CHAPTER VI

SUGGESIVE MEASURES
VEHICULAR EMISSION & STRATEGY FOR CLEAN AIR : AN INTEGRATED APPROACH

The vehicle population in India is growing at the rate of around 5 to 10 percent per annum. Out of a total population of around 40 millions vehicles about 76 percent are two wheelers with a very high proportion of two stroke engines. It is being pointed out that vehicular pollution contributes substantially towards deterioration of air quality in some of the large cities.

Vehicles manufacturers are fully seized of the situation and are continuously striving for technology upgradation to meet the increasing tighter emission norms.

However, it must be borne in mind that the first comprehensive legislation for vehicular emission was implemented only in 1991 and the level and pace of manufacture of increasing environment friendly vehicles are borne out from these charts.

It is in this perspective that one must evolve a strategy for achieving clean air in our cities. Although all vehicles manufactured conform to current norms and standards for emission and safety, some of the factors that impact the sustainable emission performance of vehicles are:

➢ No guarantee of usage of appropriate fuels and lubricants.
➢ Absence of an inspection & certification system and regular maintenance culture.

➢ Vehicle users do not always come to the authorised dealers even during the warranty period (usually one year), currently given by manufacturers.

➢ There is no surety that users would be using OEM-Specified components, spares and lubricants.

➢ Issues like overloading and improper handling of vehicles would be deterrents to a vehicle's sustainable performance.

**Therefore Some Recommendations Are Suggested**

1. **AIR Quality**

1. Enhance and strengthen the network for air quality monitoring on a regular basis particularly by way of including some of the important and secondary pollutants (CO, HC, Ozone etc) which are currently not being measured.

2. Fix realistic air quality goals various types of pollutants on the lines of the WHO guidelines.

3. Carry out dispersion modeling ascertain exposure levels and damage potential.

4. Identify pollutants and prepare source-wise pollutant inventories for realistic apportioning of the most cost effective controls which need to be applied on each source.
5. Carry out predictions of pollutant loads over reasonable future periods of time (10 to 15 years) and define levels of control which will be required to maintain air quality at desired levels.

6. Base future vehicle emission norms on the above data.

2. In-Use Vehicles

1. Mandate certification based on inspection and maintenance for all categories of vehicles presently, only commercial vehicles are covered. Ensure strict compliance through more reliable, supplementary system.


3. Detailed evaluation of feasibility of retrofitment exercise particularly in Indian conditions and an assessment of the environmental benefits they will bring.

3. Fuel And Lubricant Quality

(a) Phase out leaded fuel.

(b) Sulphur in diesel to be reduced to 0.05% by 2005.

(c) Strictly prevent fuel and lube oil contamination on and adulteration during distribution and usage.

(d) Improve lube oil quality to reduce emission.

4. Traffic Management

(a) Enhance and upgrade public transport to reduce dependence on personal vehicles.
(b) Provide encouragement and fiscal assistance to operators and manufacturers of modern, ecofriendly buses designed for comfort, reliability and quality of service in inter and intra city traffic.

(c) Construct bicycle tracks to encourage segregation of slow and fast moving traffic.

(d) Check overloading of commercial vehicles and make provision for deterrent action.

(e) Institute de-bottlenecking and other measures to ensure smooth traffic flows.

(f) Expand and improve road infrastructure for example, construction of by passes, all weather roads.

5. **Technology**

(a) Encourage USE of alternate fuels, such as CNG/Propane/ LPG. Which are cleaner alternatives to petrol and diesel, for intra city public transport vehicles such as taxis, metro buses etc.

(b) Ensure adequate safety measures against fire and accidents while using alternate fuels like LPG/Propane.

(c) Leave the choice of vehicle technologies to the industry to comply with future emission regulations.
6. **Roads**

Prepare a long term action plan to build new roads and improve current road infrastructure to promote smooth and faster traffic flow and to ensure lower pollutant contribution from auto mobiles.

7. **Integrated Urban Development**

(a) Reduce multiplicity of authorities for urban development in general and urban transport is particular.

(b) Setting up a Unified Metropolitan Development Authority.

**CONTROLLING VEHICULAR POLLUTION**

Vehicles technology has advanced rapidly in recent years in the developed countries, resulting in production of cars and passenger vehicles which are more safer comfortable and less polluting.

However, because of their production in large volumes, changes have not been so distinctly visible in the case of small engines powering the two and three wheelers. This is about to change, driven by fight emission norms especially in the Asian countries.

As metropolises spread their domain in to hitherto undisputed hinterlands, two wheelers have emerged as the most adaptable mode of transport. This transformation is evident in countries as varied as India, Thailand, Philippines and Taiwan.

