

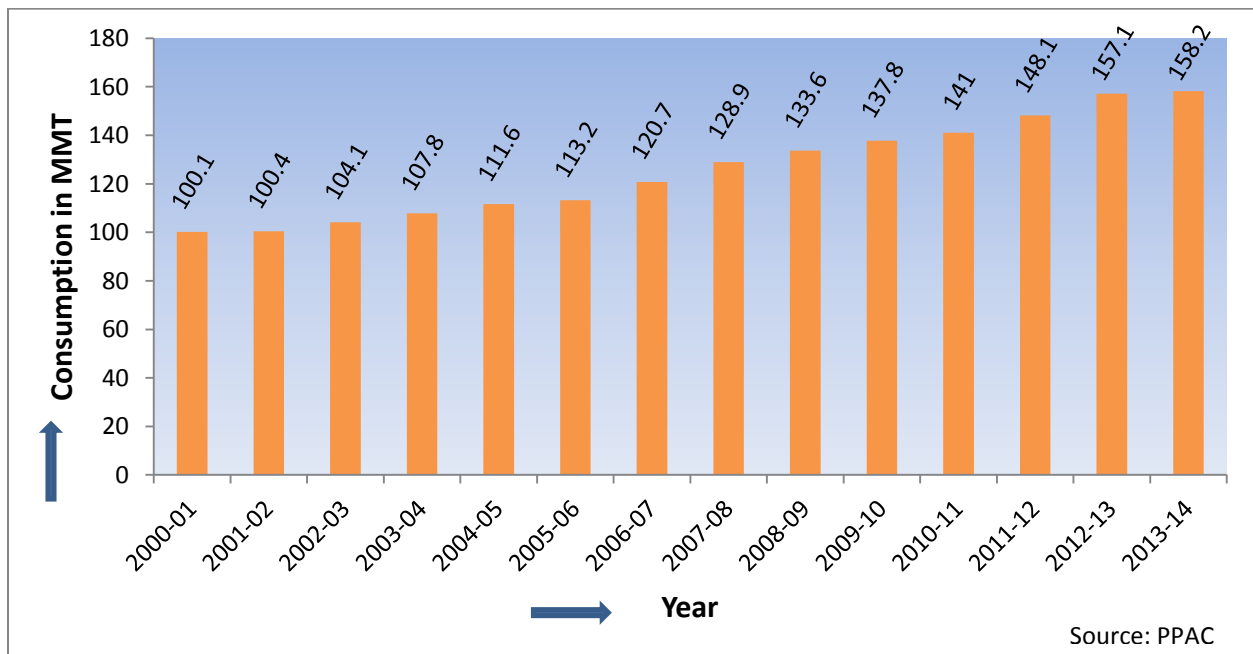
## CONSERVATION OF PETROLEUM PRODUCTS

A very high priority is attached by the Government to conservation of petroleum products in view of the need to reduce ever increasing gap between demand for and indigenous supply of crude oil and petroleum products.

