

## **Forging Trends in North America and Brazil**

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### **North America**

***Profile:*** Forging Industry Association (FIA) headquartered in Cleveland, Ohio, is the representative organization of the North American forging industry which includes production in the United States, Canada and Mexico.

Established in 1935 to serve a membership of Closed Die forging companies, FIA has expanded through the years to include Open Die, Seamless Rolled Ring and Cold forging segments which comprise the overall forging industry. 140 forging producer companies are members of FIA.

FIA membership is also open to supplier companies on a worldwide geographical basis. Eligible companies provide forging grade materials, equipment, services and technology applicable to the forging industry. Current Supplier membership numbers 75 companies.

15 Individual Academic Memberships have been extended to University-level professors of metallurgical and mechanical engineering disciplines and who are either involved in collaborative teaming with the industry, or who are actively engaged in teaching students about the forging process and industry.

***Size:*** **The total number of independent or custom forge plants in North America** is estimated to be 335. FIA members operate 185 of those plants or 55% of the total. FIA members produce approximately 60% of the total sales dollar volume of the custom forging industry.

**Employment** in the industry is a number we do not track, but estimate at perhaps 35,000 in North America.

**Total forging industry output in North America** is believed to be somewhat in excess of \$7.5 billion.

Approximately 90% of that amount is categorized as custom, made-to-order forgings produced and sold commercially by independent and non-affiliated forging companies.

**Average Custom forging sales volume** over the past 3 years is divided as:

- \$5.1 Billion Closed, Impression Die Forging, including cold and warm forging
- \$760 Million Open Die Forging
- \$663 Million Seamless Rolled Ring Forging

**Forging Tonnage** for the Industry measures:

- 1,780,000 tons FERROUS, and 126 million pounds NON-FERROUS for Closed Die Forging
- 354,100 tons FERROUS, and 21 million pounds NON FERROUS for Open Die Forging
- Material weight for Rolled Ring Forgings, is not measured.

**Customers: Major End Use Market Shipments for Custom Impression Die Forgings are:**

- 34 % to Automotive including Light Truck and Motorcycle
- 31% Aerospace including jet engine, aircraft parts and space vehicles
- 11% to Heavy Trucks ...class 6 through 8 ... plus Bus and Trailer
- 5% to Off Highway Equipment including Construction and Mining
- 3% to Oil Field Machinery and Equipment

**Largest End-Use Markets for Custom Open Die Forgings are:**

- 15% Construction, Mining and Material Handling Equipment, including gas and oilfield products,
- 11% Aircraft and parts
- 10% for Steel Works, Furnaces and Rolling Mills

- 10% General Industrial Machinery and Equipment
- 9% to Metal Service Centers

**Largest End-Use Markets for Custom Seamless Rolled Ring Forgings are:**

- 53% Aircraft engines and parts
- 8% for Aircraft Auxiliary equipment and parts, Missiles, and Space Vehicles
- 7% Ball and Roller Bearings
- 5% Metalworking and Special Industry Machinery

## **Market Conditions**

While certain customer segments like Power Generation, Aerospace and Light Trucks have generally performed well, the trend of aggregate production and sales by the industry has declined over the past several years. Peak years were 1999 for Closed Die; and 1998 for both Open Die and Rolled Ring sales.

A much anticipated forecast for recovery in 2001 did not materialize. In fact, the opposite occurred as world terror events of September 11 had the effect of actually increasing the rate of decline for nearly all markets, making this one of the steepest declines in our industry's business activity in more than 20 years.

While we have seen published U.S. economic reports signaling a strong turnaround underway in the first quarter of 2002, our industry has seen few signs of that improvement through April.

Instead of ramping back up for eventual growth, industry reaction has been one of continuing consolidation and of companies continuing to cutback ... more than a few have closed permanently over the past 3 years.

While we hope to be proven wrong, most of the industry is not looking for significant improvement until the end of 2002.

## Trends

Market Penetration: We do not track the overall consumption of forgings used in North America, but a trend we have noted in recent years is the growth in the amount of forgings imported into the domestic market from off-shore. This has been off-set to some degree by growth in exports by an increasing number of North American producers.

We also see a growing number of off-shore companies building plants in North America which domestic producers look to as new customer opportunities for the future.

Steel: Our industry is very concerned about the crisis in our steel and metals industries. Two thirds of North American steel companies failed financially in the past two years forcing their reorganization, consolidation or closure. A number of these companies are forging bar and ingot suppliers. The concern is about availability and cost increase in certain sizes and grades. The recently enacted Steel Tariffs in the U.S. are designed to help our steel industry get back on its feet, but the consequences on the forging industry as consumers are thought to be mostly detrimental.

Profits: Another disturbing trend ... is the lengthening profit recession in our industry. The impact of the world economy and global sourcing of forged components and parts has led our customers to hold the line on price increases from their forging suppliers.

In many cases annual price reductions have become a requirement of a multi-year contract between the forging company and his customer. This practice is a continuing-challenge for our companies which must absorb their higher operating costs from productivity gains.

Investment: The impact of falling profit levels has made it difficult especially for smaller and mid-size companies to make the Capital Re-tooling and Technology investments needed to stay competitive. Capital reinvestment has slowed dramatically over the past 12-18 months.

One way that a number of companies have improved their position has been to provide more value added services, including more heat treating, machining and assembly operations for their customers.

There are, however, some bright spots and more positive trends to report, as well.