All these countries have been affected by serious problems of air pollution and congestion associated with the growing number of
EMISSION REDUCTION IN PETROL VEHICLES PRE-1998 TO 2000

![Graph showing emission levels over years](image-url)
these vehicles. Each of these countries have tackled the problem in a unique manner.

1. **Taiwan's**: Large population of two wheelers have been rapidly converted from convention two stroke to catalytic converter fitted ones, four-stroke engines now account for 50 percent of the total number. Their main strategy to control air pollution include:

   ➢ An extensive air quality monitoring system which helps to identify highly polluting areas.

   ➢ Adoption of tight norms for two-wheelers as compared to other countries, along with the requirement that the two-wheelers would comply with the norms for the useful life of the vehicle.

   ➢ An inspection & certification (I&C) system to ensure that vehicles are maintained as per manufacturers specifications.

2. **Some of the steps taken by Thailand to study the effect and thereby reducing air polluting area**

   ➢ Building an inventory of mobile source emission for Bangkok in 1994.

   ➢ Health surveys were conducted to study pollution related diseases.

   ➢ Comprehensive automated air quality monitoring network consisting of 53 stations throughout Thailand.

   ➢ Complete phase-out of leaded gasoline and improvement of fuel and lubricant quality.
Implementation of emission norms very strict for commercial vehicles and gradually tightening for two and three-wheelers.

Proposes to establish inspection & Maintenance system for all vehicles, and,

Traffic management such as staggered working hours.

3. **Philippines** have setup 'Urban Air Quality Management Strategy and Action Plan' (URBAIR) through its **Metropolitan Environmental Improvement Programme with the assistance of the world Bank**

1. Banned the import of second hand public transport vehicles which did not meet the emission norms.

2. Switch over to cleaner fuels.

3. Awareness campaigns through posters, TV ads, radio messages etc.

4. Stricter enforcement to traffic rules and regulations.

5. Air quality monitoring.


4. **Netherlands** would be a typical example of European approach to the problem. The government provides incentives to non motorized public transport and restraints on use of motorized transport special traffic management activities are undertaken to encourage the use of bicycles.

5. Due to serious vehicular pollution problems existing in **California**, United states have a separate regulatory board (CARB) for California.
It has imposed one of the strictest emission norms in the world. California has also introduced more stringent standards for light duty vehicles and trucks, with the progressive introduction of Low, ultra Low and Zero Emission vehicles. There are proposals for hybrid electric vehicles with very low emission.

6. Inspection and Maintenance (I&M) programmes are receiving greater attention in many countries. It is widely accepted that such a programme can improve overall air quality as much as by 40 percent.

7. As far as the Fuel Quality is concerned, Austria, Denmark, Finland and Sweden in Europe and Japan, South Korea and Thailand in Asia have already totally eliminated lead from petrol, some Countries including Austria, Italy, Germany, Finland and Sweden stipulate very low benzene contents.

8. In Europe a landmark achievement of the governments is the establishment of a level of co-operations between the Motor industry and the oil industry which resulted in forming an Auto-oil programmer. This programmer visualizes a new approach to achieve environmental targets through co-operations between these two key sectors. The measures identified by the Auto oil programme will from the basis for the next step in emission legislation to come into force by the years 2000 and 2005.


**ROAD INFRASTRUCTURE**

Need for Balanced and timely development roads in the Union Budget 1998-99: One of the highlights of Union Budget 1998-99 is the emphasis on infrastructure, particularly the sectors of energy, telecommunications and transport. These three sectors are undeniably vital for the acceleration of economic development in the country.

The capital outlay for the three sectors has been increased to Rs 61,146 crores, up 35 percent from the budgetary allocation for FY 97-98. The total central plan allocation for the Transportation sectors under MOST is only 7.11 percent of the investment on energy, telecommunications and transport, of which roads and bridges and road transport account for 4.02 percent.

In addition to the above, an estimated accrual of Rs. 790 crores per year from a surcharge of Rs. 1 per litre of petrol sold will be Utilized to augment the corpus of the NHAI.

Rs.16 crores has been allocated to Road Transport which includes central Government contribution to state Road Transport Corporations (SRTCs) and schemes for control of Motor vehicle pollution.

These are much needed allocations for the National highways which constitute only 2 percent of the 2 million km. road network but carry 40 percent of the total
Passenger and freight traffic. But how are they going to be utilized? Formed in 1995-96, the first year's allocation of Rs. 200 crores to the NHAI remained substantially under utilised Allocation of Rs. 500 crores in 1997-98 was also not fully utilised and Ministry of Surface Transport (MOST) had to divert Rs. 110 crores to other on-going projects, thus leaving Rs. 390 crores with NHAI.

