Auto-components: Meeting the "Climate Change" Challenge

As the Copenhagen chronicle unfolds, pressure on the automotive industry to reduce emissions mounts. The extent and speed of adoption of electric and hybrid vehicles will determine their impact on the auto component industry. However, *Arindam Chakrabarti, Madhura Sekhsaria and Ashim Sharma* of Tata Strategic Management Group believe that players need to take immediate cognizance of the shifts and dynamics in auto components and position themselves for the future.

Concern about vehicular CO_2 emission is gaining importance with every passing day. All OEMs have intensified development efforts for hybrid and electric vehicles. The next decade will witness co-existence of multiple propulsion systems. In particular, companies leading the innovation curve on energy storage technologies have seen significant investments from major players. GE's investment in battery manufacturer A123 is a case in point.

Beyond the hype surrounding alternate propulsion technologies, a silent revolution in IC technology is continuing unnoticed. Recent modifications and upcoming developments in IC technology have the potential to reduce emissions significantly. The 'Next Gen ICE' will see immediate adoption and promises to bring about changes in the supplier landscape for IC vehicles.

The 'Next-Gen ICE' – Leaner, Meaner, Mightier

In a bid to reduce emissions (measured in CO_2 gm/km) with current technology and fuels, automakers are striving to pack in more miles per gallon of fuel. In effect, there is a concerted move to increase efficiency of the vehicle without compromising on performance. Automakers are adopting either or all of the following measures to ensure adherence to emission norms:

- Light weighting
- Efficiency improvement
- Alternate hydrocarbons

With these measures, petrol engines upto 1.2L and diesel engines upto 1.4L capacity are likely to meet even the 2020 emission norms. It appears that the Indian owner will be driving mainly Next-Gen ICE powered hatches well beyond 2020 even as larger cars move into hybrid and EV modes.

Light weighting:

A leaner automobile goes a long way in emission reduction. A 100 kg reduction in the weight of a 1-1.5 ton car can improve mileage by 1 km/litre and translates into lower carbon emissions of ~8-11 g/km.

Weight reduction can be achieved by part elimination, material substitution or process changes. Automakers world over have been continuously working towards incorporating newer materials into vehicles to make them lighter. The list of alternatives is ever increasing – from steel alloys, stainless steels, ultra high strength steels to various compositions of aluminum, magnesium and fiber reinforced plastics.

Exhibit 1 :Trends in material usage in European vehicles (%)

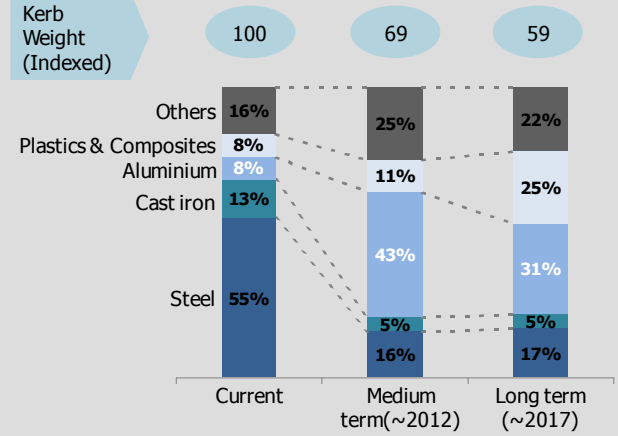


Exhibit 1 outlines some trends in material usage in automobiles in the future. There may be an opportunity to reduce vehicle weight by 40% just by changing the material mix.

Auto makers like Audi have successfully reduced vehicle weight with use of high strength aluminum in the body. The Audi A2 at 895 kg weighs 150 kg less than a comparable compact with a steel body. Closer home, the Mahindra Scorpio has become leaner and lost ~120 kgs over the last 6 years.

Not only material but process technology is also undergoing significant changes. Processes such as sintering and hydro forming that aid efficient use of material and consequently lighter finished parts are fast gaining patronage. On an average, sintered steel parts are 5-15% lighter than cast or forged parts of the same geometry.

Efficiency Improvement

Efficiency improvement initiatives aimed at improving fuel efficiency include measures such as 'Downsizing', friction reduction and improvements in volumetric and thermodynamic efficiency of the engine.

An emerging trend that addresses engine efficiency is that of 'Downsizing' i.e. increasing engine power and torque without increasing cylinder capacity or same power at reduced cylinder capacity. Audi has downsized the V8 engine (8 cylinders) to aV6 engine (6 cylinders) in its S5 model without affecting performance. The Mahindra Scorpio that could churn out 109 bhp of peak power with a 2.6L engine now delivers 120 bhp using a 2.2L engine.

