AUTO & AUTO COMPONENTS INDUSTRY: Relevance of frugal engineering to increase in the backdrop of rising commodity and fuel prices

Overview

After having recorded a strong double-digit volume growth over the last two years, the auto and auto components industry may face strong headwinds in 2011-12 leading to moderation in growth contributed by firming up of commodity prices, rising fuel costs and interest rates. While the industry has made big strides over the last decade towards improving internal efficiency and thereby partially offsetting input cost pressures, efficiency gains alone may be insufficient going forward for players to use as a lever to combat cost headwinds. Industry players will therefore need to intensify their focus on deploying more cost effective vehicle systems in their new product development and existing model refurbishment programmes. In this respect, ICRA expects usage of common parts, vehicle light weighting, engine efficiency improvement and other frugal engineering themes to occupy centre stage in the Indian automotive market in the times to come. Enhancing focus on these areas is likely to be one of the key strategies of industry participants to sustain volume growth and ensure stability of profit margins.

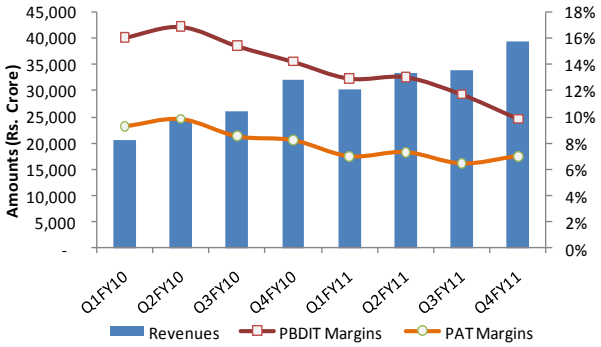
Trend in Quarterly Performance

2010-11 - a year of healthy revenue growth but declining profit margins

Robust demand across all automobile segments gave a strong thrust to volumes and revenues of the automotive industry in 2010-11 (Refer **Table 1** and **Figures** below). However, increase in cost of raw materials, energy and manpower during the year resulted in sequential drop in PBDIT margins quarter-on-quarter for both auto Original Equipment Manufacturers (OEMs) as well as auto component manufacturers. The drop in PBDIT margins was relatively sharper in case of OEMs as they were unable to fully pass on the increase in input costs to customers due to elevated competitive intensity. However, the component manufacturers were relatively less impacted as they are generally able to pass on the increase in raw material costs (constituting the bulk of their cost structure) to OEM customers. This could be attributable to component suppliers' low profitability (RoCE) and hence limited ability to absorb pricing pressures from OEMs beyond an extent.

Auto Original Equipment Manufacturers

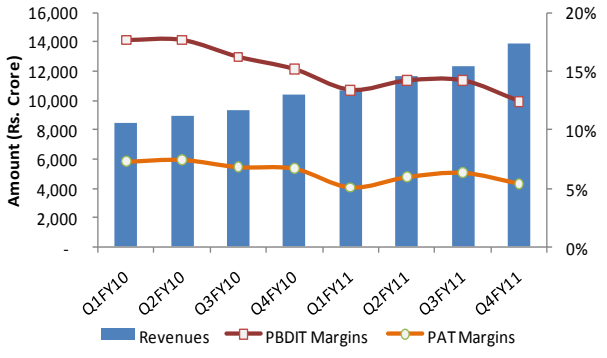
Figure 1: Trend in Aggregate Revenues and Weighted Average Margins



Source: ICRA's Estimates, Capitaline Database, Sample of publically listed OEMs

Auto Component Manufacturers

Figure 2: Trend in Aggregate Revenues and Weighted Average Margins



Source: ICRA's Estimates, Capitaline Database, Sample of 28 select entities

Going forward, if commodity headwinds persist, the profit margins of OEMs may get further squeezed. This could in turn restrict the flexibility hitherto enjoyed by component manufacturers in terms of their back-to-back pricing arrangement with OEM customers, resulting in price risk burden to also fall upon suppliers to a greater extent. To mitigate the adverse impact of the above, cost control through component and process VA-VE (value analysis/ value engineering) would be an important means to arrest margin erosion.