**Table No. 76**

*The Outlay For Roads & Bridges*

<table>
<thead>
<tr>
<th>Activity</th>
<th>Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction and Development of National Highways</td>
<td>Rs. 1683.50 crores</td>
</tr>
<tr>
<td>Inter-State roads of economic importance</td>
<td>Rs. 20.00 crores</td>
</tr>
<tr>
<td>Highway Research &amp; Planning</td>
<td>Rs. 20.25 crores</td>
</tr>
<tr>
<td>National Highway Authority of Indian (NHAI)</td>
<td>Rs. 500.00 crores</td>
</tr>
<tr>
<td>Total</td>
<td>Rs. 2223.75 crores</td>
</tr>
<tr>
<td>Revenue to the Govt. from auto &amp; auto related activities(1997-98)</td>
<td>Rs. 31714.13 crores</td>
</tr>
</tbody>
</table>

MoST has recently also released Rs. 800 crores to NHAI to undertake a few ADB-sponsored projects. Reportedly only half of this fund was utilized while the balance is still available with the NHAI.

Under utilization of funds can be attributed to the fact that NHAI is still in the process of identifying projects and carrying out
feasibility studies. Moreover, a Complete policy framework for private participation in Highways projects is still to be announced by MOST.

Meanwhile, work has commenced on four laning of the Delhi-Mumbai-Chennai-Calcutta National Highways. NHAI has also taken up two expressway projects on the Kanpur-Agra and Mumbai-Vadodara Sector.

Increased allocation for highways development augurs well for the automobile industry. The total vehicle operation cost on the road network is estimated to be around Rs.1000 billion (US $35 billion) Road improvements would result in savings of about 15 percent of the vehicle operation cost of Rs. 150 billion (US $5 billion) per annum. Vehicle operating costs (VOCs) increase with deterioration in quality of road surface.

However, there is need to improve the absorptive capacity and implementation constraint that is more serious than the financial constraint.

**Intra - City Roads**

Also while National Highways and state Highways are being given their due priority, we should not lose sight of the deteriorating conditions of the intercity roads. Improving city roads is a necessity for controlling pollution, accidents and fatalities.
Some Disconcerting Accident Data

1. India's vehicle population is only 1 percent of the total world vehicle population, while road accidents in India constitute about 6 percent of the global accident rate.

2. India has the highest accident rate per 1000 vehicles, that is, 12, compared to 4.4 in France, 4.8 in Sweden, 8.8 in Japan and 8.9 in West Germany.

3. Road accidents in India are increasing at the rate of 8 percent per annum while the human population has been increasing at the rate of 2.1 percent per annum.

4. Out of the 0.1 million accidental deaths every year, road accidents alone account for as many 60,000 fatalities.

5. 57 percent of the accidents occur in major metro cities.

6. Mumbai has the highest fatality rate per thousand vehicles in the country, whereas Delhi has the highest mortality rate. In 1994 the fatality rate in Mumbai per 1000 vehicles was 2.41 whereas the total number of deaths in Delhi was 1679.

7. Loss due to accidents account for 1 percent of the annual GNP. Total economic loss on account of road accidents is of the order of Rs. 50 billion.
The National Road Safety Council was constituted in 1987 to provide guidelines for achieving some very essential objectives. The council had recommended the following targets:-

a. Reducing the number of accidents to 50 per 10,000 vehicles and.

b. Number of fatalities to be 12 per 10,000 vehicles by the year 2001.

What are the steps being taken to achieve the above mentioned objectives intended policies must be translated into action with a time bound programme. We welcome the announcements in the Union Budget 1998-99 or providing 100 percent tax exemption for safety schemes implemented by corporates.

**Multiplicity of Authorities**

Research has shown that safety can be enhanced by building greater safety into the roads. While roads are a state subject there is need for uniformity in development. A Roads Board or the lines of the NHAI should be set up, which could oversee the development of roads across the country. One impediment which has been pointed out at various fora is the multiplicity of authorities looking into urban development in general and urban transport in particular and the consequent delay in getting clearances for projects and lack of co-ordination. A unified Metropolitan planning Authority responsible for intersect oral co-
ordination and formulation of policies may provide a way out of problems currently faced.

**Rural Roads**

As Indian agriculture stands on the threshold of becoming globally competitive and a major exporting sector, it is imperative that rural roads are accorded priority. The Road Development plan 1981-2001 had envisaged all weather road connection to all villages with population of 500 and above by 2001. Presently only 50 percent of the 60,000 villages have been provided with all weather roads. There is also need to tailor road building technology, which now is chiefly oriented towards urban roads to suit rural conditions. This will be cost effective.

