

**Market Trends  
in the  
Investment  
Casting Industry**

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## **MARKET TRENDS IN THE INVESTMENT CASTING INDUSTRY**

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### **INTRODUCTION**

At the 1984 World Conference on Investment Casting in Washington DC, Graham Gould of ECC International Ltd presented a paper, of which he and Charles Baker were co-authors, called Investment Casting Industry Current and Future Market Trends. The paper was well received and since then BICTA has been asked on numerous occasions for copies of the text and on the possibilities of such data being updated. Therefore in my paper I have used the Washington lecture figures as a starting base and have endeavoured to project what has happened to the industry since 1982 to the end of 1988. Then we have a brief look at possible future trends.

The paper is a collection of statistical data collated as a result of numerous discussions with many people throughout the industry and I am most grateful for their assistance. I feel it is best presented by projecting a series of slides of such data.

### **TRENDS IN THE UK INVESTMENT CASTING INDUSTRY**

**Turnover and number of foundries** – In figure 1 a comparison of the 1982 and 1988 data is shown and a picture of the actual growth can be observed.

#### **Figure 1. UK Investment Casting Industry**

	1982	1988
TURNOVER	£105M	£250M
FOUNDRIES	49	55

**Employees and sales** – In figure 2 a comparison of the 1982 and 1988 data is shown regarding number of employees and sales per employee within the industry.

**Figure 2. UK Investment Casting Industry**

	1982	1988
TURNOVER	£105M	£250M
FOUNDRIES	49	55
EMPLOYEES	5000	6000
£/EMPLOYEE	21000	42000

**Market Split** – In figure 3 a broad turnover percentage breakdown between commercial and non-commercial (aerospace) castings is given.

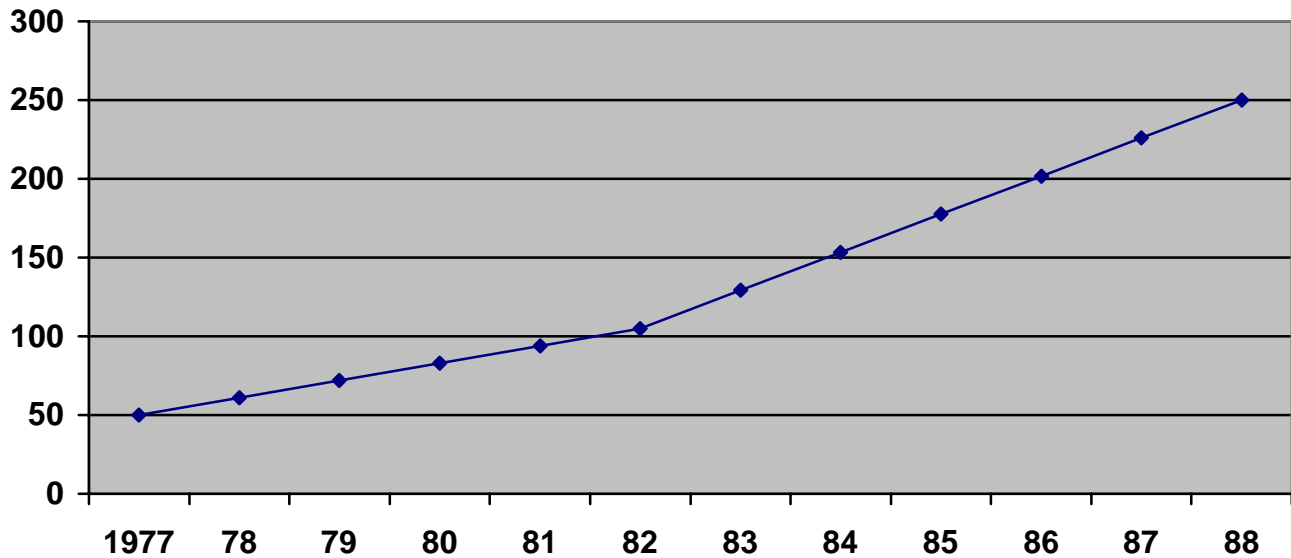
**Figure 3. UK Investment Casting Industry**

	1982	1988
TURNOVER	£105M	£250M
FOUNDRIES	49	55
EMPLOYEES	5000	6000
£/EMPLOYEE	21000	42000
COMMERCIAL CASTINGS	33%	30%
NON-COMMERCIAL (AEROSPACE) CASTINGS	67%	70%

**Growth of the industry** – In figure 4 a simple graphical presentation is made to show growth in turnover from 1977 to 1988

**Figure 4. UK Investment Casting Industry**

Growth of the UK Industry 1977-1988 (Turnover £M)



**THE UK INVESTMENT CASTING INDUSTRY COMPARED WITH OTHER MARKETS IN THE WORLD**

Having looked at the UK industry and market trends in some detail, it may be useful to compare these figures with other major markets in the world. Again we can see some interesting growth patterns as figures 5 and 6 show.