Table 1: Trend in Sales Volumes of Automobiles (Domestic + Export)

Sales Units (Nos.)	2006-07	2007-08	2008-09	2009-10	2010-11	April-May 2011
PV	**1,578,431**	**1,766,390**	**1,888,432**	**2,395,922**	**2,973,900**	**490,811**
Growth	*20%*	*12%*	*7%*	*27%*	*24%*	*11%*
CV	**517,648**	**545,816**	**426,795**	**576,402**	**752,705**	**122,229**
Growth	*32%*	*5%*	*-22%*	*35%*	*31%*	*15%*
2W	**8,491,978**	**8,068,447**	**8,441,793**	**10,511,415**	**13,329,895**	**2,451,787**
Growth	*12%*	*-5%*	*5%*	*25%*	*27%*	*20%*
3W	**547,805**	**506,006**	**493,793**	**613,606**	**795,989**	**139,530**
Growth	*25%*	*-8%*	*-2%*	*24%*	*30%*	*23%*

Source: SIAM, ICRA's Estimates

Cost Down Avenues

Industry players likely to put greater emphasis on commonality of components and design optimization across models

The growing competitive intensity in the Indian automobile market has meant that OEMs have had to increase the rate at which they introduce new models and upgrade existing ones. While the growing size of the market pie across all automotive segments has so far assimilated the flurry of new vehicles, as reflected in the steady volume growth recorded by most new models (barring few exceptions), this has necessitated large capital investments by OEMs and component manufacturers. Since the trend in rising frequency of new model introductions is expected to hold in the future as well, OEMs and their suppliers may need to lay a greater emphasis on collaborative approach for design optimization of components and use common parts across multiple models to benefit from scale economies. This could increase the efficiency of capital investments and enable spreading out of fixed costs over a larger volume base. Some of the individual components and vehicle systems which are already in common use across multiple models are given in **Table 2**.

Table 2: Common components and systems used across multiple models

Common Parts	Used in multiple models
Common K Series Engine (1.0 litre)	*Alto, WagonR, Zen Estilo, A-Star*
Common K Series Engine (1.2 litre)	*Ritz, Swift, Swift Dzire*
Torsion Beam, Steering System, Plastic Modules	*Swift, Swift Dzire*
Engine and Suspension Components	*Splendor, Passion*
Suspension Arm Ball Joints	*Indica, Alto, Zen Estilo*
Drive Shaft Bell Joint	*Santro, WagonR*

Source: ICRA, Company

While component commonality and multiple models built on the same platform is a known feature of the global automotive industry, it is yet to attract the same degree of attention in the domestic market. One of the reasons for the same is the design approach followed by domestic OEMs and suppliers which is less collaborative as compared to their global counterparts. In the past, the responsibility for vehicle system design in case of large domestic OEMs like *Maruti Suzuki* and *Hero Honda* rested primarily with their foreign principals. These designs were directly adapted into the Indian context, even though there did exist a scope for tweaking the design without compromising on functionality and make it similar to an already productionized part in the domestic market and hence reduce costs.

Examples of overdesigns:

- ✧ If a certain plastic component was designed for a global platform, it was one with specifications that could withstand the intense heat in India as well as the freezing weather in Canada.
- ✧ Due to a product-centric approach, designs were frozen by OEMs without taking optimization inputs from suppliers in respective markets. Certain non-standard designs were finalized by OEMs even though standard design solutions were readily available off-the-shelf with suppliers which met the application's requirements.

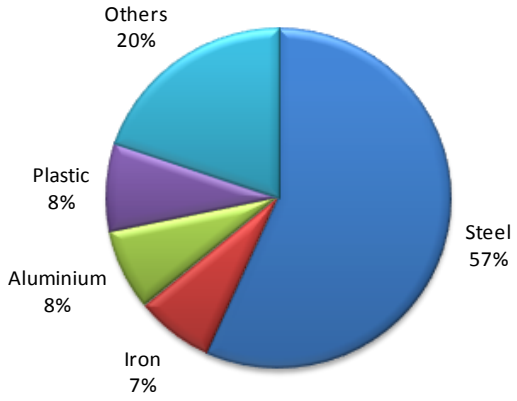
In a way, even as such designs were common with the multi-country platforms of global OEMs[1] meeting the highest common denominator for specifications, they were 'over-designed' for the Indian market in certain cases leading to higher vehicle costs. This shows that although usage of common parts has obvious advantages, this one-size-fits-all approach needs to be carefully balanced with local market requirements. Overall, the merits of following the component commonality approach including scale economies, lower lead time of development, deployment of already proven design and lesser validation expenses cannot be ignored and could potentially be an important area for cost rationalization for the automotive industry in the future[2].