**In Conclusion**

There is need for balanced development of main roads (NHs and SHs), rural roads and urban roads. This is because all categories of roads have environmental economic and safety implications in varying degrees. In conjunction with connectivity the quality of road surface and maintenance have also to be taken cognisance of.

**Dealer Improvement Schemes**

To gear up for the Mint flag-off end-October automobile giant Telco is working on a dealer identity programme. The Tata group is also redesigning its group corporate identity for which it has appointed
Wolff Olins, a British firm which specializes in developing corporate identities.

The dealer identity programme begin in March-April and will be rolled out in a phased manner from end-October coinciding with the launch of the small car.

The small car will bear a different logo which will eventually find its way on to other passenger car models in the Telco stable.

The dealer identity programme will include a new layout, commonality of displays and signages and a new colour scheme. To ensure uniformity of salesmanship, dealership personnel are already being trained at the Telco training school in Pune.

The idea is to offer Telco customers a uniform purchase environment and over a period of time the company intends to get all its dealers to make the change.

However, since an immediate makeover may not be economically viable for dealers, the company plans to conduct the identity programme in phases. In the first phase, the 40 odd Mint dealerships already inked, will be encouraged to come on board.

Telco plans to have a 115 dealer strong network running in the next three years so far, the company has chalked out dealerships for 34 cities across the country. These include Delhi, Jammu, Ambala,
Ludhiana, Chandigarh, Noida, Gurgaon, Agra, Kanpur, Lucknow and Varanasi in the north; Jaipur, Ahmedabad, Baroda, Mumbai, Goa, Nasik, Indore, Jabalpur, Nanded, Pune and Nagpur in the West, Bangalore, Hubli, Mangalore, Cochin, Coimbatore, Madurai, Chennai, Visakhapatnum and Hyderabad in the South and Calcutta, Patna and Guwahati in east.

Telco plans to put all these dealerships in place before October 15. Display vehicles will be made available by last week of October. All dealerships will put up an exclusive set-up for mint.

Telco plans to roll out 30,000 small cars in 98-99. It's production target for 2000: 60,000 units which will be the break-even point for the small car project.

**AUTOMOBILE INDUSTRY, AND INFRASTRUCTURE IMPROVEMENT THE INDIAN**

As expected there has been a significant increase in the variety of product offering in this sector. In the commercial vehicles area, in addition of the present products from Telco, Ashko Leyland, Bajaj Tempo and the Japanese LCV manufacturers, Volvo will soon be entering the market with heavy Trucks and Buses, Daewoo has stated its intent to manufacture commercial vehicles and Ford as well as General Motors have also at various times similarly stated their plans to introduce their range of light trucks in the Indian market. The commercial vehicle buyer will, therefore, have a wide choice of internationally proven
commercial vehicles from which to choose. The passenger car segment has already undergone a dramatic change several international products are now available in addition to the existing cars from Maruti, Hindustan Motors and Premier Automobiles.

Ford, Opel and Daewoo have been the three strong new entrants in the market. Honda, Hyundai, Mitsubishi and Toyota are also expected to enter the Indian market in the near future. Over 370,000 passenger cars were sold in India during the year an increase of 16 percent over the previous year. The demand is expected to be between 6,00,000-10,00,000 units by the turn of the century, with a major share being in the low-priced segment.

The automobile industry is already becoming an extremely competitive business area and will become more so as the new capacity presently under construction gets commissioned. The consumer will have an ever-increasing visual choice of products and decisions on purchase will be totally discretionary based on appeal, price, quality, reliability and after-sales support. This will undoubtedly demand an upgradation of the capabilities of the existing manufactures and their re-orientation towards being more competitive and market-driven. The component manufacturers will also need to upgrade their technology and processes to remain competitive.
The growth in the automobile industry will further stress the woefully inadequate supporting infrastructure like roads and highway networks, the tremendous increase in motor vehicles will also bring greater pressure on the enforcement of air pollution and vehicle emission standards. The automobile manufacturers must recognize their responsibility in controlling emission levels in their vehicles and must actively support as well as comply with the new emission norms being legislated.

Like their counterpart in recently industrialized Asian Countries, buyers are becoming increasingly car minded. From two or three earlier, they are beginning to adjust to over a dozen choices now. They will no longer buy any old thing on wheels but will demand stylish and economical cars. The affluent will want classy cars. The young will prefer low cost or sporty cars. Women will go in for small cars that reflect their personalities. Contractors and farmers will look out for working cars or comfortable pickups suitable both for work and leisure. Despite some ups and downs demand should grow exponentially and the carmakers will have to tailor their models to suit the many evolving market niches.

