

Critical Analysis of Petroleum Swap of Oil Giants in Maharashtra

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Abstract:- The petroleum industry carries immense importance in the Indian economy. Supply chain management in the petroleum industry contains various challenges, specifically in the logistics area, that are not present in most other industries. These logistical challenges have a major influence on the cost of oil derivatives and customer satisfaction level (CSL). Companies in the petroleum industry have become increasingly reliant on the services of third-party logistics companies to manage their supply chains. Companies in the petroleum industry took the outsourcing idea a step further to collaborate with competitors and found shared solutions to their supply chain challenges. This form of collaboration is referred to as a *systematic cooperative reciprocal barter*, or swaps. The objective of this paper is to shed some light on the downstream supply chain challenges and opportunities in the Indian petroleum industry and swap practices that should have been employed by petroleum industry's giants around the nation. The paper analyses the benefits of Swapping practices which have long been ignored in the operations management literature. This paper will be based on the petrol pump survey that is being conducted in the state of Maharashtra.

Keywords:- Petroleum Industry, Supply Chain, Swap, CSL.

I. INDIAN PETROLEUM INDUSTRY- AN OVERVIEW

The Indian Petroleum industry is one of the oldest in the world, with oil being struck at Makum near Margherita in Assam in 1867 nine years after Col. Drake's discovery in Titusville. The industry has come a long way since then. For nearly fifty years after independence, the oil sector in India has seen the growth of giant national oil companies in a sheltered environment. A process of transition of the sector has begun since the mid nineties, from a state of complete protection to the phase of open competition. The move was inevitable if India had to attract funds and technology from abroad into our petroleum sector. The sector in recent years has been characterized by rising consumption of oil products, declining crude production and low reserve accretion.

The years since independence have, however, seen the rapid growth of the upstream and downstream oil sectors. There has been optimal use of resources for exploration activities and increasing refining capacity as well as the

creation of a vast marketing infrastructure and a pool of highly trained and skilled manpower. Indigeneous crude production has risen to 35 million tonnes per year, an addition of fourteen refineries, an installed capacity of 69 million tonnes per year and a network of 5000 km of pipelines. But with the consumption of hydrocarbons said to increase manifold in the coming decades (155mtpa by the end of the 10th plan) the liberalisation, deregulation and reforms in the petroleum sector is essential for the health and overall growth of our economy.

The petroleum industry traditionally had prices decided by the Government of India. Effective from August 1, 2004, the Government put in a revised methodology allowing oil companies limited freedom to revise the prices of motor spirit and High Speed Diesel (HSD). The NELP (New Exploration and Licensing Policy) has been put into place and more and more international operators are considering investing in India.

The total investment estimated in the petroleum sector from 1995 till 2010, is expected to be Rs. 4,32,000 cr (US\$120 bn), out of which Rs. 2,58,000 cr (US\$80 bn), are for the upstream sector alone. The Petroleum, Oil and Lubricants (POL), product consumption is slated to touch 155 Million Metric Tonnes (MMT) by 2006-2007 and 200 MMT by the year 2010 (HPCLs perspective plan: Vision 2020).

Petrochemical industry in India employs around 40,000 people directly and around 4 lakh indirectly. This sector caters to a whole host of industries like oil, gas, plastics, agro chemicals, pharmaceuticals, clothing, housing, transportation, communication, healthcare, etc. diversified nature of customers demanding well thought out strategy for enhancing customer satisfaction level.

II. SUPPLY CHAIN MANAGEMENT – A LITERATURE REVIEW

The Supply Chain Council defines a supply chain as a "collection of activities a company uses to plan, source, make and deliver a product or service". Supply chain management aims at managing the activities in the supply chain to improve profitability for the organization. Supply chain management as a new business paradigm was motivated by the interest in integrating procurement, manufacturing and distribution activities-integration made possible by advances in IT (Shapiro, 2004). SCM is more

than a simple tool to evaluate and optimize a supply chain; it is a complex, structured business relationship model. It takes into consideration all aspects of the events required to produce the company's product in the most efficient and cost effective manner possible (Quiett, 2002). According to Mohanty and Deshmukh, (2005), another very comprehensive definition of supply chain management is that it is a loop:

- It starts with customer and ends with customer.
- Through the loop flow all materials, finished goods, information and transactions.
- It requires looking at business as one continuous, seamless process.