**Figure 5. Comparison of the UK and World Investment Casting Industries**

1982	UK	W EUROPE	USA	JAPAN
TURNOVER	£105M	£120M	£800M	£50M
FOUNDRIES	49	60	240	35

1988

TURNOVER	£250M	£250M	£1300M (\$2200M)	£190M (¥45000M)
FOUNDRIES	55	80	400	65

**Figure 6. Comparison of the UK and World Investment Casting Industries**

<u>1982</u>	UK	W EUROPE	USA	JAPAN
EMPLOYEES	5000	6000	23000	3500
£/EMPLOYEE	21000	20000	35000	14000
COMMERCIAL CASTINGS	33%	70%	60%	90%
NON-COMMERCIAL (AEROSPACE) CASTINGS	67%	30%	40%	10%
<u>1988</u>				
EMPLOYEES	6000	65000	27000	6500
£/EMPLOYEE	42000	39000	48000	30000
COMMERCIAL CASTINGS	30%	45%	40%	80%
NON-COMMERCIAL (AEROSPACE) CASTINGS	70%	55%	60%	20%

It must be emphasised again that in figures 5 and 6 (as in figure 3) the percentage data expressed for commercial castings against non-commercial or aerospace castings is only as a percentage of turnover. One interesting fact published on the US industry for 1987 is that although the non-commercial or aerospace section of the industry contributes to approximately 60% of the turnover it only makes up about 25% of the overall tonnage.

Also when talking about numbers of foundries in each of the markets we are referring to foundries with approximately £500,000 turnover or more. There are in all of the markets numerous smaller foundries.

The figures listed are based on certain available data, some estimates and numerous discussions throughout the industry. With such information the aim is to give only a generalised picture of the investment casting industry. Currency calculations for 1988 figures are based on exchange rates at September 1989.

## A LOOK TO THE FUTURE

In the previous figures we have seen how the UK and world industries have grown over the past 10-12 years. Predictions for the future are difficult and depend on many variables. Before considering some of the variables and factors that could influence the future and growth of the industry it may be useful to look at figure 7 which is an attempt to show predictions on the size, forecast growth and distribution of the world market for investment castings up to 1995.

### **Figure 7. The World Market for Investment Casting. Size, Forecast Growth and Distribution**

	1989	1995
	£2B	£2.75B
	\$3B	\$4.25B
AIRMELT & VACMELT SUPER ALLOYS	46%	36%
STAINLESS STEELS	31%	36%
CARBON STEELS	6%	14%
TITANIUM	-	4%
ALUMINIUM	-	6%
ALL OTHERS	17%	3%

As before it must be stressed when looking at figure 7 that we are talking about turnover and not numbers of castings produced. It is more difficult to obtain data relating to tonnage or numbers of castings produced. Also it is worth emphasising that the 1989 total of £2B or \$3B is roughly split on a 60/40 basis of non-commercial (aerospace) to commercial castings.

### **Factors that could influence future trends**

As mentioned before, there are numerous variables that could influence the future of the industry. In the Washington paper these are divided into two broad categories, external and internal, and for ease of reference/continuity it would seem beneficial to do this again. As a guide we can break down the two categories as shown in figure 8.

## **Figure 8. Some variables to consider regarding the future**

### **A. External Factors**

1. General economic situation
2. Situation in major consuming industries
  - a) Aerospace
  - b) Automotive/motor industry
  - c) Other markets
3. Competition
  - a) Markets
  - b) Processes & materials

### **B. Internal Factors**

1. Technical developments in the industry
2. Structure of the industry

These are only a guide. Without any doubt there must be others but if we can consider these it may provide some thought as to the direction the industry is going. Let us look at some of these factors in a little more detail.

### **A. External Factors**

#### **1. General economic situation**

In trying to analyse the many factors that could influence the future progress of the investment casting, or any industry come to that, one cannot avoid considering the influences of general economic affairs. It goes without saying how important it is to be aware and updated on forecasts on economic behaviour in a wider context.

For example the UK GDP for the past three years has changed from 4.4% in 1987 to 3.8% in 1988 to a predicted 2.5 % in 1989. The forecast for the next four years published by Oxford Economic Forecasting is 2% in 1990, 2.5% in 1991, 3% in 1992 and 3% in 1993.

The CBI in their report for August 1989 assume base rates will remain at 14% until the end of 1989 but will ease back to 12% in 1990 as the economy grows more slowly. They anticipate inflation falling back to 6/7% in the forth quarter of 1989 and to 5.6% average for 1990.

Such forecasts are a guide but only that. There are of course risks and uncertainties. For example if the world economy is not buoyant this could jeopardise any improvement in the UK's current account deficit. Also base rates may rise further in 1989 and remain high for longer in 1990 triggering a slowdown in investment.



We have considered some brief examples and the aim is only to highlight how such factors could have an external influence on the industry.

## **2. Situation in major consuming industries**

During the period covered by the data 1982-1988 we have seen some excellent growth in the turnover of the industry. What happens in the future?

