widening of the range of products manufactured and/or sold in China.

### Rest of the world

#### Africa

Howden Africa Holdings Limited ('HAHL'), in which Howden has a holding of some 55 per cent, increased its sales by 21 per cent to £43 million in the year, principally due to increased orders and return to service work from ESKOM, the South African state owned power utility.

HAHL is well placed to benefit from the strong commodity prices cycle and increases in gross domestic fixed investment over the next five years. However, these positive factors could be partially offset by a strong Rand and the impact that a strong currency could have on export earnings for the South African mining and heavy industry sectors.

#### Asia Pacific (excluding China)

Howden's sales in Asia Pacific (excluding China) are predominantly to the mining, industrial and power supply industries in Australia, and therefore have benefited from favourable commodity prices.

In India, medium term opportunities are seen in the mining and process gas sectors and later in the power market. Measures are being taken by Howden to ensure that it will be positioned to meet these opportunities.

### Associated undertakings

Howden has a 49 per cent interest in Howden Compressors Limited, a Scottish based and incorporated company.

In 2005, Howden's share of the post tax profits of its associated undertakings amounted to £1.1 million (2004: £1.2 million).





Final machining of a variable pitch axial flow fan hub

### China – Howden’s decade of technological leadership

Howden has been trading in China for the past 30 years and in 1994 established Howden Hua with two local partners. The initial opportunities which Howden identified were improving the performance of the then existing power plant equipment in China by retro-fitting air preheaters with Howden modern technology and the potential for providing a lower cost base for projects outside China.

Over the last decade, Howden Hua, supported by Howden’s European technical centres, has become widely recognised throughout China as the technology leader on fans and rotary heat exchangers in the power generation industry for both boilers and FGD plants. During this time, Howden Hua has invested in the expansion and upgrading of its facilities in China. The principal manufacturing facility is located at Weihai in Shandong province; the design centre is in Beijing.

The company’s expertise has also extended to heavy industrial specialist applications in the steel industry where it enjoys a leading market position in the supply of sinter fans.

There remains scope for Howden to further expand in other markets in China, particularly the petrochemical sector where sustained investment is expected to continue.

