

# Modern Plastics & Polymers

Business Insights • Technologies • Opportunities

Vol 2 No 4 December 2006 - January 2007

www.modernplasticsandpolymers.in

Rs 100

## Injection moulding technology

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**Naresh Panchal**  
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Indian moulds industry

## Exploring new horizons

Plastics has become ubiquitous in its presence and offers a solution to the everyday needs of both the common man and the industrial user. With plastics becoming an integral part of our everyday lives, there is a constant need for the development of newer mould and moulding technologies the world over. Moulds industry in India may not be currently on the ascent, but it is definitely showing positive vibes in its desire to reinvent innovation for the plastics industry. Plastics is currently finding applications across all sectors of life, and the moulds industry is contemplating on measures to keep up with the pace. To delve deeper into what the Indian moulds industry plans to offer to the plastics processor, read on...

**Sundeep Nadkarni**

**T**he growth in the plastics industry is giving significant impetus to the Indian mould making industry. Mould makers are gradually shifting from being fabricators and assemblers to providing machinery and complete end-to-end solutions.

With plastics finding a variety of applications in diverse sectors for domestic and industrial appliances, the mould makers are constantly trying to evolve and


innovate in their efforts to stay in the competition. Industry leaders reveal that the end-user segment for plastic moulds is growing, and it is up to the mould manufacturer to cash in on these newer trends.

### The Indian scenario

"A closer look at the Indian plastics industry reveals that about 75 per cent of the growth in plastics consumption has been in commodity







plastics catering to household industries, cosmetics products, and domestic appliances. This trend is quite distinct from the trend in developed countries where maximum growth is seen in sophisticated engineering, defence, electronics and automobile sectors. The mould makers in India are trying to become complete plastic machinery providers. To make this a reality, the growth of the plastics processing industry and mould making industry must be equal. The two are completely dependant on each other for the success of the finished product, and moulding technologies would evolve with the latest trends in plastics applications," avers Vipul Dave, chief executive officer, Alfa Moulds Pvt Ltd.

The end application of the product and the moulding process being used for production are also critical in selecting the material of construction (MOC) of the moulds. A number of MOCs are currently available for the plastics industry in India.

"The specifications for MOCs and the designing of the moulds are dependant upon a number of external factors. We manufacture plastic moulds for injection and blow moulding, mainly for the industrial applications. The different types of MOCs being used for

these moulds include P-20, C-45, MS, OHNS, WPS, Stavax, different grades of Buderus, and EN series, etc. The selection of the MOC depends on the production requirements and the desired quality of the end product. If the moulds require a high gloss, Stavax or Buderus (high hard / high gloss) are used. For large volume of production of up to 5 lakh shots, the MOC used is P-20. If lesser number of pieces are required, and quality of end product is not the utmost priority, then C-45 or OHNS are used as suitable MOCs," states Opinder Singh, proprietor, Om Enterprises.

### Facing global competition

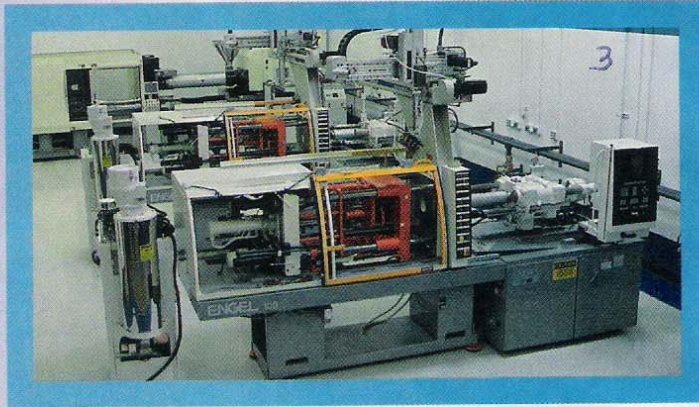
The Indian mould making industry is growing at steady rates, but mould makers believe that true development of technology is possible only when the applications of plastics expands to newer horizons. The common belief is that the plastics processing industry should demand for high-end machinery for better quality of products, and be ready to invest into these expensive but cost-efficient equipment. The industry believes that India can compete with the best in the world in terms of technology and innovation, provided the plastics processing industry cooperates with them in this endeavour.

"There is no dearth of technical knowledge in terms of innovation, but the end-user industry has to create the need for developing newer mould technologies. With domestic products being the primary application for plastics in India, the need for developing newer mould technologies is not evident. In the developed countries, plastics is being used in manufacturing products that is currently unheard of in India. But the industry is slowly discovering the importance of value-added products, which are necessitating the development of high-end technologies," informs Naresh Panchal, technical director, N A Group of Companies.

Technology transfer from developed countries has led to some innovations in the mould making industry in India, but the buck stops there. This transfer of technology is not sufficient for the overall growth of the industry, and the mould makers and plastics processors need to wake up to newer technologies to make their presence felt on the world map.