**Transparent And Stable Auto policy**

In order not to repeat the past mistakes and to provide the much needed competition a transparent and stable auto policy is the
need of the hour. This will also convey our commitment to reform and send out positive signals for those intending to invest in India. The automobile industry is capital and technology intensive.

The best of companies require a lead time of minimum three years to give shape to their product plans, hence a stable policy is a must for regular products planning and development. A proper policy approach would bring in the state of the art technology and funds.

The auto policy should provide total clarity with regard to the investment requirement technology, transfer, environmental concerns, programme for indigenisation, fuel economy, safety export obligations etc.

The policy should not only provide clarity but also may emphasise the need for long term commitment from manufacturers. This is necessary for developing the indigenous components industry and would achieve the objective of cost-effective-ness in localisation of components and assemblies.

We are fast nearing the date by which we have to integrate our tariff structures with that an the rest of the world in line with the WTO agreement.

As experience shows, that in the case of Maruti, though affected by the appreciating yen by value of its monopolistic position was able to achieve a healthy volume of sales which helped in keeping the
costs comparatively low. It is worth noting that the cost of indulgencing components in Europe is four times more this is so because of the high cost of tooling equipment and personal cost.

A Long term commitment by global majors would naturally lead to continuous indigenisation programmer of critical components and assemblies thus ensuring the development of India as a production base due to low cost advantage.

This would not be the case if there is no clarity and stability in the auto policy as it would only lead to opportunistic tendencies and may lead to a number of short term uneconomical opportunism leading to fragmentation in capacity and volumes resulting in frittering away of resources.

We are fast nearing the date by which we man have to integrate our tariff structures with that as the rest of the world in line with the WTO agreements. At that point the tariff levels being low it may not be attractive as well as competitive to undertake indigenisation of components as it may become cheaper to import than to make them.

Therefore, a policy conducive for long term commitment, to develop the auto component industry is needed.

It is also imperative to have a cohesive and stable policy as far as fuels are concerned, we pursued a differential pricing policy to suit our economic conditions which many not be wrong as may other
countries have also pursued polices which might also be more skewed. But what is required is consistency in the policy.

Even if the government wishes to change the pricing there should be a well thought out times table, instead of arbitrary and sudden changes. As explained earlier the frequent changes in policy thwarted the efforts of the manufacturers in launching vehicles to meet the market aspirations.

**HIGH FINANCIAL STAKES**

A significant characteristic of these new joint ventures is the fact that all the foreign collaborators have a major stake in their Indian projects unlike the simple sale of technology of earlier times. The level of their commitment to their projects is therefore very much higher and they will not allow bad products to blemish their carefully nurtured international brand images. Customers can thus expect much better products and service. There are concerns that India is not getting the latest automotive or manufacturing technology. Critics cite the fact that the new Mercedes-Benz E 220, Peugeot 309 and UNO are 12-year old Models. An older body shell does not, however, mean obsolete technology. Almost every improvement in engines, gears, transmission, suspensions, safety features, accessories and manufacturing processes can be fitted or applied to an older body shape and intense competition will ensure that they do.
The technical factors of fuel efficiency, road-holding, braking, catalytic converters, engine emissions, passive and active safety, are mandatory and are substantially similar in every class of cars today. The basic engine designs were optimised decades ago but the use of many new materials and manufacturing processes have lowered production costs, increased reliability and engine life.

The sleek flowing new body shapes actually have more to do with fashion than with aerodynamics. The streamlining or air-drag factors were effectively optimized many decades ago. Few cars can even today match the saucer shaped 1956 Citroen DS 19. New shapes developed on race tracks have, however become an intrinsic part of automotive fashion which manufacturers aggressively promote to boost the sales of their new models. The curvaceous and liquid shapes of current car fashion are mainly intend to force competitors to spend heavily on retooling to retain their market shares.

The body-shell is the most expensive part of a car requiring incredibly expensive dies and tooling. When India gets an old body design it also gets the benefit of much cheaper and predicated old body shape. If the Mercedes, Peugeot, Uno and Astra had opted for the latest dies, the costs would have made them unmarketable.

Auto makers spend millions on styling research for a new car model for which the auto development costs can typically exceed half
a billion dollars (Rs. 1,750 crores) As the world auto industry is a 1,000 billion (Rs.35,00,000 crores) business, the promotion of a new model places enormous value on glamour and lifestyle.