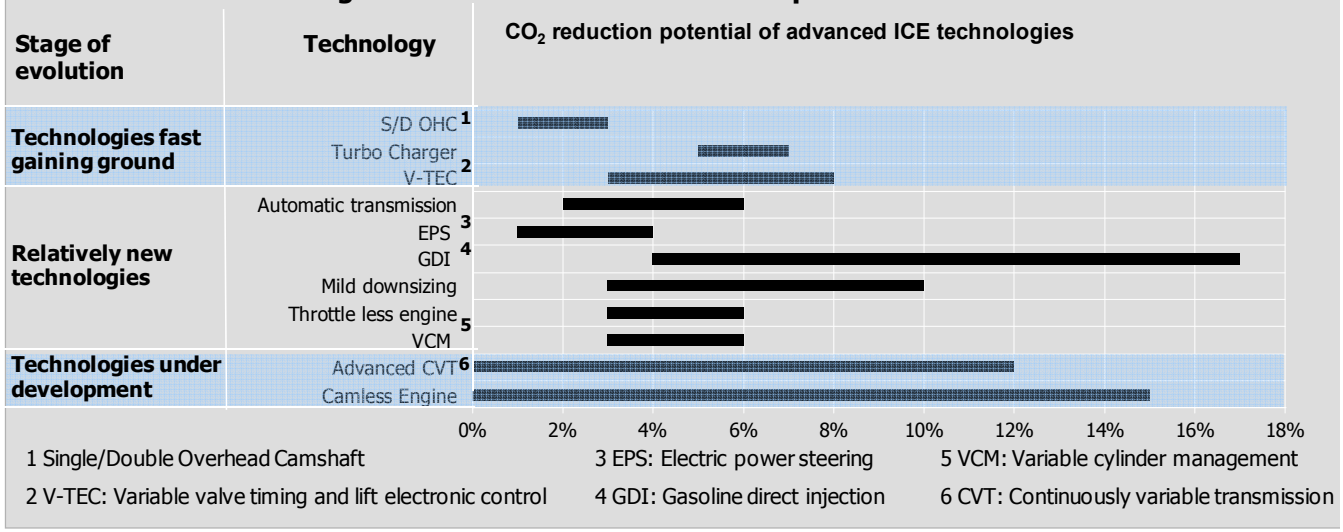
To improve the output for the same capacity of the engine, automakers are trying to pack in more and more fuel charge in the same cylinder space. Technologies such as turbo chargers and intercoolers that are used predominantly in diesel engines will soon become a common feature in gasoline engines. New technologies such as Variable Cylinder Management (VCM) adopted by Honda and Throttle-less engines adopted by BMW have the potential to reduce emissions in the range of 3-10%. Exhibit 2 below provides an overview of new technologies and their emission reduction potential.

Such changes individually may have a small impact on emissions but collectively promise to lower emissions significantly and enable small to mid segment cars to meet 2020 norms on CO_2 emissions. The usage of such technologies will result in significant alterations to component specifications.

Alternate Fuels:

Recent years have seen a notable shift towards diesel vehicles. Industry observers are of the view that the share of diesel vehicles in India could rise from the current figure of around 31% to 55% within the next 2-3 years.

Exhibit 2: New technologies and their emission reduction potential

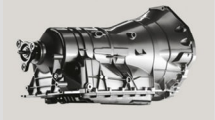


India's CNG fleets are already amongst the largest in the world. OEMs are quickly latching on to this trend and introducing factory fitted models with CNG/ LPG capabilities in a move to lower emission profile. The Wagon R Duo, Santro CNG stand testimony to this emerging trend. Even premium cars such as Chevrolet Optra have rolled out with alternate fuel options. If this turns into a sustainable trend, it will demand changes to fuel injection and storage systems.

need to evaluate their product portfolio to identify

- Products that may witness a shrinking demand
- Product segments/ products poised for future growth with the advent of the advanced ICE
- New products to address the emerging demand for hybrids and EVs
- Capabilities necessary to meet performance and quality requirements for new technologies