"The innovations in the Indian mould making industry is currently happening through products manufactured through transfer of technology from a technology leader. But after the absorption





of technology from companies in the developed world, there always exists a gap where the receiver ends up with lesser know-how than the supplier. The technology leader goes on upgrading its products, and widening the technology gap between the two companies. Indian companies need to constantly innovate independently to bridge the gap during the technology transfer, and then make an attempt to adapt it to local conditions, to tackle any issues regarding local materials, labour, market and environment," observes Dave.

### Technical parameters

Moulds and its ancillaries are an integral part of the plastics processing industry, and appropriate quality measures and technical parameters have to be monitored regularly to ensure smooth moulding operations. The mould cavity determines part geometric characteristics, and moulds have many features that influence process operation, efficiency and effectiveness in terms of part quality.

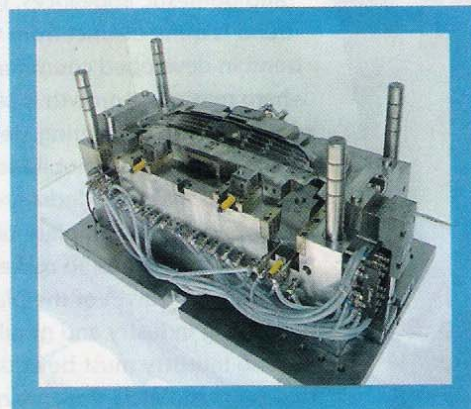
"While designing moulds used in injection moulding, special is needed to



select the type of moulds, which meet the specifications sought by customers' moulding machine, as well as take into account the product weight and tonnage requirements. Mould systems include two-plate moulds, three plate moulds, stripper moulds, slide moulds, feed systems, runner systems, runner shapes, runner layouts, etc. Design selection for gates are also critical for moulding processes, which include sprue gate, restricted gate, side or edge gate, flash gate, fan gate, tab gate, diaphragm gate, spider gate, ring gate, and hot tip gating. Other parameters include choosing mould temperature controls, hot tips, ejection systems, venting, and availability

of standard mould parts in the market," elaborates Dave.

Other process operations in moulding include provision of coolant flow channels to accelerate part cooling and also reduce cycle times. The parts moulded in blow moulding processes

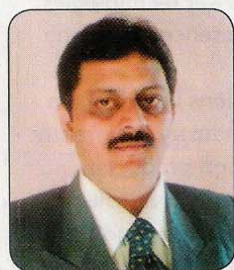


have to be cooled to a suitable ejection temperature in minimum time periods. During the production of preforms in injection blow moulding, the coolant may be heated to a temperature lower than the melt temperature, but high enough to enable the direct transfer of the preform to the blowing station with minimum temperature conditioning.

Elaborating on other parameters for moulding operations, Singh explains, "Technical parameters in moulding considered before the manufacturing of the moulds are fitments to be used, desired aesthetics of the end product, and the final application of the end-product. Moulding process temperature conditions are also a pivotal parameter gauged during the manufacturing of moulds. Designing factors include information on

### Vipul Dave

chief executive officer, Alfa Moulds Pvt Ltd



"The mould makers in India are trying to become complete plastic machinery providers. To make this a reality, the growth of the plastic processing industry and mould making industry must be equal





whether the moulds are being used in extremely hot, cold or normal temperature and pressure conditions."

### Customer demands

Mould makers in India have adopted a customer-centric approach towards manufacturing newer mould technologies. Criteria cited by the plastics processor single-handedly dictate the development and advances in mould technologies. Cost-effective machinery seems to be the need of the hour for the plastics processing companies in India, and mould makers have to follow suit in their bid to tap into the competitive market.

"The criteria cited by customers are exclusively as per their technical requirements, and designing and manufacturing of moulds is initiated only after a clear understanding of the process requirements. The priorities for the processor are listed, and the mould manufacturing is done based on these priorities. These include requirement of better impact strengths, gloss requirements, hidden parts, and the end application of the plastic product. These parameters have to be discussed before we initiate the designing and manufacturing of moulds," opines Singh.

Mould manufacturers have been dependant on the growth of the plastics industry for a number of years. The need for newer moulds and machines is catching up, albeit at a relatively slower

### Opinder Singh

proprietor, Om Enterprises



Hindrances in Indian mould making industries include irregular pricing of raw materials. In India, there is a lack of proper control on price of raw materials, which is a basic requirement for mould manufacturers like us

rate. The use of moulds and ancillaries for high-end plastics applications would result in increased capital expenditure for the plastics industry, and this is one of the major concerns of the mould manufacturer in India.

"The major difference between the Indian and global mould makers is the wide spread use of sophisticated and specially designed CNC machines which result in shortening the machining periods and maintaining the desired accuracies in single operations. In India, these expensive machinery are not affordable for the small- & medium-sized enterprises which form a significant part of the Indian plastics industry. The operations in plastics processing in India are mostly done on conventional, inexpensive machinery, which affect the quality of the mould and increases the cycle times of the moulding processes," cites Dave.