This process absorbs distinct functions such as forecasting, purchasing, manufacturing, distribution, sales and marketing into a continuous business transaction.

- *Petroleum Downstream Supply Chain Management*

The supply chain of the petroleum industry is extremely complex compared to other industries. It is divided into two different, yet closely related, major segments: the upstream and downstream supply chains.

The upstream supply chain involves the acquisition of crude oil, which is the specialty of the oil companies. The upstream process includes the exploration, forecasting, production, and logistics management of delivering crude oil from remotely located oil wells to refineries.

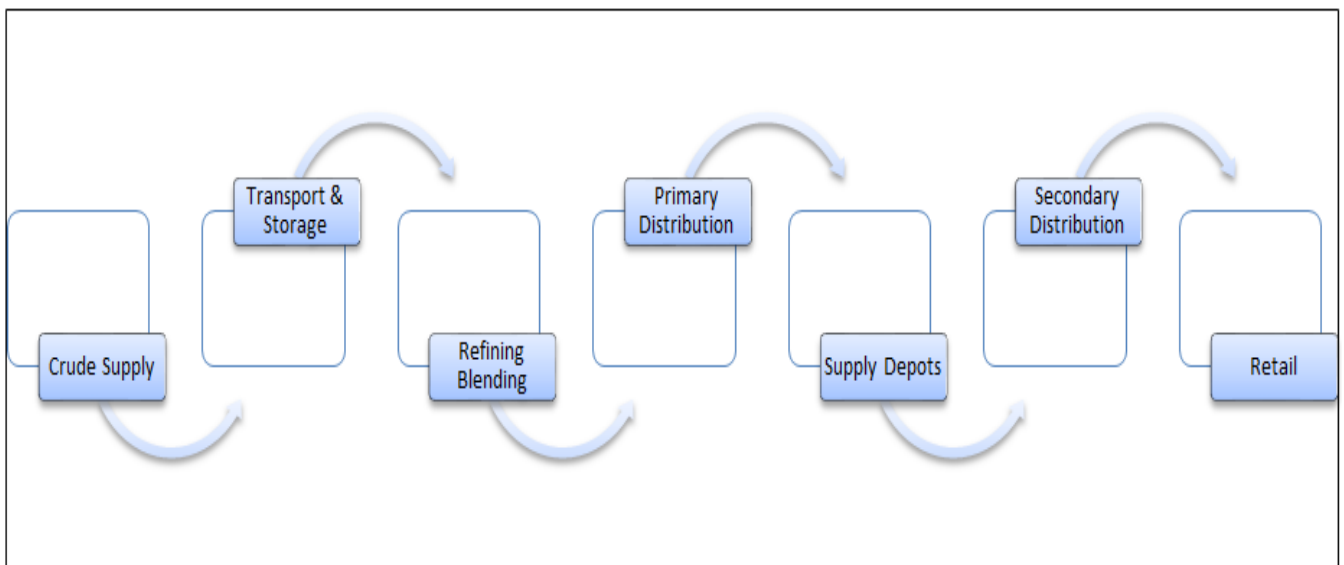


Fig 1 The whole Petroleum Supply Chain

- *Problem Formulation*

The petroleum downstream supply chain ever finds it difficult to reduce the cost of transportation from refinery to the petrol pumps. The petroleum customer service level is the desired output of all supply chains, as it is there in downstream petroleum supply as well. Uncertain demand pattern, Refinery capacity, inadequate transportation facility, supply depots storage capacity & so on are the constraints for not achieving the desired customer satisfaction level. The swapping practices seem to be the one shot solution to the above constrained downstream supply chain model. Hence the author of this paper find an opportunity to discuss the Pluses of SWAP (often called as Hospitality or Sharing) with respect to the public sector giants of petroleum industry in the state of Maharashtra.

- *The Swap Practice:*

In a commodity-type industry such as oil and petrochemicals, the source of the commodity is often of no interest to the final customer as long as the commodity adheres to its required specifications and the delivery of that commodity is made by the promised due date. Therefore, competing oil and petrochemical companies form supply chain alliances when delivering commodities to customers in order to reduce transportation and inventory costs and

improve customer service. In return, cost savings for transportation in the overall supply chain are shared among participating companies. This form of collaboration is referred to as shipment swapping. This kind of collaboration with competitors creates a shared solution to common supply chain obstacles and is predicted to be the “Next Big Thing” (Morton, 2003).