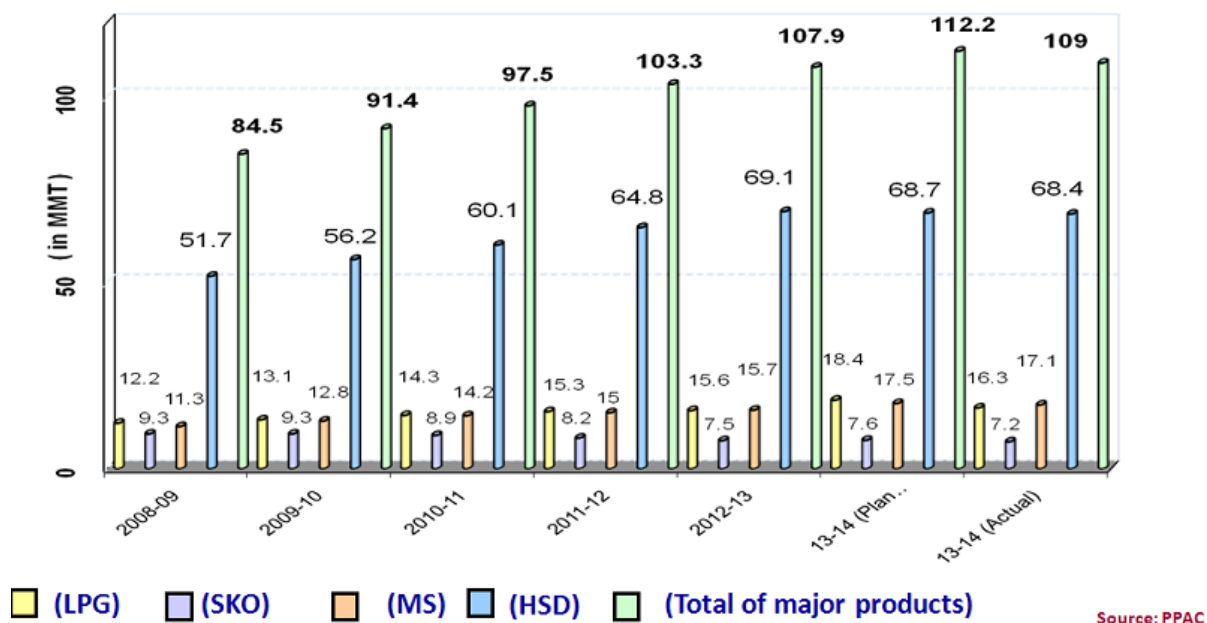
In the mechanised and the fast-moving world of today the consumption of petroleum products has become an important yardstick of a country's prosperity.

Despite the discovery of new sources of unconventional energy, petroleum remains the primary energy source in India, and even more so, all over the world. The consumption of petroleum in the world, which started as a few tonnes a year around 160 years ago, has reached over 6965 MMT of oil equivalents. per year ! . Even in India, it is increasing at a very steep rate from 3.5 MMT in 1950-51 to 158.2 in 2013-14 (source PPAC). This is expected to reach 245 MMT in 2021-22.

**Consumption pattern of all Petroleum Products for the last many years are as below:**



## Consumption Pattern (Major products)



Out of the known reserves, only a part may be technically economically feasible to explore. This fact, coupled with the present and expected consumption rates implies that these reserves may not last long.

Given our limited reserves, our present known stocks For India, the situation could be even more difficult. Our present indigenous production is only 37.9 MMT and is less than 25% of our annual requirement.

Therefore, the need of the hour is to conserve petroleum by its judicious use, substituting it by other resources wherever feasible and restricting its use only to the essential needs.

Petroleum Conservation, then becomes our joint responsibility be it the industries, individual citizens, organisations, Oil Companies and the Government. Each one of us has specific and significant role to play in conservation of petroleum products.

### **OVERALL STRATEGY OF PROMOTING OIL CONSERVATION**

Government has initiated various steps to promote conservation of petroleum products in the transport, industrial, agricultural and domestic sectors. These include adoption of measures and practices which are conducive to increase fuel efficiency and training programme in the

transport sector; modernisation of boilers, furnaces and other oil operated equipments with efficient ones and promotion of fuel efficient practices and equipment in the industrial sector; standardisation of fuel efficient irrigation pump sets and rectification of existing pump sets to make them more energy efficient in the agricultural sector and development as well as promotion of the use of fuel efficient equipment and appliances like kerosene and LPG stoves in the household sector. These activities are promoted and coordinated by the Petroleum Conservation Research Association (PCRA) and Oil Marketing Companies under the guidance and supervision of Ministry of Petroleum & Natural Gas.

### **CONSERVATION OF PETROLEUM PRODUCTS**

1. Oil and gas conservation means their better and more efficient use with regard to economic, social or environmental costs and benefits, resulting in attainment of higher energy use efficiencies, minimization of wasteful practices and wastage and protection of the environment.
2. Despite discovery of new sources of unconventional energy and due to existing inadequacies in supply of other forms of commercial energy relative to demand, petroleum remains the primary energy source in India and a preferred swing fuel.
3. Out of the known Indian reserves of 760 MMT of Crude Oil and 1.3 Trillion Cubic Meters of Natural Gas, only a part may be technically and economically feasible to exploit. This fact, coupled with the present and expected consumption rates implies that these reserves may not last long. Our present indigenous production is only 37.9 MMT and is less than 25% of our annual requirement. Therefore, the Government attaches high priority to minimizing the gaps between indigenous production and consumption of petroleum products. The need of the hour is to conserve petroleum by its judicious use, substituting it by other resources wherever feasible and restricting its use only to the essential needs.
4. Various steps are being taken to promote conservation of petroleum products in the following areas. The following specific activities are taken up from time to time.