Modernization: First off is the rapid, almost full scale acceptance, use and integration of electronics, micro-processors, computers and e-commerce into our companies, plants,

communications and operating systems. These technologies have become almost common-place in use for nearly all phases of operations by most forging companies today. This has been an amazing overall change in the industry over the last ten years, and certainly has occurred at a much faster rate of use and acquired knowledge over the past three.

Technology Focus: Another trend is the growth in collaborative activity by our industry toward development of new Technology.

Our industry has been traditionally independent in action and individually proprietary in these matters, but has found we can no longer succeed without a joint effort by the industry to develop new and *Break-through* solutions to enhance operating productivity.

Through a more focused effort led by FIA, and under the auspices of our supporting organization FIERF ... the Forging Industry Educational Research Foundation ... the industry has made significant gains in developing new relationships with new, nontraditional partners toward our purpose.

On behalf of the industry, FIA has been recognized as an Allied Partner with the U.S. Department of Energy, Office of Industrial Technologies. This has opened access to, and financial support for working with National Research Laboratories at Oak Ridge, Sandia and Idaho; with other metals-related R&D activities within the U.S. Departments of Commerce (NIST ... National Institute of Standards and Testing) and Defense; and in partnerships with leading Academics and Universities engaged in R&D activities important to our industry.

New Developments: One such joint effort led to invention and commercialization of an in-line measurement device and closed loop system applicable to hot forging production.

Another effort underway is the development of a **Forging Center for Excellence**, under the guidance of one of our colleagues, Dr. Rajiv Shivpuri at Ohio State University. This project we believe, is a first-of-its-kind in North America. It is receiving both financial and donated, in-kind support and attention from U.S. government and Ohio state-supported agencies; from FIA and the forging industry; and from associated supplier company industries.

The initial focus of this Center will be Research on problems relating to forging dies, die materials, and lubrication. We envision the Center eventually to serve as a showcase

for Forging Technology Development and Demonstration and as an advanced educational facility for industry personnel.

General Trends: Other positive trends we see emerging in our industry are briefly mentioned as follows:

*Materials:*

- Conversion of more carbon and carbon-alloy parts to microalloy steel, aluminum and magnesium alloys.
- Intelligent Die Design emphasis to reduce the input stock volume without going to net shape forming
- Nontraditional die materials to extend die life

*Heating Stock:*

- More widespread use of induction heating
- Infrared heating of forging billets to improve material microstructure is under t
- Refitting of furnaces with the latest insulation and burner technology

*Lubrication:*

- New application technologies to reduce the amount of graphite used.
- Automation of the lubrication process using robots (Selective application to lubricate and cool sections of the die)
- Surface technology that eliminates the need for lubricants

*Forge Shop Controls Integration:*

- Conversion of more hammers to microprocessor control
- Incorporation of Device NetSystem (Multiple PLC's and computers on the same network at the same time) throughout the process and organization

*Others ... Adoption of:*

- Lean Manufacturing concepts and practices
- STEP (Standard for The Exchange of Product Model Data) Electronic Communication ... ISO 10303
- Faster and more sophisticated 3D Simulation Programs for complex shapes and for ring rolling
- Diagnostic and prognostic systems in the forging line
- Purchase or joint venture with companies which produce parts by competing technologies

- Addition of upgraded ancillary equipment such as heat treat and machining centers

## **Brazil**

With appreciation and thanks to Mr. Arnaldo Meschnark, President of the Brazilian Forging Center (CBF), who provided the following overview and report.

The Brazilian forging industry has existed for more than 50 years, but has developed more substantially since 1958 with the growth of the automotive industry in Brazil.

16 companies created the Brazilian Forging Association in January 1958, which marks the modern history of the industry. In 1965, the Association was transformed into the Brazilian Forging Center ... CBF.

The Industry has a strong international reputation, especially on account of its exports which are estimated at 15% of total industry sales.

Brazil has approximately 100 forging companies producing an average of 260,000 tons a year in a variety of parts and for a number of distinct market segments. Out of those 100 companies, 50% are affiliated with CBF. These 50 member companies account for approximately 80% of Brazilian domestic forging production.

The major Brazilian forging companies, by number of employees ... are: KRUPP, SIFCO, CIONPAL, FORJAS BRASILEIRAS, SADA FORJAS, and CORNETTA, which together produce 60% of forging demand.

At present, the industry in Brazil employs 41,500 workers.

The major Brazilian forging consumer markets are:

- Automotive industry: 80%
- Agriculture/ construction 10%
- Oil industry 5%
- Railway industry 3%
- Others 2%

Brazilian yearly production of automotive vehicles is spread over 30 auto, truck, bus and tractor companies, and has ranged between 1.5 and 2.0 million units over the past 5 years; the installed capacity by far exceeds its current production.

CBF represents a modern, highly competitive technical industry.

The great concern in the sector has always been quality, and the number of companies certified by ISO and by QS 9000 is evidence that among the Brazilian forging industry, 60% have ISO and QS certification, whereas 20% are in the certification process. The next target of all affiliated companies is ISO 14000 certification, which deals with environmental preservation - something that has always been among the priorities in this industry.

Other notable trends, and the Outlook for Brazil and the forging industry include:

- A 7% growth in exports, three times the growth rate recorded by the world market which has remained at 2%.
- A commercial trade balance surplus between \$1.5 billion and \$2 billion, measured in U.S. dollars.
- Estimates for the year 2003 are that foreign investment volume in Brazil will reach \$17 billion. Leading investors are the United States followed by Spain, Holland, France, Portugal, Germany and the United Kingdom.
- GDP should remain at 2% and the basic interest rate may experience a slight decline, from 19% currently, to 16%.
- A reduction in inflation for 2003 which is expected to then remain between 4% and 5% a year.