The swapping technique is currently applied by oil and petrochemical companies around the world in all of its different forms: asset swapping, business swapping, and shipment swapping. However, because of the absence of any general analytical discussion of swap practices in the literature, the author has conducted the survey of petrol pumps in the state of Maharashtra to find out the benefits that can be sought by using this SWAP practices.

The present research paper attempts to study and verify that the systematic cooperative barter system of downstream supply chain management i.e. SWAP has a positive bearing on cost reduction that saves company's millions of dollars. It further attempts to ascertain that the SWAP practice improves the customer services by petroleum industry.

III. METHODOLOGY OF RESEARCH

The Indian petroleum industry consists of seventeen public sector oil refineries and two private sector oil refineries in different parts of ten States of the country. The companies under private sector units of the industry, both by their numbers and also by their years of operation, remain the dominant players in Indian petroleum industry. Rightly therefore the investigator proposes to include within the scope of the study public sector players of the Indian petroleum industry.

From amongst the ten Indian States where petroleum refineries are located, The State of Maharashtra alone accounts for largest share of installed capacity (excluding private sector refineries in Gujarat) and also its refinery crude throughput. It is for this reason that the Authors have done the study to be confined within the territory of Maharashtra so that its findings can be validly generalized for the country as a whole.

There are only two petroleum giants **BPCL** (Bharat Petroleum Corporation Limited) and **HPCL** (Hindustan Petroleum Corporation Limited) which have their refineries located at Mumbai in the State of Maharashtra. Obviously therefore the author is left with no choice than to study only these two petroleum giants of India from amongst the four major Indian petroleum companies including IOC (Indian Oil Corporation) and GAIL (Gas Authority of India Ltd) besides HPCL and BPCL.

Physical flow of a product as highly inflammable as that of petroleum industry through the entire length and breadth of the country encompassing all geographical and topographical limitations to end no. of users for equally end no. of uses is a gigantic task aptly taken care of by an emerging field of management science called as Supply Chain Management. However petroleum product pricing being considered as a black hole of subsidies is an issue of hot debate amongst economists and oil companies. The supply chain management in this industry remains to be more concurrent and vibrant with its impact on petroleum pricing and petroleum subsidy as well.

There are numbers of products of petroleum industry. However of these products three namely HSD, LDO and Lubes are widely distributed and consumed in India as these flow through different distribution channels. Hence for the purpose of present study only these three products have been included within the scope for its data collection and analysis.

There are, as of today, more than 2000 retail outlets in the State of Maharashtra for HPCL and BPCL companies which are the highest no. of retail outlets of BPCL in any of the Indian States. The present study is based on data collected from 100 respondents i.e. retail outlets as shown in the following table no. - 1. The convenience sampling method shall be resorted to for drawing sample of retail outlets (i.e. Petrol Pumps). It would also give due consideration to retail outlets from different terrains of the State in the proposed sample.

Table 1 Showing Analysis of Select Petrol Pump Respondents

Petrol Pumps under study									
Clusters	Buldhana		Akola		Amravati		Washim		Total no. of Petrol pumps
Category Respondents	Company Owned	Privately Owned	Company Owned	Privately Owned	Company Owned	Privately Owned	Company Owned	Privately Owned	
HPCL	02	10	02	07	02	06	02	07	38
BPCL	01	05	02	06	02	06	01	05	28
Others	02	09	00	11	02	04	01	05	34
Total No. of Pumps	05	24	04	24	06	16	04	17	100
Subtotal (by Cluster	29		28		22		21		100

The above table indicates that the majority of the petrol pumps are owned by the individual parties i.e. privately owned in the state of Maharashtra. Four clusters were identified namely Buldhana, Akola, Amravati & Washim. The distribution of respondents (Petrol pumps) with respect to dealership of select oil companies is shown in the above table. It indicates that the HPCL petrol pumps were 38% and BPCL and Others are 28% & 34% respectively. All the other companies like IOCL, Reliance, Essar, and IBP are taken in to others category. The only HPCL & BPCL together constitutes the majority of Petroleum retail outlets in Maharashtra. It is been identified that one of the variables that is availability of petrol pumps by dealership and the Public Sector Oil Companies are having a cutthroat competition across the state.