### **IN HOUSE CONSERVATION IN UPSTREAM AND REFINING SECTORS**

Effective and result-oriented conservation methods adopted by the upstream undertakings in the oil sector include reduction of gas flaring by re-injection of gas to underground reservoir, installation of waste heat recovery systems, utilization of non-conventional energy sources and close monitoring of all conservation efforts by ONGC and OIL.

Energy audits, efficiency upgradation of equipment and appliances; substitution of diesel with Natural Gas, deployment of solar-powered illumination panel and efficient usage of solar energy, battery operated vehicles, Bio-gas etc., are other steps taken.

The oil refineries implement various schemes like revamp and replacement of low efficiency furnaces and boilers, installation of heat exchangers, economizers and co-generation equipment, and adoption of improved house keeping practices. They benchmark energy consumption levels with international pacesetters for improvement. They also implement 'ENCON' (Energy Conservation) schemes like heat integration and technology upgradation for yield-energy optimization, vapour recovery system to arrest the avoidable escape of gases through flare, tank seal etc.

In addition, they have implemented an Action Plan to produce and sell high grade lubricants to replace the lubricants of lower efficiency, in a phased manner and constantly upgrade lubricants in line with the international developments meeting Euro Standards. Multi-grade railroad engine oils with diesel saving potential have been developed for introduction in Indian Railways.

Although transport losses are inevitable while moving the petroleum products by import tankers and coastal tankers over sea routes and at ports of unloading, a number of steps taken by the Ministry to keep the loss down to the lowest level have led to a progressive reduction.

### **PETROLEUM CONSERVATION RESEARCH ASSOCIATION (PCRA) AND ITS ACTIVITIES**

As a part of the Government's response to the oil crisis of early seventies, the PCRA was set up in 1976 to undertake studies to identify the potential and to make recommendations for achieving conservation of petroleum products in various sectors of the economy. It sponsors R&D activities for the development of fuel-efficient equipment / devices and organizes multi-media campaigns for creating mass awareness for the conservation of petroleum products. Fuel oil utilization studies, energy audits, boiler modernization scheme, introduction of equipment bank concept, use of energy vans, development of oil consumption norms, model depot projects, driver training programs, demonstration clinics/ workshops/ exhibitions, consumer meets, education films/TV spots, hoarding/ electronic display, distribution of printed literature, R&D projects are other activities.

## **MULTI MEDIA MASS AWARENESS PROGRAMME**

PCRA aims at making oil conservation a national movement. As part of its mandate, PCRA is entrusted with the task of creating awareness amongst the masses about the importance, methods and benefits of conserving petroleum products & emission reduction.

To take the message to the people, PCRA uses all possible and effective media for mass communication. These include electronic and press media e.g. TV, Radio, Electronic displays; Press at the National and State level printed literature for specific target groups; outdoor publicity through Hoarding, Bus panels, Kiosks, Balloons, Banners Transliders etc.

The focus of all the messages is easy to implement and practical conservation tips for the industrial, transport, agriculture & domestic sectors. For effective communication to the target groups in semi-urban and rural areas, messages are made in regional languages. Field interactive programs like seminars, Technical meets, Consumer meets, Workshops, Clinics, van-publicity, Exhibitions, Kisan melas are conducted for dissemination of conservation messages and demonstration of conservation techniques.

To give impetus to the oil conservation movement, PCRA utilizes various platforms like the World environment day, World energy day, various festivals etc. When creative press advertisements are brought out.

Over the years, PCRA has developed a number of films, TV spots and radio jingles in various languages for promoting oil conservation. PCRA also publishes quarterly a journal and a newsletter. Active Conservation Techniques (ACT), is a journal containing articles on technology by energy experts. It also brings out successful case studies leading to conservation of energy. The conservation news is an in-house newsletter highlighting the major activities carried out by PCRA in the core sectors.