Today, most auto-makers have lost their national identities. Global collaboration typically result in a body shape from Italy, design elements from many countries, engines from the UK, gearboxes from Belgium, suspension parts from France, and components from East Asia and East Europe. Only the sheet metal, assembly and paint-shops are located in a particular country. India thus has the opportunity of becoming part of a huge global exchange for the price of adjusting to a confusing array of new automotive brands. None of the new cars conform exactly to the specifications in other countries. The foreign partners with a stake in their Indian projects are deeply concerned about their world reputations. The intense competition between the auto makers will automatically ensure that India gets the technology it needs. Indian policy makers and industry need to understand the dynamics if the global automotive business if the country is to gain the full benefits of this developing opportunity.
FUEL POLICY

After having decided to open-up the passengers car sector the vacillating attitude in terms of fuel policy is disturbing.

If there is any thinking to impose a "penalty duty" on diesel cars, it would be a retrograde step since it would make it difficult for any manufacturer to decide whether to pursue technological options pertaining to petrol-driven or diesel driven cars. The continued uncertainty in this area will lead to losing the advantage in adoption a continuous programme for technological developments.

It is not just enough to have opened our doors and say that let the "Fittest Survive" To build an internationally competitive Indian automobile industry, we do need a comprehensive and transparent auto policy. It is also essential to develop the infrastructure simultaneously to avoid chaotic conditions.

The programme to develop the automobile Industry would naturally lead to rapid increase in vehicle population greater congestion in cities and towns.

Hence it is imperative to give matching priority to road development, road maintenance, traffic management, parking space et al.

The development of diesel fuel injection equipment (FIE) for the Indian automotive industry after Independence may be said to have passed through three distinct phases coinciding with the last three
decades. The Seventies saw the automotive industry trying to cope with demand. Efforts were concentrated on indigenising and increasing production. Large investments were made for productionising technology developed during the Sixties. This period also witnessed a fuel crisis which led to the sharp rise in prices of petroleum products as a result of which there was a need to improve the fuel efficiency of engines. The industry during this period was dominated by the commercial vehicle sector. The commercial vehicle diesel engine used the fuel injection pump of the inline type and large scale production of this was started during this period. Inline pumps were used in large numbers by the agricultural tractors also. The market, therefore, took an orientation towards inline pumps. Almost all the inline pumps meant for original equipment supply were made by motor Industries Company Ltd (MICO), a venture manufacturing under licence from Robert Bosch (GmbH), Germany.

The second stage, in the Eighties saw the manufacturers' attention focused on improving fuel efficiency following the fuel crisis of the Seventies. The Central Government also offered incentives by reducing import duties when vehicles met the prescribed fuel efficiency norms. New collaboration agreements for engine development were signed to meet the fuel efficiency norms.
With only a single source of supply for the industry, the additional burden of developing new specifications was felt at this stage. The industry also faced a severe disruption of FIE supplies from that source when it was caught up in a series of events that led to the stoppage of supplies. Suddenly the industry found itself starkly exposed to the pressures arising from dependence on a single source and the need for an alternative sources was felt. The Government also was aware of this situation and wanted to encourage a second manufacturer. In the Eighties Robert Bosch was the dominant player in the world market with a sizable share covering all automobile manufacturing companies. Lucas Diesel was the other manufacturer in Europe.

This period witnessed a growth in the number of diesel powered cars in Europe due to its reliability and fuel economy. Common myths on the performance of diesel engines such as poor start ability, noise vibration and drivability were exploded by the development of rotary pumps. The distributor pumps developed for this market, besides meeting the exacting demands of the high speed diesel car engines, were also compact and possessed a low pump weight to engine power ratio. Lucas diesel developed the DPC rotary pumps for car applications which had all the features desired of rotary pumps for this segment.

Emission legislations were tightened in advanced countries which led to the development of fuel injection equipment controlled
partly or fully by electronics. This paved the way for proper engine management with precise metering and timing control in almost every stroke. The manufacture of electronic rotary pumps was taken up by both Bosch and Lucas Diesel to meet the stringent norms for pollution and noise control.

In the early nineties, when the rest of the world had switched over to rotary pumps and electronically controlled engine management systems, India continued to rely on inline pumps. This was due to the fact that the engine manufacturers had little choice in the type of fuel injection equipment. The use of diesel engine for car and utility vehicle applications was also limited. In 1990, after establishing itself firmly as a leader in auto-electrical, Lucas-TVS ventured into this business. It believed that the future for automotive diesel engines would be with rotary pumps. The FIE division of Lucas-TVS, in collaboration with Lucas Diesel, France, was started to manufacture state of the-art rotary pumps and injectors for both DI and IDI diesel engines. Six years down the road, the company has established for itself a reputation for total customer satisfaction.