➤ *Analytical Perspective of Downstream Petroleum Supply Chains in the State of Maharashtra:*

As discussed earlier the survey was conducted across the state of Maharashtra, 100 respondents were sampled out by convenience method. This section contains the details of the petrol pumps, their awareness of Swapping practices and the benefits sought as a function of these hospitality.

Here the authors came across the availability of select petroleum products at the respondent Petrol-pumps. The following graph shows the availability of the products. The graph indicates that mostly retailed product at petrol pumps are HSD & Lubes. Where some of the products like MS Motor spirit (Petrol) is also available at these retail outlets.

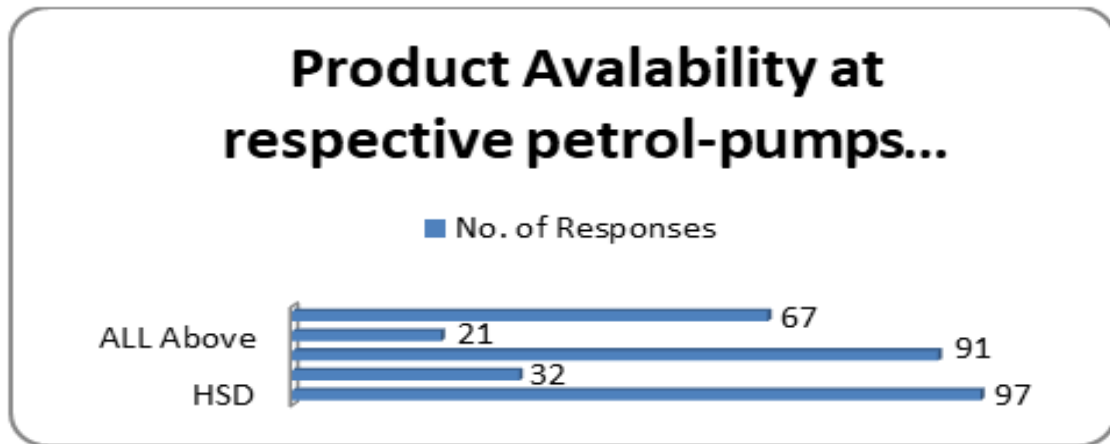


Chart 1 Showing Product Availability at the Petrol Pumps

The availability of HSD & Lubes is almost cent percent i.e. almost all the petrol pumps deal with these products. In any other category, the most available product found out to be MS (Motor Spirit/ Petrol)

Further moving towards the SWAP practices in select products for the respondents, the average distance of the Supply depots from the individual petrol pump was found to be 82 kms approximately. There is a high density of petrol pumps through out the state of Maharashtra.

Table 2 Opinions of the Select Petrol Pumps on the Bearing of Supply Depots Distance on their Individual Profitability

Opinion about Profitability as a function of Distance from supply depots													
Clusters:	Buldhana			Akola			Amravati			Washim			Total
Category of Respondents	HPCL	BPCL	Others	HPCL	BPCL	Others	HPCL	BPCL	Others	HPCL	BPCL	Others	
Positive	7	3	6	5	5	6	5	6	3	4	5	4	59
Negative	4	3	4	3	3	5	3	1	2	5	1	1	35
Neutral	1	0	1	1	0	0	0	1	1	0	0	1	6
Total	29			28			22			21			100

In the highly dense State of Maharashtra, the petrol pump respondents have a opinion that the cost of petroleum products is the function of the distance of individual pump from the supply depots. The entire cluster shows the homogeneity in their opinions.

The table no. - 2 indicates that majority of respondents were having an opinion that there is variability of prices as per the distance of the pump from its supply depots. As the prices are varying so will be the profitability (cost parameters of POL products) at these pumps.

In petroleum logistics, the frequency of procurement orders is also important factor in analyzing the downstream supply chains. Majority of petrol pumps have a flexible schedule of ordering. The following chart shows the frequency of orders.