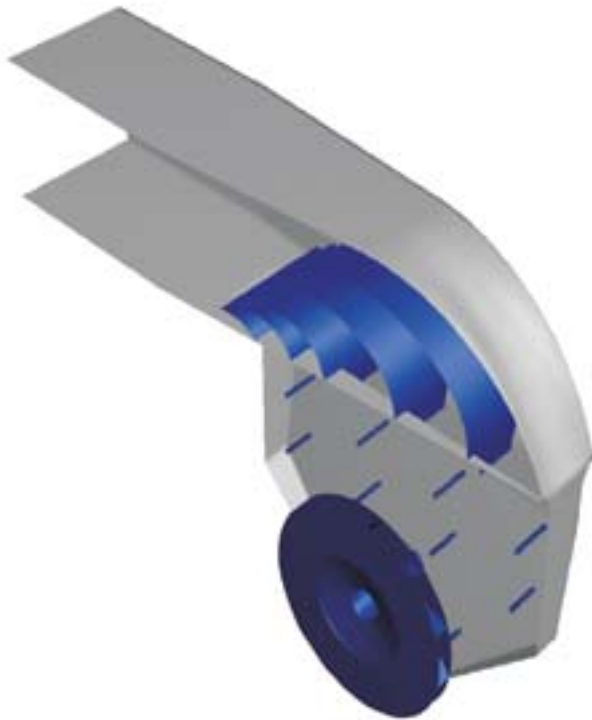


Figure 1  
**Impeller, inlet box and bend**

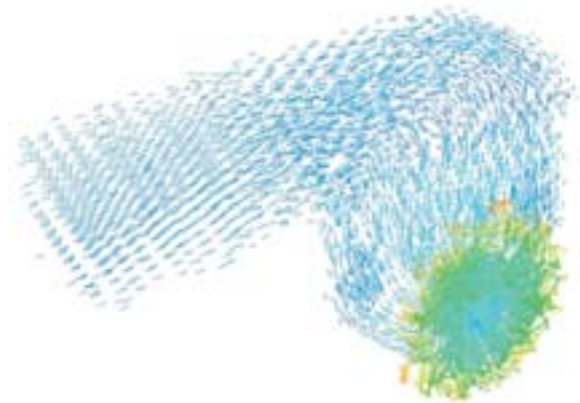


Figure 2  
**Flow vectors**

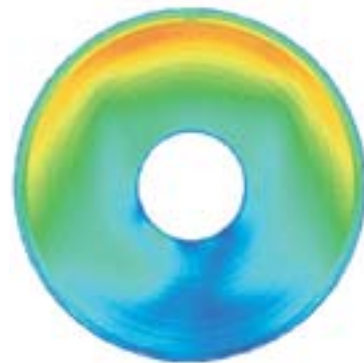


Figure 3  
**Velocity magnitudes**

---

### Computational fluid dynamics in Howden

Howden is increasingly replacing the laboratory testing of the aerodynamic characteristics of its products with computer studies using a technique called computational fluid dynamics (CFD). This accelerates product development and enhances efficiency.

An example of the power of this approach was demonstrated in a contract to supply a fan in a location where space constraints meant that there would have to be a sharp bend immediately before the fan. The basic configuration is shown in Figure 1.

Traditionally, the flow through this configuration would have been tested using a scale model, involving long delays and a high cost. Instead, the arrangement was modelled in CFD.

Figure 2 shows the flow through the bend, into the inlet box and out of the impeller. It can be seen that, with the bend and the guide vanes, the flow in the system looks generally uniform.

However, with CFD, it is possible to evaluate areas of flow in detail. Figure 3 shows the flow entering the inlet cone. This is not uniform, with more flow and higher pressure at the top (shown up in orange and yellow) than at the bottom (shown in blue). Different configurations can be studied to obtain an optimum configuration. In this application, a final design was developed that gave only a marginal pressure difference between the top and bottom.

The above examples illustrate the potential power of CFD. As Howden applies the technique more extensively, it will be able to exploit it more fully, improving its existing designs, increasing its understanding of aerodynamic characteristics of products and increasing its ability to support customers in their application of Howden products. This will help to maintain Howden's position as a leading supplier in air and gas handling technology.

## Future developments and longer term growth prospects

### Market expansion

China continues to provide an attractive market for Howden technology. Howden Hua does not yet offer the full range of Howden products to its customers in China, but plans are at an advanced stage to broaden the range of its products and activities, particularly in the petrochemical and allied process market sectors.

South America is seen by Howden as a region that has potential for substantial growth. Howden South America, based in Brazil, is currently growing its share of the industrial fan markets throughout the South American region and, in conjunction with other Howden companies, is expanding its product range in South America.

Demand for new and incremental power plants in Europe and North America is increasing as capacity margins are eroded and much of the existing plant, which was built during the boom period of the 1960s and 1970s, is reaching the end of its useful working life. In addition, ever more stringent environmental protection legislation requires that power generating companies in North America, Europe and China invest in plant that has efficient atmospheric pollution systems.

### Aftermarket

Howden is focusing on strengthening its aftermarket presence, particularly in the servicing of, and supply of spare parts for, its substantial installed base. The size of the aftermarket varies between different countries and industries. In the power generation industry as a whole, the aftermarket is estimated to account for around one-half of total expenditure by power generating companies on fans and heat exchangers; however, in Europe and North America, where the power generation markets are relatively mature, the aftermarket accounts for between 60 per cent and 70 per cent of expenditure, whereas in China, new build presently accounts for some 90 per cent of industry expenditure.

The aftermarket in China will become increasingly significant for Howden Hua as the equipment which it has supplied in China in prior years requires servicing, spare parts and refurbishment.

Outside the power industry, the aftermarket tends to be less important relative to new build; in the petrochemical industry, new build represents approximately 60 per cent of the total expenditure in both Europe and North America, and almost 100 per cent in China.

### New products and applications

Howden's development of new products and applications will be weighted by value towards the power generation and petrochemical markets, where increasing plant capacity and efficiencies impose new demands on equipment suppliers. New processes emerging in response to carbon abatement programmes, such as hydrogen fuel cells and carbon capture and storage, will provide growth opportunities for a number of Howden products.

Any resurgence of the nuclear power industry will provide opportunities for Howden in the longer term, particularly if advanced gas-cooled technologies, such as the Pebble Bed Modular Reactor, are widely adopted.

### Lean manufacturing and outsourcing

Howden is primarily an applications engineer rather than a manufacturer. Its use of sub-contractors has risen significantly over the past three years and it increasingly only manufactures components that are performance critical, protect its technology or maintain its markets.

Where manufacturing is undertaken by Howden, there are opportunities for improved efficiencies. Building on the benefits already achieved by the various restructurings, pilot 'Lean' manufacturing and other continuous improvement measures are underway in selected operations.