For the benefit of various target groups of petroleum products, PCRA has developed literature containing simple ready to implement conservation tips and techniques. Special low cost green leaflets have also been developed to educate the masses on the ill effects of pollution caused due to incomplete combustion and its impact on health. The guiding light being "Where conservation fails pollution starts".

## **MEGA CAMPAIGN (SAVE FUEL YAANI SAVE MONEY)**

With this background in mind, PCRA launched its Mega Campaign under 2013 in a grand manner, in terms of activities as well as resources. Mega Campaign was launched by Hon'ble minister of petroleum on 1<sup>st</sup> October 2013 at New Delhi to reinforce countrymen's commitment to conserve precious petroleum products and stop wastage of resources. Central theme of the event was kept on "Transport" sector which constitutes around 50% consumption of petroleum fuels in India. Event was also followed up by various technical sessions exploring newer avenues in transport arena to bring about possible savings in fuels. Technical sessions were attended in large no. by experts from State Transport Undertakings, Ministerial representatives from Petroleum, Home, Transport, Urban Development, MoRTH, Surface Transport, Environment, etc. On the appeal of Hon'ble petroleum minister, many state governments observed one day in a week as Bus Day to promote increased use of public transport. Entire campaign was whole heartedly supported by OMCs.

Conservation messages were displayed by OMCs at their retail outlets and LPG distributorships through creative hoardings and banners. PCRA carried out campaign through bulk SMS push, digital media and internet website on conservation tips. Mega media campaign was launched through DAVP by DAVP empanelled agencies. Other people connect activities during the Mega Campaign comprised of transport workshops, nukkad nataks, driver training programs, safety and conservation workshops, cyclothons, walkathons, intersection activities, LPG clinics, checking of vehicles at retail outlets during free air / pollution checks, fuel saving tips through smart phones, etc. Post Mega Campaign, an impact assessment survey was conducted by PCRA, indicators of which revealed the effectiveness of the campaign to reach out the end users of petroleum products. Summary activities carried out under Mega Campaign are as under:

<b>TV Campaigns</b>	<b>Radio Campaign</b>	<b>Print Campaign</b>
TV (Cable & Satellite)	PVT FM Radio Stations	Half Page Ads. In various News Papers
DD-1 (National)	Vividh Bharti	
DD News	FM Gold / Rainbow	
DD Bharti	FM Gold (Spon.)	
DD Regional ( 6 nos.)	Regional News	

## **OIL & GAS CONSERVATION FORTNIGHT (OGCF)**

In order to generate awareness among the masses about the urgency of conserving petroleum products, the celebration of oil conservation week with the participation of PCRA and the entire oil industry under the guidance of the Ministry of Petroleum & Natural Gas was started in year 1991. Considering the over whelming response and enthusiasm generated by OCW in the entire country, and to further increase the reach as well as effectiveness of the oil conservation campaign the duration of the program was increased to a fortnight from the year 1997 onwards.

The eco-friendliness of natural gas stands established beyond doubt and it is being used in progressively large volumes by Power, Fertilizer, Industrial, Commercial, Domestic and Transport sectors. As the demand is increasing, there is large scope for gas conservation. Keeping this in view, the national fortnightly conservation campaign has been renamed as "Oil & Gas Conservation Fortnight" in place of Oil Conservation Fortnight (OCF) since 2004.

During the fortnight the entire oil industry under the guidance of MOP&NG undertakes various kinds of activities to emphasize the need and importance of conservation of petroleum products & environment protection. The activities undertaken include: dissemination of oil conservation messages through outdoor publicity, print media, electronic media, training programs, kisan melas, technical meets & distribution of literature in national as well as vernacular languages all over the country.

The activities are carried out by the State Level Co-ordinators (SLCs) of the Oil Industry in each State under the directions of the Regional Level Coordinators (RLCs). Over the years the no. of activities undertaken during OCF has risen.