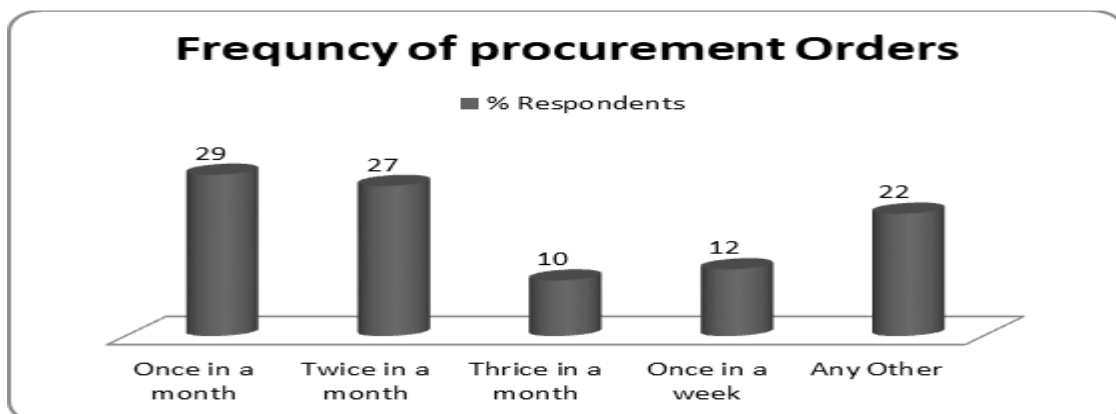


Chart 2 Frequency of Procurement Orders at the Petrol-Pumps

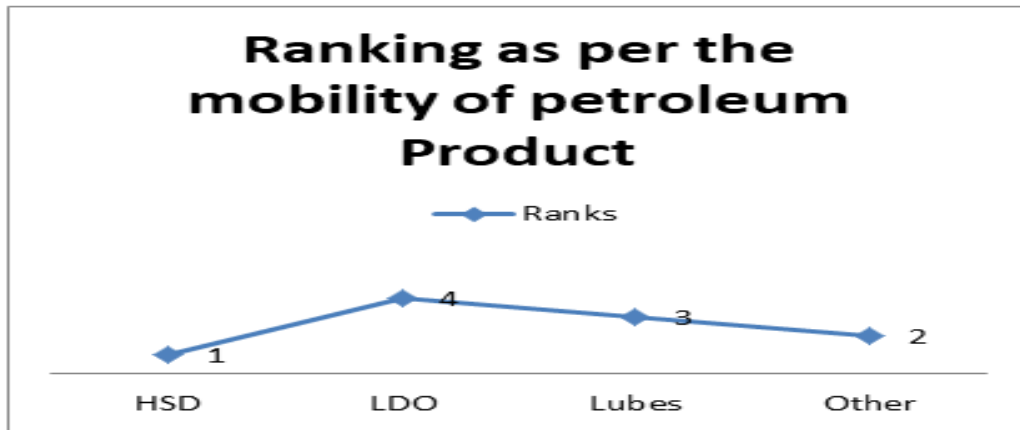


Chart 3 Mobility of Select POL Products

It can be notified from the chart no - 2 that about once or twice in a month is the frequency that most of the pumps follow. But it all depends on the dynamics of petroleum demand at individual locations.

Author has taken the select products (i.e. HSD, LDO and Lubes) for the purpose of analyzing the effects of SWAP practices. The chart no. - 3 shows the average mobility of these products at the retail outlets in the state of Maharashtra. High Speed Diesel (HSD) is the highly mobile at the petroleum outlets. Where as Light Diesel Oil (SDO) is least mobile at these retail outlets.

The petroleum industry is also featured with pipelines as a mode of transportation with roadways and railways. Here purely railways are not used for the purpose of transportation of supplies at the pumps but the common or popular way of transporting is found to be Roadways. It is also notified that the significant amounts of products are also moved by roadways and railways.

