



FORGING A GREAT FUTURE

INDIAN FORGING INDUSTRY

Applications of Forged Products

B.V.R.Raja, S.N.Davidson, S.P.Patnaik
Alloy Steels Plant, SAIL

Widening Scope Of Forging Industry

The application of forged products is not limited to automotive sector alone and there is ample scope for expanding the market of forgings to various sectors. Considering the advantages that forgings offer, the applications are numerous in the markets mentioned below.

Steel, Coal, Metals & Metal Working Industry

This industry is booming in the country showing tremendous potential for growth with green and brown field projects coming up in a big way. The various forgings that are generally used in steel industry are rolls for blooming/ slabbing/ plate / merchant / rail/structural /cold rolling mills, straightener parts, continuous casting machine rolls, pinch rolls, shafts, crane wheels, tools, shear blades for hot/cold rolling mills, die blocks, spindles, hanging rods in secondary refining units,



piston rods, ram, axles, mill roll ends, gears, die cams, conveyor line parts, hammers, beater heads, knife cutters, disc cutters, crusher parts, grate bars, yokes, flanges, nozzles, mounting rackets, tyre moulds etc.

Coal industry is a large consumer of forgings and the forged parts used include shafts, crusher parts, material handling equipment parts, conveyor line parts etc. Another important user of forgings is the metals & metal working industry where the forgings applied are tools, hollow forgings, rings, die blocks, eccentric shafts, rams, cylinders etc.

Cement, Chemical Processing & Oil Exploration Industry

These industries periodically go for a shut down. During the shut down period, the critical parts are changed without waiting for their obsolescence. Hence, these sectors are perennial sources of revenue for the forging industry. The various forged parts used in cement industry are forgings for rotary kilns, conveyors and gear drives for kilns, kiln support rollers, mill support rollers, tie rods, crusher shafts, dry pinions etc. The forgings applied in oil field machinery equipment are valves, drilling bit holders, valve bodies, bonnets, gates & retainers, drill bits, scraper blades, pipe tees, fittings etc. Forging parts used in chemical process industry include manifold, ball mill shafts etc.



Sugar & Ship Building Industry

Sugar industry is one of the major consumers of forgings. The forging parts applied in this industry include miller roller shafts, gear shafts, pinion shafts, tail bars, pinions, shredder shafts, cane cutter shafts, fibereizer shafts etc. In ship building industry, the forgings used are propeller shafts, rudder etc.



Defence Sector

Defence sector is considered to be a valuable customer for forgings. In this sector, the forged parts generally used are steering arm rod wheels, track link part, ammunition cases, shells, gears, bushings, parts of armoured vehicles etc.

Railways Sector

Railways consume numerous forgings to meet their requirements. The various forgings used in this sector are wheels, axles, camshafts, rail joints, anchors, gear stops, hand

brake levers, gears, power transmission parts, brake assemblies, bolts, studs, fasteners, tools & tackles etc.



Material Handling & Off Highway Equipment Industry

This is an industry that consumes forgings for use as parts in fork lifts, transmission case, bearing sleeves, brackets, support vibration absorber, crane wheels, rock tipper teeth, wire rope sockets, drilling rig bit bases, drag line chains, crawler tractor pivot linkage pins, trencher digging wheel parts etc.

Mechanical Power Transmission Equipment Industry

It constitutes of industries manufacturing pumps, fans, compressors, bearings etc. The various forged parts used in this sector are valve seats & guards, crank shafts, frames, drill holders, connecting rods, gear, lubricant valve cum bearing housing, air motor case, ID/FD fan shafts, pump casings, pump shafts, ring forgings for bearing assemblies, rotor spiders, crowns etc.



Power Sector

There has been continuous focus on improving power situation by the government of India. This led to reforms in the power sector leading to opening up various green field projects and expansion of the existing ones. It is one of the important customers for forgings. The forgings used are rotor shafts for turbines, shafts for wind power generators in wind mills, eccentric shafts, studs, spindles, nozzles, flanges for heat exchangers, higher diameter bolts etc

Electric Equipment Industry

This industry covers various electrical equipment manufacturers and switch gear producers. The forging parts consumed are in the form of frame, handle, arm, mechanism housing, lock, catch, coupling etc.



Farm Machinery Industry

This is one of the upcoming industries in the country catering to the needs of farmers. The various forged parts used are sickles, axes, cultivator shanks, plough beam heads etc.

Challenges Faced By Indian Forging Industry

Though the forging industry has consistently recorded a notable increase in production, capacity utilization and exports, it bore the brunt of the steep and frequent raise in cost of forging quality steel, acute shortage of this steel, ever increasing cost of energy/power and fuel putting adding pressure on the margins coupled with imposition of stringent pollution control norms for this sector.