Exhibit 3: Implications for Indian Auto-components industry

Vehicle System	Major Developments	Growth Areas	Concern Areas
 Engine	• Aluminum engine block • Camless engine • Carbon pistons • GDI • Micro alloyed steels in forged parts • Mild downsizing • Plastic/ Magnesium intake manifolds • Single/ Double overhead cam • Throttle-less engine • Turbo Charger • Variable Cylinder Management	• New materials such as micro alloyed steels, aluminum, plastic resin, etc. • Increasing use of Power Electronics and Programming for engine controls • Complex small castings and forgings	• Reduced steel consumption due to reduction in engine size and substitution • Reduction in castings and forgings for linkage mechanisms
 Transmission	• Automatic transmission • Continuously variable transmission (CVT)	• Increasing use of Power Electronics and Programming for gearbox operation • Components such as Epicyclic Gear trains, Fluid Flywheels, Pulleys etc.	• Reduction in selection, shifting and motion transmission components for manual transmissions
 Body & Interiors	• Advanced joinery techniques • Aluminum body shell • HSLA steels • Impact resistant plastics	• Opportunity for high strength steels • Increasing use of aluminum/ plastics	• Reduction in small steel stampings (e.g. brackets) • Conventional joining processes such as welding

Implications for component manufacturers:

Impending technology changes will be accompanied by several changes in component specification and processing in key vehicle systems. The 'New-Gen ICE' may result in component reduction at one end but will also open opportunity that component manufacturers can address.

Exhibit 3 outlines major technological developments in the New-Gen ICE and their implications on the auto component industry.

Component makers need to assess the impact of these trends on their business models. They will

The component sector is likely to witness enormous churn and turmoil as these trends play out. As in most periods of intense change, the position of industry leaders and laggards can get reordered. Firms that read these signals and gain insights early will be well positioned to make the right choices in terms of products, markets and technologies to safeguard their future profitability and growth.

About Tata Strategic:

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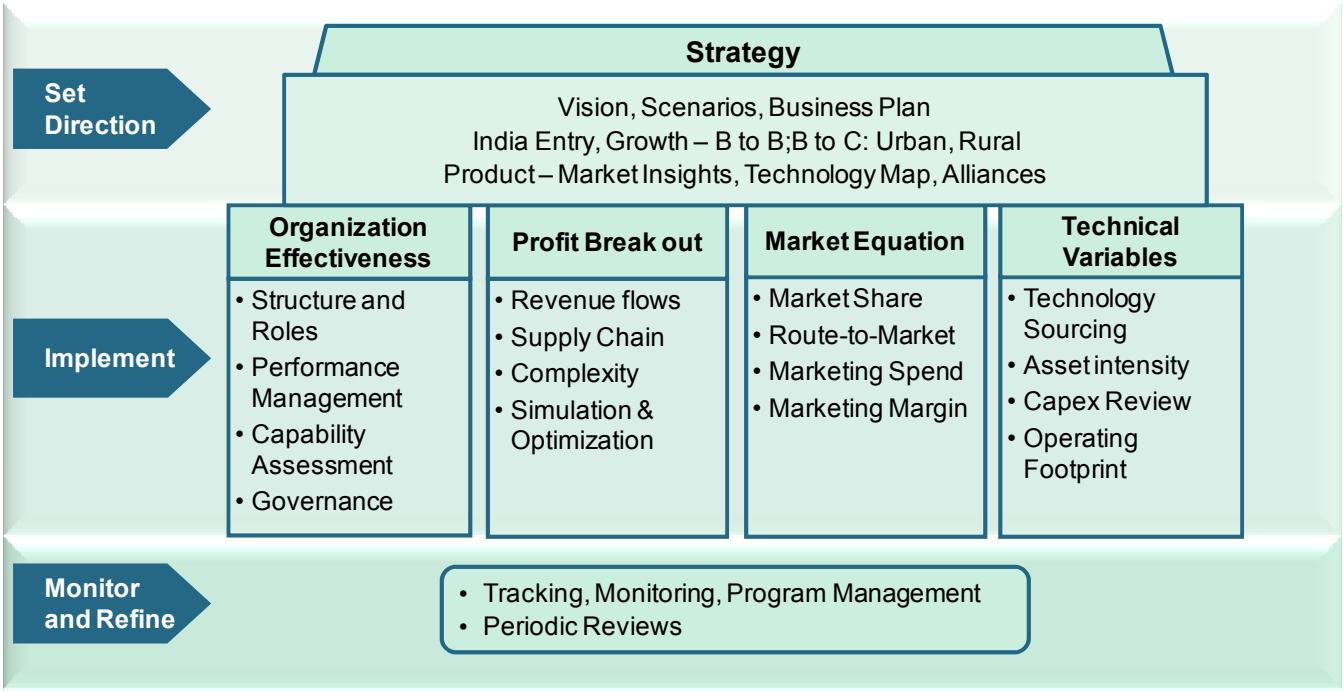

About the Author:

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