The factory was set up on a green field site at Mannur village, near Madras. The company is progressing on a phased indigenisation programme. The components used in the pump and injector are manufactured the tolerance of a few microns and the finish is
than not obtained only by fine finishing operation such as lapping and honing. The machinery and the manufacturing technology used in this industry are highly specialized and application oriented. Lucas Diesel Systems, as a group, is working on world-wide strategic sourcing of FIE components and finished products. This is facilitated by the adoption of a single quality standard for the entire group, thereby ensuring complete inter-changeability among the constituents of the Lucas Diesel group. Individual sites, however, continue to work to obtain internationally accredited quality standards for their respective operations. The driving forces behind diesel engine development are: fuel economy, increased power requirement and emission control with the fuel injection equipment playing a significant supporting role. The function of the fuel injection pump is to inject the correct quantity of fuel at the right time in finely atomized condition through an injector into the cylinder to enable optimum combustion. The tools at the disposal of the FIE manufacturer, therefore, are varying the injected quantity, changing the injection timing, increasing the injection pressures and redefining the injection characteristics.

The options available with the FIE maker provide the flexibility required by the engine manufacturer in choosing the solutions that suit him most. Considerable work has been by the FIE manufacturer in increasing the injection pressures, providing exhaust gas recalculation
(EGR) load sensors, and total electronic control of both quantity of fuel injected and the time of injection. The efficiency of the engine is improved by increasing the air available for combustion. This is made possible by turbo-charging, after-cooling and port geometry optimization. The role of the fuel injection equipment here, is to optimize the injection timing on the speed and load of the engine. Injections pressures can also be increased and nozzle geometry optimized to improve cruise control by operating the engine at optimum speeds.

A part form continuous improvement in the materials used, the engine design has to be recast to take higher loads. All systems are tuned to this end. Turbo charging and after cooling are some of the options available to the engine manufacturer. Higher injection pressures along with adequate quantity of fuel at increased injection rates are some of the demands of the fuel injection equipment.

There has been a concerted drive the world over towards controlling auto pollution. Towards this end, the Union Government introduced certain legislations six years ago. Since then, there has been a gradual decrease in the maximum values of the pollutants that are permissible. At present the gaseous constituents of exhaust, hydrocarbons (HC) oxides of nitrogen (NOX), carbon monoxide (CO) and visible smoke are covered by legislation soon the particulate matter from exhaust will also be brought within the scope of the legislation. The gasoline
engines require a catalytic converter to meet the current norms, while the
diesel engines meet the norms with a fine tuning on the injection system
and alterations to the engine.

The stringent emission legislation in Europe and those that
are proposed have driven the diesel car industry to use electronic control
in fuel injection equipment Lucas Diesel Systems has already moved
towards this direction and electronically controlled pumps have been
successfully introduced for both Mercedes Benz and Peugeot. It will not
be long before this technology comes to India.

There are number of factors that have a bearing on emission
levels, apart from the design and performance efficiency of the fuel
injection equipment. These are fuel quality and specification, vehicle
maintenance and traffic management.

Modifications to diesel fuel composition are receiving
considerable attention as a quick and cost effective means of reducing
emissions from existing vehicles. The sulphur contents, cetone number of
diesel, the fraction of aromatic hydrocarbons and the use of certain fuel
additives are important factors among the various properties which
control emission.

Sulphur content, in addition to a direct reduction in
emissions of $\text{SO}_4^{2-}$ and sulphate particles, lower sulphur content of
diesel fuel reduces the indirect formation of sulphate particles from $\text{SO}_4$
22 in the atmosphere. The first step has been taken by introducing 0.5 per cent sulphur in all the metros. Further reduction is also called for.

**Aromatic Hydrocarbons:** A reduction in the aromatic hydrocarbon content of diesel helps improve the fuel's ignition quality, enhancing cold starting and idling performance and reducing engine noise.

**Fuel Additives:** A number of well controlled studies have demonstrated the ability of detergent additives in diesel to prevent and to move injector tip deposits, thus reducing smoke levels. Besides, the development and technologies considered above, traffic and vehicle management will be very important. Any move towards reduction of emissions will have to be done with the cooperation of different tiers in the industry. The new technology will call for new investments and continuous applied research work which will need substantial resource allocation.

This research survey was to give valuable suggestions to improve the strategies, polices, promotional activities etc. of the company. Proper product development should be introduced.

**IMPROVEMENTS**

On the basis of problems posed up by the consumers & suggestions, they have advised certain suggestions to be formed that
might be helpful, to improve the product and also which may be helpful for the future policy.