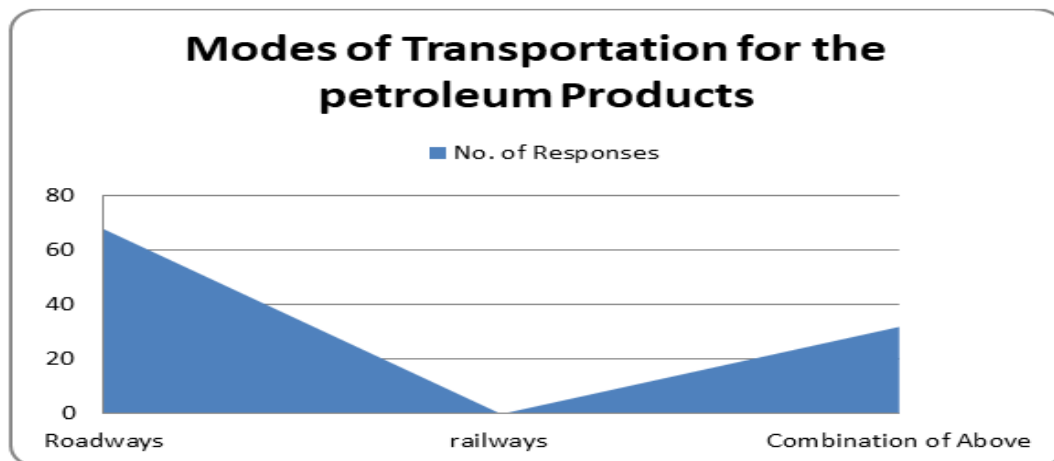


Chart 4 The Modes of Transportation of POL Products

Generally the company is responsible to deliver the petroleum products at individual petrol pumps at the pre decided time. The petrol pump respondents were analyzed as per the category of vehicle used for procurement purpose. The table no. - 3 shows their responses.

Table 3 Categories of Vehicles Used for Procurement Purpose

Category of vehicle used for procurement purpose:													
Clusters:	Buldhana			Akola			Amravati			Washim			Percentage
Category of Respondents	HPCL	BPCL	Others	HPCL	BPCL	Others	HPCL	BPCL	Others	HPCL	BPCL	Others	
Your own vehicle	1	1	3	0	0	2	0	0	2	1	0	1	11%
Your rented vehicle	0	0	1	0	0	1	0	0	1	0	0	1	04%
Company vehicle	4	1	2	3	1	0	1	2	1	2	2	1	20%
Company paid (3PL) vehicle	6	4	4	6	6	7	5	5	2	6	3	2	56%
Others	1	0	1	0	1	1	2	1	0	0	1	1	09%
Sub-total	12	6	11	9	8	11	8	8	6	9	6	6	100

The interpretation of this data reveals that Third party Logisticians are playing a major role in the Transportation of Petroleum products from supply depots to the individual petrol pumps.

Here 56% of the Pumps receive the products by company paid 3PL Logisticians. But the others also use their own vehicles or rented vehicles fro this purpose.

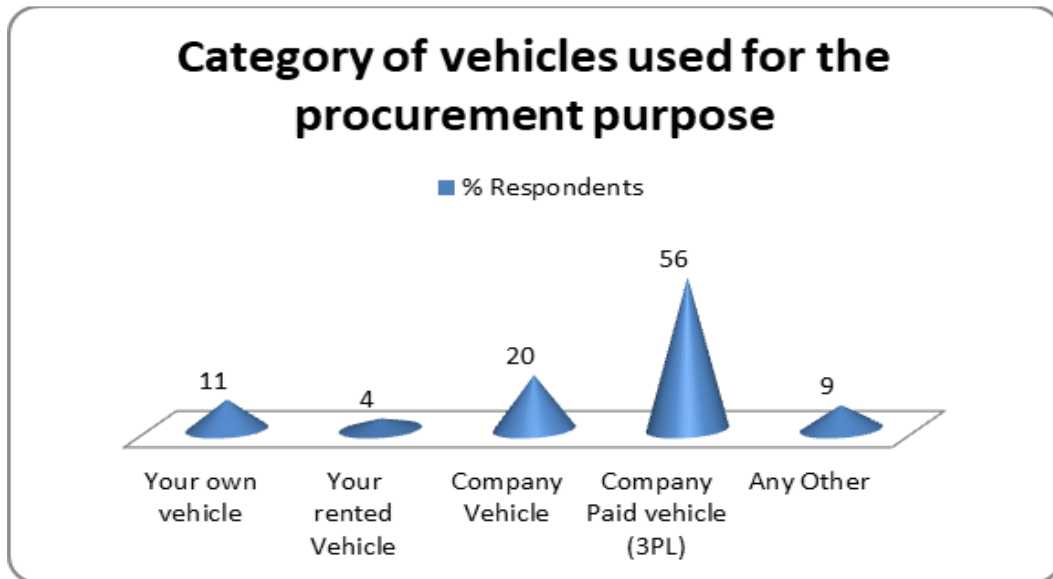


Chart 5 Category of Vehicle used for Procurement Purpose

The most popular way of transporting the POL products from supply Depots to individual pumps is by the Third party Logisticians. As stated earlier, company is responsible for making the product available at the retail outlets at right time; the obvious cost of such transportation is bared by the petroleum company.