## **END USERS OF PETROLEUM PRODUCTS AND CONSERVATION EFFORTS**

In addition to the activities of PCRA detailed above, sectoral conservation steps taken by it are as follows:

### **TRANSPORT SECTOR**

The major thrust areas of activities in this sector include Driver Training Program, Model Depot Projects, Model Garages, Emission Check Program, engine replacement schemes and mass awareness program. This sector has been identified with a saving potential of 20%.

Besides, PCRA also promotes high performance lube oils thereby propagating awareness on lube oils. The annual recurring saving in transport sector due to PCRA efforts leads to substantial savings.

The various awards instituted by PCRA to motivate drivers and other state transport agencies to achieve maximum fuel efficiency includes best kilometer per liter achieved for State Transport Undertaking. PCRA networks with a large number of organizations viz. ASRTU, STU AIAM, ARAI, CRRI, MOST, MoRTH, Indian Army Traffic Police, NGOs and automobile associations for propagating awareness on efficient utilization of petroleum products in the transport sector.

### **INDUSTRIAL SECTOR**

PCRA in its efforts to conserve oil in this sector carries out Energy Audits, fuel oil diagnostic studies; organizes seminars, consumer meets, clinics, and workshops and also undertakes Research and Development projects such as the development of low air pressure industrial burners etc. for efficiency improvement, PCRA identifies the potential for saving petroleum fuels in all these areas of activities and subsequently follows it up on a regular basis to assess actual realization of the identified savings.

PCRA experience of conducting Energy Audits in a wide sectors of industries has demonstrated that there is a potential for saving more than 20% of petroleum products consumed in this sector. A part of this saving potential can be realized by making operational adjustments without any investments.

### **AGRICULTURAL SECTOR**

In the efforts of propagating fuel conservation, PCRA tries to reach the vast farming community and the thrust areas of activities includes replacement of inefficient foot valves, rectification of Lift Irrigation Pumps, Van Publicity programs, work group projects in adopted villages, Kisan Melas and Demonstration Centers. Besides this PCRA also educates students who in turn educate the farmers about the efficient use of petroleum products in tractors and lift irrigation pumps.

PCRA networks with Agricultural Universities, Colleges, Schools, Krishi Vigyan Kendras, NABARD, SIRD, DRDA, IARI and State Government Agencies for propagating awareness on Oil Conservation in the agriculture sector. This has resulted in effectively reaching the farmers of our country and educating them about good maintenance practices for their pump sets and



tractors.

The savings through PCRA's efforts in agriculture sector leads to a substantial recurring savings.

## **DOMESTIC SECTOR**

The housewives and youth are the major target segments in this sector. PCRA's gamut of activities includes education of housewives on good cooking habits, educating housewives and youth on good driving habits, development of Fuel Efficient Kerosene and LPG stoves and lighting appliances. PCRA also encourages the use of alternate sources of energy such as bio-gas, solar heater etc.



PCRA adopts a networking institutional approach and takes help of Mahila Mandals, AIWC, AIWA, Youth forum, Jaycees, Lions Clubs, Rotary clubs, Residents Welfare Associations and various schools and colleges for conducting awareness programs. This results in an substantial annual recurring savings of petroleum products, which is a significant achievement.

Action Group meetings and adoption of States has been introduced to give further impetus to the oil conservation movement and for focussed attention at the State level.

## **STANDARD & LABELING PROGRAM**

PCRA in association with BEE has undertaken the activities leading to development and implementation of Standards & Labeling Programme for Domestic LPG Stoves and Diesel Engine Driven Monoset Pumps for Agricultural Purposes. Program entails making available Star rated products in the market thus providing informed choice to the consumer for buying fuel efficient products. This shall also result in substantial saving of precious petroleum products.