### Growth barriers

Industry experts cite a number of aspects that hinder the overall growth of the mould manufacturing industry. These include lack of infrastructure, lack of development in technical know-how, poor vendor support, insufficient research activities, and the money-centric attitude of the plastics industry.

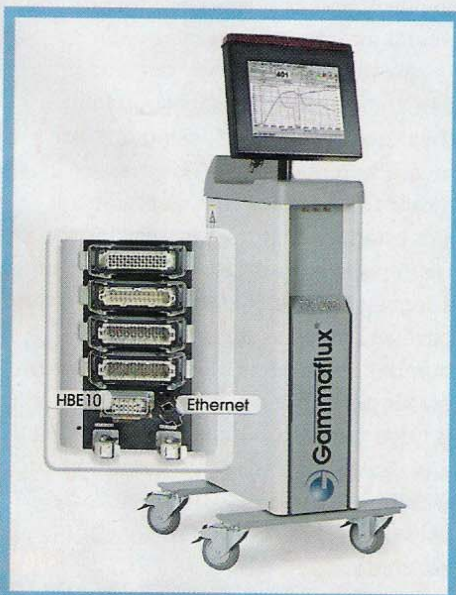
"The lack of manufacturing quality moulds and the demand for low cost moulds without considerations on the quality of end products is hindering the development of the industry in a major way. Process efficient machines, quality products and productivity optimisation only can help the industry overcome these drawbacks. The mould making

industry is a comparatively inexpensive industry in India, resulting in high-fragmentation of the industry leading to low economies of scale. These issues have to be handled effectively and immediately for the betterment of the mould making industry," says Panchal.

Industry experts state that the competitiveness and quality of mould manufacturers is dependant on the competitiveness and quality of its subcontractors. Acute shortage of technical know-how has been cited as another major issue, with the industry not being able to retain technically skilled manpower.

Speaking on other issues hampering the industry growth, Singh emphasises, "Hindrances in Indian mould making industries include irregular pricing of raw materials. In India, there is a lack of proper control on price of raw materials, which is a basic requirement for mould manufacturers like us. For the manufacturing of moulds for large volume capacities, raw material prices become a major concern for us, affecting our competitiveness in the industry. Another major drawback is the lack of interest and support from the government in promoting this industry."

"Chinese mould makers are a major threat to India in this regard, where the industry is concentrating on the infrastructure of their units, specialising their segments and products, and making optimum utility of standard mould parts from mould base to ejector pins and slide cores. In India, few mould makers are adopting these technologies, which can be attributed to lack of technical





## Naresh Panchal

technical director, N A Group of Companies



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awareness and source of information. Indian educational curriculum is not geared to impart the all round technical knowledge required by engineers and operators in this sector. For example, an engineer in this sector also needs knowledge in mechanical engineering, hydraulics, electronics & electricals, which is not evident in the current scenario," states Dave.

### Future trends

The list of opportunities to be explored by the mould makers and the plastics processing industry is endless. Mould makers are taking the initiative of developing newer moulding technologies, which would facilitate the overall growth of the plastics industry.

"The latest trend implies fully automatic injection moulds with the fastest cycle times. The operating requirements for degating runners and flashes need to be eliminated, and customers are preferring split or complicated moulds instead of handling operations like side holes, cuts, etc. The shift is towards hot runner mould technology, and customers looking for low-cost alternatives are preferring semi-hot runner systems for reducing wastage of the feed system and for faster production rates," states Dave.

Newer MOCs are being used for moulds, and the compatibility of moulds with newer raw materials are also being explored in India. Aluminium die casting moulds are gaining increased

acceptance among plastics processors for high-end applications. Says Panchal, "Developments in moulds manufacturing are gaining importance in India, and the industry is waking up to it. Companies are developing aluminium die casting moulds that give precise finishing for specific applications, which cannot be done manually. For complicated small moulding applications, aluminium cast moulds are in demand. Tailor-made equipment for specific applications such as mannequins, car bumpers, and fuel tanks have further fuelled the development of these aluminium moulds."

### Conclusion

There is still a long way ahead for the Indian mould making industry to be termed developed in all aspects. With customers prioritising quality and technology over price factors, the road to development seems smoother for the mould making industry.

"Customers are slowly but surely demanding higher productivity from their moulds, and are looking out for means to reduce the cycle times for their moulds. As a mould manufacturer, our aim is to give better after-sales service for customised manufacturing solutions on a regular basis. Mould makers from India have an excellent opportunity with a number of products being converted into plastic parts. The potential market for us is huge, demand is increasing everyday, and those who stick to quality standards with timely delivery will undoubtedly lead the way in the days to come," concludes Dave.

MPP