In most of the cases the company bears the cost of transportation, but few respondents are exception.

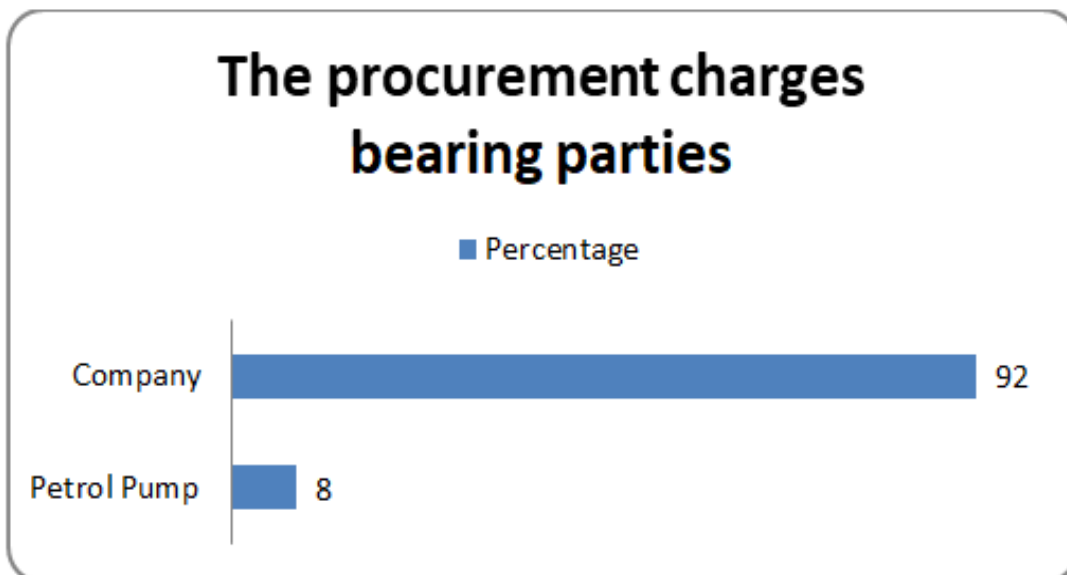


Chart 6 The Procurement Charges bearing parties

The petroleum companies always SWAPS (shares) the resources with the competing companies (i.e. Systematic Cooperative Reciprocal Barter System / HOSPITALITY) .This hospitality is done at two levels one at refinery level & other at supply depots level. In the survey of petrol pump the author found out the awareness of swap practices amongst the petrol pump respondents.

Table 4 Awareness of SWAP Practices:

Awareness About SWAP practices																									
Clusters	Buldhana						Akola						Amravati						Washim					Total	
Category (Owners hip)	Company Owned			Privately Owned			Company Owned			Privately Owned			Company Owned			Privately Owned			Company Owned		Privately Owned			All Respondents (% Awareness)	
Category (Dealers hip)	HPCL	BPCL	Others	HPCL	BPCL	Others	HPCL	BPCL	Others	HPCL	BPCL	Others	HPCL	BPCL	Others	HPCL	BPCL	Others	HPCL	BPCL	Others				
Aware	2	1	2	0	0	0	2	2	0	0	0	0	2	2	1	1	0	0	2	1	0	0	0	0	18%
Unaware	0	0	0	1	5	9	0	0	0	7	6	1	0	0	1	5	6	4	0	0	1	7	5	5	82%
Subtotal by Cluster	29						28						22						21					100	

The majority of the petrol pump respondents are still unaware of the hospitality arrangements the percentage awareness of SWAP is about 18% in the state of Maharashtra. Mostly the petrol pumps owned by oil companies have the greater awareness of the swapping practices.