The label designs for Domestic LPG Stoves and Diesel Engine Driven Monoset Pumps for agriculture purpose are as below:

 <p><b>FUEL SAVINGS GUIDE</b></p>	<p><b>Thermal Efficiency</b></p>	<p>LPG Stove Type : XX  Brand : XXX  Model No./Year : ABC / XXXX  Material of Burners : XX  Total Gas Consumption : XX</p>	
	<p><b>73%*</b></p>		
<p>Label Period: 1st Jan 2014 - 31st Dec 2015</p>			

 <p><b>FUEL SAVINGS GUIDE</b></p>	<p>Specific Fuel Consumption of monoset pump* : <math>\text{g/h/m}^3/\text{l/s}</math></p>		<p>Manufacturers Logo if available</p>	
	<p><b>Diesel Engine Driven Monoset Pumps for Agricultural Purpose</b></p>			
<p>Pump Type _____ Pump SLNo. _____ Model No./Year _____ kW/HP _____</p>	<p>Suction (size) _____ mm Delivery (size) _____ mm Impeller Dia _____ mm</p>	<p>Full Load Speed _____ rpm Capacity (Range) _____ (liters/s)</p>		
<p>Duty Point: Head: _____ m Discharge: _____ l/s</p>	<p>Fuel Consumption (at Duty Point) _____ cc/hr (at Fuel Density _____ g/cc)</p>	<p>* Specific Fuel Consumption (SFC) at Duty Point _____ g/h/m<sup>3</sup>/l/s</p>		
<p><b>Name of the manufacturer with complete address</b></p>				
<p>Label Period: In Association with PCRA</p>				
<p><small>*Under test conditions when tested in accordance with relevant IS XXXX the actual energy consumption will depend on how the equipment is being used</small></p>				

## ISO 50001- ENERGY MANAGEMENT SYSTEM

Industries benefit immensely from popular ISO 50001-energy management tool by curtailing inefficient energy utilization. Increasing industrial competition and ever increasing costs of available forms of energy, especially fossil fuels have focused attention on the need to cut down on waste full energy consumption and to enhance and sustained industrial profits.

PCRA has equipped itself with 6 lead auditors for ISO 50001, who have provided the consultancy work of implementation of ISO 50001 to various installations such as BPCL Mumbai refinery, Uran LPG plant, CIPLA, IOCL installations, etc.

## ENERGY EFFICIENCY OPPORTUNITIES UNDER PAT

PAT (Perform, Achieve & Trade) is part of the BEE initiated National Mission on Enhanced Energy Efficiency, which intends to enhance energy efficiency in large energy intensive industries in India. Under the PAT scheme 478 industrial units have been notified by GOI to reduce their specific energy consumption.

While there is an incentive for exceeding the targets by way of earning and trading the

E-certs, under achiever will have to pay a penalty. PCRA has embarked upon a plan to cater to this vast available opportunity (6.686 mmtoe approx.) by carrying out energy efficiency studies and provide solutions. As an initial breakthrough, PCRA has completed the work in 4 such industries and work is in progress in another 6 units.

## **R&D PROJECTS**

One of the major objectives of PCRA is “To promote Research, Development and Deployment efforts aimed at petroleum conservation and environment protection, support and facilitate efforts aimed at petroleum conservation and environment protection, support and facilitate efforts for adoption and dissemination of fuel efficient technologies and substitution of petroleum products with alternate fuels, and renewable. Also to establish synergistic institutional linkages at the national & international levels in the areas of petroleum conservation and environment protection”.

To invite and sponsor Research and Development projects on prestigious Research Institution, Technical Institutions, CSIR Laboratories etc. primarily aimed at petroleum conservation and environmental protection through development of fuel efficient technologies, processes, equipment's, appliances etc. in different sectors of economy viz. industrial, transport, agriculture and domestic. On successful completion of R & D projects, PCRA helps in commercializing the technologies, processes, equipment's, appliances etc. through technology transfer to interested entrepreneurs.

The various R & D activities carried out by PCRA recently are as under :

### **(i) Biogas enrichment & bottling technology for vehicular use**

In collaboration with IIT Delhi, a technology has been developed to enrich biogas and convert it into bio-CNG, which can be used in vehicles as an alternative to petroleum fuel. A biogas enrichment and bottling plant has been installed in Bhilwara. Enriched biogas (bio-CNG) is being used to run a CNG auto luggage carrier. It has been found that bio CNG (95% methane content) gives better mileage than petroleum CNG.