**SUGGESTIONS FOR TWO WHEELER SEGMENT**

It is obscured that the consumers of two wheeler segment like Mopeds, Scooter, Motorcycles are almost satisfied with their vehicles but they say that the stepny stand in scooter section, which often breaks after some time. A local stepny stand is available in the market which is strong and good looking. So consumer advise the company to provide such durable stepny stand.

It is also advisable for the company to increase average/mileage and thus lessen the fuel consumption.

About the sales promotion technique of the company, people say that two-wheeler vehicles should be made available on easy installment basis. So that more and more people may buy it. Many of the female consumers of the two wheeler segments want that company should launch a two wheeler vehicles like scooter with "self start." And female customers also say that few two wheelers vehicles weight is more heavier, so some of them face problems in mounting them an the stand, releasing the stand, and to some extent in driving. So the company should decrease the weight of the light/heavy vehicles.

In moped segment, styling has been the main gainer, so it is advisable for the moped segment. Further fuel efficiency and pricing
parameters have been steadily losing their weightage in the overall buying decisions, so mopeds manufacturing companies should increase average/mileage and to decrease the weight of mopeds.

In Motorcycle segment also the factor gaining importance has been styling, fuel efficiency, etc. Further, the introduction of new and better models with average performance levels of the motorcycle segment is expected for the customers.

**SUGGESTIONS FOR CAR SEGMENT**

There has been a need, that has struck a common chord with the customers, that the car's exterior looks are not in line with the latest trend of cars coming out in the market (Especially Premier Padmini Deluxe), keeping this fact in mind, it is suggested that the car's shape be given more of an aerodynamic touch, keeping the cost factor in mind.

It is also advisable for the car sector to increase the fuel-efficiency.

Some of the customer have come out with suggestion that if a lighting facility is provided in the bonnet of the car then it will be a help in emergency situations in the night time.

It would be highly commendable if some measures are taken to make the rear suspensions efficient in case of Maruti 800 and HM. It is also might do real if the boot-space within is increased (in case of Maruti's Products).
SUGGESTIONS FOR M&HCV SEGMENT

It is certain, recommendations which might offer some help to the M&M HCV segment in bringing certain minor modifications in their products in line with the customer's choices and preferences.

The expected high industrial growth rate in India, would continue to lead to growth in freight traffic and thus increase demand for CVs. A stable growth in agricultural production is expected to support this growth.

The slow growth of railways has led to an increase in road transportation and hence, an increase in demand for CVs, this trend is expected to continue in the future.

About 90 percent of M& HCVs and 70 percent of all CVs sales are not on hire purchase or on lease basis. So it is also advisable for this segment for making availability of finance.

Private operators of buses have to obtain licenses to ply buses on any route. An increase in private operators in likely to increase in future growth in demand for buses.

Modern age in not just an age of quality management but it is an age of total quality mgt. TQM does not out the improvement in the only product quality but also quality improvement of every thing related to production i.e. man, m/c material and method, all the machinery and
equipment should be maintained by preventive maintenance technique. to obtained better products.

To make effective workplace layout and to reduce unnecessary tiresome motion, line side material storage bins should be placed in such a way near to the operator that the operator need not move here and there.

Store in charge should continuously check the availability of components at the main line, for speedy supply to the factory for making of the vehicles is on. The short supply of components may result in delay in manufacturing process.

I would like to put the following suggestions in the mobile industry for further improvements for the betterment of the Industry as a whole and increasing the Nation's Finance.

**SUGGESTION**

1. Proper utilisation of resources to reduce the prices.
2. Prices should be stable and less variable. It should be reduced through proper resource utilisation.
3. Proper commission and margin should be given to the small dealers so that they feel more satisfied.
4. Advertising should be made more reliable and effective.
5. Sales promotion techniques should be used frequently.
6. Measures for market development should be taken.
7. Dealers should formulate plans to local market targetting.
8. Proper supply should be done.
9. Credit facilities should be given to users.
10. Selling plans should be more accurate.
11. R&D programmers should be more frequent.
12. It is certain, recommendations which might offer some help to the various companies in bringing certain minor modifications in their products in line with the customer's choices and preferences.
13. Sales & Service should go together by the company.
14. Parking facility should be increased in the big cities, without disturbing the road traffic.
15. Traffic control is absolutely necessary to avoid accidents.
16. In order to avoid pollution by traffic should be limited by using better equipment.
17. Old vehicles giving service for more than 10 year (a limit of service should be proposed by the Government) should not be allowed to operate.
18. Life time road tax should be imposed vehicles wise.
19. Parking tax should be leveled for all vehicles.
20. License fee should be increased for the vehicles of all types.
21. Training of personnels is Automobile repairs with good engineers and mechanics is the need of the hour for all types of vehicles.