Forging Quality Steel - Cost & Availability

Forging quality steel is the major input for the forging industry. The industry was grappling with increasing

cost of forging quality steel and has been trying to put its best efforts to get best bargain from the steel makers. Also, the industry started facing shortage of this steel on account of closing of many mini steel plants and discontinuation of the production of forging quality steel by some of the major steel plants. A major cause of worry is that our country lacks captive resources of key ingredients for forging quality steels



like Nickel, Molybdenum Oxide, Vanadium etc. which are sourced through imports by the alloy steel producers. The prices of some of these key constituents of forging quality steel have skyrocketed in the past two years. This upsurge in the cost of metallics coupled with reduced availability has made the situation challenging for the alloy and special steel producers to supply forging quality steels to the market at competitive prices.

There has been increasing trend of using continuous cast blooms for forging for reducing the overall forging cost in many large and medium forging units engaged in Closed Die forging. Majority of the steel makers are shifting from the erstwhile ingot route to continuous casting route for reducing the production cost. This led to restricted availability of ingots/large size blooms for Open Die forging units.

Inefficient Economies Of Scale

There are far too many small and tiny forging units present in the country belonging to the unorganized sector. These units possess conventional technology with inadequate testing and inspection facilities. Along with this, similar product profiles are produced by various forging units leading to cost competition among them. Meeting the mandatory requirement to comply to the stringent pollution control norms coupled with increasing cost of inputs has affected the

cost competitiveness of the forgers making them unable to cater the forging quality steel requirement of the automobile industry.

Technological Gap, Inadequate Expenditure On R&D And Training

Technological gap exists in many forging units and lack of information sharing persists among the forgers on operating practices. In majority of the units, the expenditure on R & D is inadequate leading towards delay in absorption of new technologies impairing the ability to cope up with the demands of the export market. The training needs are insufficient for the forging units to meet the growing demands of the export market and compete internationally. Also, there is dearth of trained manpower at shop floor and managerial level in various units.

Insufficient Overseas Marketing Support Facilities

There is absence of a structured overseas marketing support facility for forgings. This is expected to have a large impact on export growth of forgings in the long run.

Alloy Steels Plant - Contributing To Growth Of Indian Forging Industry

Alloy Steels Plant (ASP), a premier unit of Steel Authority of India Limited, Durgapur is a TS 16949 and ISO 9001 certified

company pioneering in the field of forging quality steels catering to the needs of forging units, automotive and various other sectors. It is equipped with state of the art technology and



has been constantly upgrading its technology and facilities to meet the changing quality requirements of the customers. It has introduced slag free tapping system in one of the EAFs to produce steels with low Ti & P contents, measures to control tramp elements, modified ladle addition & secondary refining practices to meet the controlled levels of sulphide, alumina, silicate and globular oxide inclusions as well as degassing at the lowest torque to achieve restricted gas levels of hydrogen of 2 ppm max., oxygen content less than 15 ppm and nitrogen not exceeding 70 ppm as specified by the customers, developed varied designs of high end up moulds with appropriate hot tops to meet the internal soundness of the product, regularized argon shroud application in bottom pouring practice and adopted gating system for rejection control. With the stringent quality control measures enforced

at every stage of manufacturing process coupled with continuous R & D efforts, ASP, today symbolizes the quest for superior products and technology.

Supply Of Forging Quality Steel Ingots / Blooms / Billets



Considering the problem of acute shortage of forging quality steel faced by the forging industry, the plant has initiated various steps to ensure the availability of ingots/large size blooms for the forging sector. Firstly, the plant still continues production of blooms and billets through the ingot route.

Secondly, it is capable of supplying annealed/ mould cooled/as cast ingots of 4 tons to 8.6 tons for open die forging units. Thirdly, the company can cater bigger size rolled blooms of 340mmX400mm, 300mmX400mm, 340mm RCS & 300 mm RCS with ultrasonic guarantee to the forgers. Finally, the plant is equipped with the technology to produce forging quality steel billets strictly adhering to the customer requirements.

Customized Steels Production

Specialized manufacturing capabilities at Alloy Steels Plant enable to produce forging quality steels with customer specified chemical composition and efficiently provide steel products in non-standard dimensions to customers with distinct product and service needs. The production capabilities are complemented by knowledgeable sales force, meticulous quality assurance process, flexible scheduling system and reliable product delivery.

Open To Close Collaboration

The plant is open to working in collaboration with various forging units for supply of forging quality steels through MoUs and involve in R&D to develop cost effective steels.

Providing Carbon & Alloy Steel Forgings To Various Sectors

The plant is equipped with 2,000 T oil hydraulic press, 5 T hammer and 2 T hammer for production of carbon & alloy steel forging of sizes as low as 100mm to as high as 650mm rounds,



squares and flats in meeting stringent ultrasonic test requirements in annealed/normalized/hardened and tempered condition as per the customer stipulations. The forge shop in the plant is under expansion with new projects such as 3500 Ton oil hydraulic press, revamping of the present press and construction of a new machine shop is underway to cater the needs of various sectors that consume steel forgings.