### a) Aerospace

The general forecast for world air travel is that it will double from now until the year 2000. Many airlines need to replace ageing fleets and forecasts for aircraft sales are very good. Such factors should give rise to great optimism for the future of the investment casting industry. However whilst this may be true it should not encourage an atmosphere of complacency. Growing emphasis on environmental factors may force engine manufacturers to review, and in some cases, redesign existing engines. Many of today's civil aircraft are obtained by airlines on leasing arrangements. If changes occurred in the structure of such leasing companies it could affect airlines and the industry as a whole. Over the past few years we have seen relative stability in aviation fuel prices, but if there were any dramatic changes and prices rose substantially then again the industry, as a whole would feel the impact of this. The massive costs of development and production of new engines will continue to force manufacturers to collaborate and combine resources on certain projects. We have already seen collaboration to produce the Concorde engine in the 1950's/60's and the V2500 during the 1980's. No doubt this trend will continue and the future of the industry could depend on the type of collaborative agreements that are established.

### b) Automotive/motor industry

During the past three years the UK motor industry has shown an average of approximately 9% growth per annum. The forecast for 1990 is 5% then an average of 7% per annum for 1991 to 1993 (data published by Oxford Economic Forecasting). The growth potential of the motor industry is forecast as good but within the UK investment casting industry there are still only a limited amount vehicle parts being investment cast. If one compares this with the situation in Japan we note something like 15 to 20% of all investment castings produced are for the motor industry and is quite likely to grow. This greater volume is thought to be due to the market size and a growing tendency to automation within some Japanese foundries enabling them to meet the low costs demanded by the motor industry. This may provide a key to the industry elsewhere for the future.

### c) Other markets

The list here is long. The computer industry, electronic equipment, valves and fittings, machine tools, office machines, medical parts, golf clubs, leisure industry, pumps, hand tools and numerous others all use or have the potential to be able to expand on these markets by maintaining a competitive method of manufacture and supply.

### **3. Competition**

#### a) Markets

Investment casting is an international industry. In the statistics we have considered the four major markets, UK, Europe, USA and Japan. There are however investment casting foundries in most industrial countries throughout the world, and during the period 1982-1988 the majority have shown similar growth patterns.

Figures are not available, but as a rough estimate markets other than the four listed could be generating a turnover in excess of £150M in total. This does not include the USSR where there is also a large investment casting industry and market.

Certainly the industry is competitive and it only emphasises the importance of expanding new markets and continuously reviewing technological change.

#### b) Processes and materials

The cost to the industry of capital, labour and raw materials can be expected to continue to increase the competitiveness and attractiveness of all processes capable of offering fully net/or close to net shape products in all fields. These fundamental economic reasons have been part of the reason for the continued success of the investment casting industry, but complacency should not settle in.

There is a threat to the substitution of certain cast metal parts by ceramic materials. Research into their application is continuing and it is important that investment casters are aware of this threat. In addition to the threat from ceramics it is also important for investment casters to be aware of the competition from powder metallurgy, some applications of the Replicast process and engineering plastics. All are processes that could provide competition for investment casting in the future.

Also existing methods of precision forging are not standing still. They too are researching various technical developments and investment casters should be fully aware of this.

Finally metal matrix composites have the potential to improve mechanical properties and could make some impact in the casting market.

### **B. Internal factors**

#### **1. Technical developments in the industry**

We have already seen within the industry a growing tendency towards automation and mechanisation. It is a trend that should continue if the industry is to remain competitive and offer the benefits of quality and consistency.

The CAD/CAM technology continues to become more important in die and pattern making. There is some movement of thought towards computer modelling with the aim of giving the industry a software package it can use to optimise casting design.

Single crystal and directional solidification are processes that should continue to be important in the production of gas turbine components.

The Hot Isostatic Pressing (HIP) process is becoming more widely applied as it gives casters the opportunity to produce high integrity or fully sound castings economically on a repetitive basis. This could open up markets in ferrous components for fatigue rated applications, titanium castings and in superalloy parts.

We have seen developments in high strength aluminium alloy casting by improving techniques to give better consistency of structure and properties and this should continue to develop.

## **2. Structure of the industry**

We may see a growing tendency towards amalgamation within the industry but there is still room for the small foundry. We have already stated how important automation and mechanisation are technologically. This again may influence the structure of the industry.

The Single European Market (1992) will provide a challenge to the industry. It could be a threat or an opportunity depending on how companies meet the demands.

Growing emphasis on environmental and health and safety regulations worldwide, and especially on how companies meet the necessary requirements will have a great influence on the future structure of the industry.

Quality control and efficient cost-effective quality control will become increasingly important as the industry moves forward and all companies within the industry should be looking at appropriate certification.

There are various associations throughout the world representing numerous investment-casing interests (e.g. BICTA in the UK, EICF in Europe, ICI in the United States and three associations in Japan). There may be the possibility of a greater degree of cooperation between such associations. Perhaps an increasing amount of useful information and data could emanate from this and be of value to the industry.



## CONCLUSION

In conclusion the figure show that the investment casting industry has experienced excellent growth over the past years. If predictions are correct it seems the industry is set to grow further. However as I mentioned before it is very important for complacency not to set in, as there are competitive processes and markets fighting for their share. It is important for the industry to remain abreast of technical developments and to sell itself to ensure predictions on the future are achieved.