For the above process to gain traction in the domestic market, collaboration between OEMs and vendors for joint model development will need to strengthen. In fact, *Toyota* followed this approach for the development of the recently launched '*Etios*' where it worked in close partnership with its key system suppliers in the domestic market to launch its first India-centric model. While the Indian automotive OEMs namely, *Bajaj Auto, TVS, Tata Motors* and *Mahindra & Mahindra* have long been working in close coordination with their suppliers, the OEM-vendor partnership in terms of vehicle design is yet to strengthen for some global OEMs in India. However, it would be imperative for such OEMs to change their past approach as they look to launch India-oriented models in the near term with the aim of increasing the likelihood of greater customer acceptability of their models through better price-value offerings. Such co-development partnerships could offer opportunities for Indian vendors to move up the technology curve, increase value addition in their business operations and lead to better scope for volume growth and margin protection.

Usage of alternate materials aimed at reducing vehicle weight to gain more prominence

In a bid to reduce vehicle weight, address newer stringent safety norms and improve fuel efficiency besides being cost-competitive, OEMs are increasingly looking to use light weight technologies in vehicles. This is reflected in the growing use of high tensile steel grades replacing conventional steel specifications, replacement of metal with plastics in certain applications and increasing usage of aluminium and other light-weight alloys in place of ferrous materials.

Figure 3: Raw Material Constituents of a Car by Weight
Source: Industry Sources



The adjacent figure shows that aluminium and plastic each account for around 8% of the weight of a typical small car, with the bulk of the weight of a car - on account of structural and suspension system components - contributed by steel. Although the content of aluminium and plastic/ composite in vehicles has increased over the years, a typical modern passenger vehicle is still essentially a steel and iron machine. Yet examining the applications where aluminium and composites have been able to achieve commercial success reveals ample opportunity for increased penetration by lightweight alternatives. Aluminium has already achieved a significant share of engine[3], powertrain and heat exchanger applications, although its use in structural components remains virtually nil in Indian vehicles. Likewise, although the use of engineering plastics and composites is increasingly gaining ground, a large proportion of the plastic grades currently used in domestic vehicles are low performance materials.

[1] *Global OEMs tend to engineer products to meet customer demands and requirements of every market by using common parts sold all over the world for providing customers with uniform quality irrespective of region.*
[2] *Certain styling-related components such as head lamps, tail lamps, bumpers, grills and other related functional parts like windshield, window glass, seats offer little scope for commonality across models due to their distinctive attributes in each model.*
[3] *While cylinder heads of most passenger vehicles in India are now made of aluminium, they continue to be ferrous cast in case of most commercial vehicles.*

Table 3: Weight reduction steps undertaken by the automotive industry

Component	Usage of Alternate Material
Fuel Tank	Use of plastic in place of conventional steel in select models of Maruti Suzuki, Ford, Honda
Cylinder Block	New K-Series engine of Maruti Suzuki uses aluminium blocks replacing ferrous blocks of earlier F-Series engines
Structural Steel	Use of tailor-welded blanks in place of reinforced steel frames by several OEMs
Fenders	Use of plastic fenders in place of conventional steel by M&M
Body	Fibre bodies in place of steel bodies in scooters - Pleasure, Dio, Scooty
Wheel Covers	Usage of ABS plastic grade (having lower density) in place of PC+ABS material by Maruti Suzuki in Wheel Covers

Source: ICRA, Company

One of the major impediments to greater adoption of light weight materials is their relatively higher cost as compared to steel[4]. As per ICRA's analysis, an increase in the proportion of aluminium by weight in a car from 8% to 10% will increase total raw material costs by around 2%, but lead to reduction in vehicle weight by around 1%. As per technical studies, this in turn could improve fuel efficiency by around 0.5% and improve vehicle acceleration by around 1% (range may vary depending on type of vehicle). These numbers show that while fuel economy and acceleration improvements can both be achieved by reducing vehicle mass via materials-enabled lightweight designs, the gains are usually small unless entire sub-systems are light weighted. This implies that engineering efforts towards reducing the weight of a car will have to be explored across greater number of vehicle sub-systems. While this may increase vehicle costs marginally, it is expected to make the overall value proposition from the customers' perspective more compelling consequent to better fuel efficiency, improved performance characteristics and lower emissions.