Direct Use For Machined Components

Alloy Steels Plant can directly help units and lend forged components for various sectors which include cold rolling mill rolls, continuous casting machine rolls, crane wheels, crane wheel assembly, pinch rolls, shear blades, beater head hammers, grate bars for sintering machine etc.

Strategies For Sustainable Growth

The key to sustainable growth of the forging industry is continual improvement in quantified terms of production, quality and intangible areas like attitude and commitment to an objective. All this necessitates the need to understand requirements, surveying, evaluating, integrating, testing and applying the improvements.

Enhancing Operational Efficiency

Capital investment should be limited to technological up gradation for overall operational efficiency of the forging units through maintaining consistent surface quality requirements of the product and meeting strict pollution control norms only in the unorganized sector. Testing and inspection facilities can be outsourced for these units. The forging units of the organized sector should adopt world class technology to meet the domestic and export market requirements. All the forging units should involve in reduction in plant inventory through just in time procurement and ensure prompt delivery commitment of the products for sustainable confidence of automobile and other sectors.



Focus On R & D

Necessary emphasis has to be given to R & D activities. The overall forging business scenario has to be considered and both incremental and major improvements are necessary for optimizing existing process technologies to maximize productivity at minimum cost and remedial measures for cost saving of techno-economic parameters need

to be found out. There is an urgent need to focus on product development activities to meet global challenges and attention needs to be paid to application areas including design usage.

Business Restructuring

Horizontal consolidation is imperative among the small/tiny forging units with specialization to the end product aiming to convert them



into organized sector. However, vertical consolidation between the steel producer, forging unit and the automobile manufacturing unit is the need of the hour. Forging industries with Open Die forging facility should involve in making MoUs with steel plants for consistent supply of ingots/large size blooms. Also, the forging units should look into signing contracts with innovative sales agreements on quarterly basis with the automobile and other sectors for better price realizations neutralizing higher input costs.

Narrowing The Technological Gap

The technological gap that still exists needs to be met with urgency through conduction of interactive sessions and seminars for sharing information between the existing forging units for initiating steps towards cost reduction aiming to meet global market requirements. Hence, efforts in the form of workshops, participation in trade fairs/exhibitions abroad, buyer-seller meets etc. would help in long term sustainability of the forging industry.

Understanding The Training Needs

The training needs have to be thoroughly understood by the forging units. The areas of focus should be on job training in any forging unit in India/abroad, utilization of facilities at NIFFT, bench marking & re-engineering for adopting the best work practices, application of quality tools, creation of efficient operation / maintenance / scheduling / delivery systems, supply chain management, strategy management and so on.

Reorienting Marketing Strategies

The forging industry has to reduce its excess dependency on automobile sector necessitating market expansion. Also, the individual forging units should reorient their product mix with key focus on end product/component specialization. The introduction of Key Account Management

System for major customers would help in improving the business performance. For high export growth, overseas marketing support facilities needs to be developed in the form of agents/agencies.

Eyeing The Export Market Of Automotive Components

The automotive components are looked upon as a thrust sector and the government of India is promoting the export of these components through a specific sectoral strategy. With increased role of outsourcing in an integrated global economy and India being considered as a low cost automotive component producer possess a greater edge in the global market aspiring to capture 10% share of US \$225 billion export market of auto components. This translates into an export target of US \$20 billion by 2015 for the Indian Auto Component industry. Going by the current trends in the domestic automotive industry, it is expected that the indigenous demand for auto components will also reach US \$20 billion by 2015. The fiscal 2005-06 figures illustrate that the forging exports touched US \$310 million and that of auto components to US \$1.80 billion, which reveals that the forging exports are 17.22% of the auto component exports. The Indian forging industry needs to capitalize on this by capacity expansion and modernization of the units to meet the global quality standards.

Pivotal Role Of Government

Governmental intervention in restoring CENVAT credit on Light Diesel Oil (LDO) is a must. Power needs to be considered as the basic input for exports and rebated for duty draw back calculations. DEPB rates are to be increased to a minimum 20% on exports for sustainable growth of this industry.

Conclusion:

The domestic automotive sector and outsourcing have been the key drivers of growth for the forging industry in India with consistent increase in production, capacity utilization and exports. The fortunes of the forging industry is on a rise due to the booming auto component industry with forging exports projected to touch the magic figure of US \$5 billion (which is about 15% of the auto component exports) by 2015. Along with this, there exists ample scope for forgings consumption in many other sectors that would open up big business opportunities for the forging industry. Considering the above, the demand for forgings is expected to be at least 16% per annum. Hence, the future looks rosy for the forging industry in terms of the expected surge in both global and domestic demand.