As the awareness about SWAP found to be low, still the paper reveals that about 19% reduction in the cost of distribution can be exhibited through SWAP practices. Most of the remotely placed respondents showed the positive bearing of SWAP on the distribution cost of POL products. Availability of POL products supplies at desired time is enhanced by 22% as a result of SWAP practices. The most obvious research about reduction of lead times as a function of swapping concludes that SWAP practices reduce the lead Times by 28%. All different parameters that were researched reveals that petroleum Customer service level (PCSL) is or can be improved by 25%. & most common benefit of SWAP reveals that the strategic resources of these oil companies can be optimally used with Oil companies and all marketing intermediaries & customers as beneficiaries.

IV. CONCLUSIONS

Petroleum customer service level (PCSL) is a function of reduction in the distribution cost, availability, reduction of lead time, oil company's asset utilization etc. Systematic cooperative reciprocal barter system i.e. SWAPS has a positive bearing on the petroleum customer service level. Though the Awareness of such Hospitality is only 18% in the highly dense State of Maharashtra, all the identified clusters showed the positive bearings. This awareness is high in the Company owned retail outlets. Despite the great challenges in the petroleum industry's supply chain, opportunities for improvements and cost savings do exist along the supply chain. One major area for improvement and cost savings lies in the logistics function. All the cost associated with supplies of POL products to these Petrol pumps are paid by the respective Oil companies. Companies in the petroleum industry have become increasingly reliant on the services of third-party logistics companies to manage their supply chains. A next step to this 3PL Model of

Petroleum Downstream Supply Chain is SWAP (Hospitality/ Sharing) amongst the competing Oil Companies which provides many other benefits those are beyond the scope of this paper.

REFERENCES

- [1]. Agrawal, D.K. (2003): Logistics and supply chain management; Macmillan India limited, New Delhi.
- [2]. Bay B, Tang N, Bennett D. An empirical study of the imperatives for a supply chain implementation project in Seagate Technology International. Supply Chain Management 2004; 9 (4); 331-40.
- [3]. BP Statistical Review of World Energy, 2007
- [4]. Burgess R. Avoiding supply chain management failure: Lessons from business process re-engineering. International Journal of Logistics Management 1998; 9 (1); 15-23
- [5]. Coyle, J.J., Bardi, E.J., and Langley, C.J. (2003): The Management of Business Logistics: A supply chain perspective, 7th Edition Thomson learning Inc, Singapore
- [6]. [http://indiabudget.nic.in/ub2004-05\(I\)/eb/sbe68.pdf](http://indiabudget.nic.in/ub2004-05(I)/eb/sbe68.pdf)
- [7]. <http://petroleum.nic.in/review.pdf>
- [8]. <http://www.ppac.org.in/>
- [9]. <http://www.rajyasabha.nic.in/journals/179/05121996.htm>
- [10]. International Energy Agency Statistics, 2007
- [11]. Kidd J, Richter F, Li X. Learning and trust in supply chain management. Management Decision 2003; 41 (7); 603-12
- [12]. Magazines The Chartered Accountant January 2006 1043
- [13]. Ministry of Statistics and Programme Implementation for sectoral growth rate of Ninth Plan, 2007
- [14]. ONGC, OIL and DGH. Bulletin, 2007
- [15]. OPEC Annual Statistical Bulletin, 2007
- [16]. Petroleum Planning and Analysis Cell. Ministry of petroleum, Government of India, New Delhi.
- [17]. Public Sector Undertakings / DGCI&S, Kolkata / Ministry of Finance, 2007
- [18]. Sahay, B.S. (2000): Supply chain Management in 21st century, Macmillan India limited, New Delhi.

- [19]. STATE OF COMPETITION IN THE INDIAN PETROLEUM INDUSTRY Final Report: January 20, 2009 by Indicus Analytics Pvt. Ltd, New Delhi for Competition Commission of India, New Delhi
- [20]. www.dyuthi.cusat.ac.in/xmlui/bitstream/handle/purl/..../Dyuthi-T0284.pdf?..
- [21]. www.egr.uh.edu/ie/.../Hussain_Assavapokee_Khumawala_2006.pdf
- [22]. www.hartfuel.com/downloads/IntegratingPetroleumSupplyChain.pdf
- [23]. www.indiastat.com/petroleum/
- [24]. www.synergies10.livejournal.com