In a move to pare costs, Maruti Suzuki had announced in July 2008 its target to reduce the weight of each component in its *M800* model by 1 gram. Achieving this target had the potential of reducing the vehicle's weight by around 2.6 kg and generate cost savings of ~Rs. 150 per vehicle. While this potential saving appeared small in relation to the price of the model, it highlighted the growing focus of OEMs on producing lighter vehicles. In fact, the next generation of the *Swift* model that is likely to be launched in Q2, 2011-12 is expected to be around 10 kg lighter than its predecessor.

Conclusion

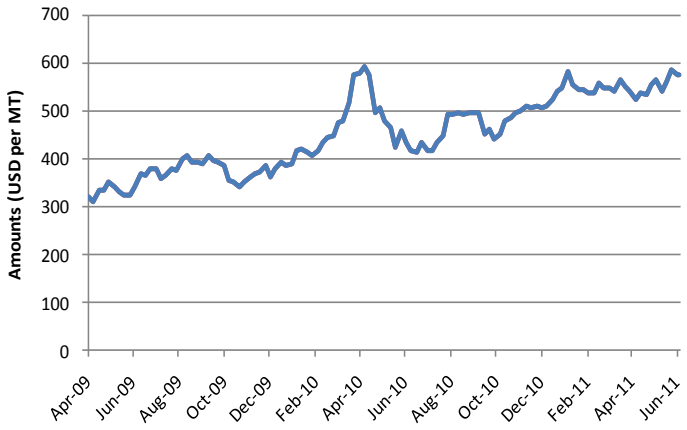
Margin pressures due to rise in commodity, manpower and power costs, besides intense competition, are not new to the Indian automotive industry. However, the measures required to be taken by the industry to placate these challenges on an ongoing basis may need to be directed in areas related to design optimization and frugal engineering, where results become visible only over a relatively longer time horizon. This may require the industry players to incur greater investments; however, the longer term benefits and resultant structural changes could alter the automotive design paradigm, change the cost drivers and provide greater value to customers. ICRA expects focus on these areas to be critical for the industry participants to sustain their volume growth and achieve stability of profit margins.

[4] *Aluminium is around 2.5 times as expensive as steel per kg.*

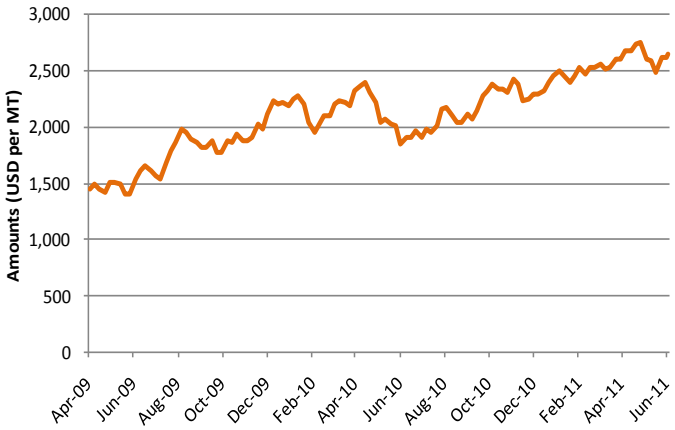
ANNEXURE

Trend in commodity price movement over the last 14 months

Trend in Price Movement of LME Steel Billet

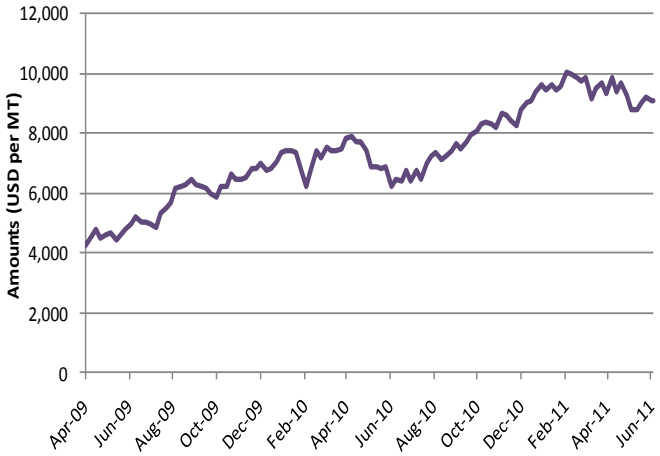


Trend in Price Movement of LME Primary Aluminium



Trend in Price Movement of Rubber (Malaysian Rubber Board, Standard Rubber)

Trend in Price Movement of LME Copper



Source: Bloomberg

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