### **(ii) Generation of SynGas through plasma gasification of plastic waste**

In collaboration with CSIR-CMERI Durgapur, an integrated, cost effective and environmentally acceptable technology to tackle the plastic waste problem has been developed. A 20 Kg/hr lab scale plasma gasification unit has been installed & commissioned in CMERI premises. SynGas (synthetic gas containing CO, H<sub>2</sub> and C<sub>x</sub>H<sub>y</sub>) generated is fed to a Gas Engine coupled with an Alternator to produce electricity. It has been observed from experimental study that 2.4 kWe net electricity can be recovered from 1 kg/hr plastic waste.

### **(iii) Porous radiant burners for LPG cooking stove**

In collaboration with IIT Guwahati, a Porous radiant burner (PRB) for domestic cooking application has been developed and successfully tested. The newly developed PRB for LPG cooking stoves has maximum thermal efficiency of 75%, against 68% of conventional burners. Measured CO and NO<sub>x</sub> emissions of the PRB are in the range of 25-200 mg/m<sup>3</sup> and 0-2 mg/m<sup>3</sup>, while the respective values of conventional burners are in the range of 250-1100 mg/m<sup>3</sup> and 75-260 mg/m<sup>3</sup>. In terms of both thermal efficiency and emissions, the PRB has been found to be better than its conventional counterparts. Compared to a conventional burner, the newly developed PRB saves about 2 kg of LPG per cylinder (14.5 kg capacity).

### **(iv) Minimization of energy consumption in potato cold storage using finned tube evaporator coil**

One of the important factors affecting energy consumption in potato cold storages is primitive design and careless selection of refrigeration system components. The bunker coil that is used as an evaporator is a major source of energy wastage and poor quality product. In collaboration with BCKV, West Bengal, finned tube evaporator coils have been designed & installed in existing bunker type cold storage system. Techno-economic analysis has shown saving of 26.5% in overall energy cost (in 3 units where implementation took place) due to reduction in diesel & electricity consumption. Also, there's material saving of 1.4% of stored products due to reduction in moisture loss.

## **FURTHER TIPS FOR CONSERVATION TO BE TAKEN BY INDIVIDUAL'S**

### **CONSERVATION AT HOME**

Customers are recommended a switchover to Energy efficient gas stoves / burners.

- While cooking use wide bottom vessels with covers
- Allow food articles taken out of the refrigerators to attain room temperature before cooking them
- Soak cereals and dals for sometime before cooking them to reduce the cooking time as well as the fuel consumption.
- Use just sufficient water for cooking
- Pressure cookers used with separators lead to substantial fuel saving.
- Reduce flame by bringing the burner knob to the simmer position as soon as the water starts boiling
- Try to eat together to avoid repeated warming of food. This not only saves fuel but also preserves the nutritional value of food
- Light the flame only after all preparations have been made and the vessel is ready to be put on the stove.
- Use hot water from solar water heaters for cooking if the facility is available
- Try to use a solar cooker, if facility and time permit

In the rural sector, use of Bio gas plants, would be an excellent fuel conservation technique.

### **CONSERVATION ON ROADS**

- The first rule of fuel conservation would be to travel judiciously and curtail wasteful driving
- Wherever possible/ available and convenient, use public transport instead of using personal transport
- Matching the size of the vehicle to your need would also go a long way in conserving fuel. For instance if you have the option of a personal car and a scooter, then use the scooter when only two persons have to travel, and the car if more persons have to travel or heavy luggage needs to be transported. Car pooling to work will not only conserve fuel but will also improve social relations with your colleagues
- Following traffic signals will help avoid traffic jams and reduce lower gear driving and

idling.

- As far as possible, avoid idling the vehicle, be it a car, scooter or any other mechanized transport.
- The criteria for choosing the vehicle you are going to buy should be its fuel efficiency.
- There is no substitute for timely attention, servicing and tuning of the vehicle in fuel conservation and emission control. This should include checking of injectors and spark plugs, correct tyre pressure, re-greasing, topping up or renewal of lubricants for engine and gear boxes.
- The use of quality lubricant is extremely important. There should not be any compromise on this aspect.
- Correct driving habits are important for conservation. Try to avoid sudden speeding, braking & stopping, clutch riding, idling, over-speeding, and over-loading
- Have your vehicle checked for emission control regularly – not only because defaulters are fined, but because it leads to fuel conservation and pollution control, which as citizens of India, is our moral duty.