



## Inventory management of selected oil refineries of India

<sup>1</sup> Bharatiben L Patel, <sup>2</sup> Dr. KG Judal

<sup>1</sup> Research Scholar, Palanpur, Gujarat, India

<sup>2</sup> Guide, Smt. C.C. Mahila & Sheth C.N. Commerce College, Visnagar, Gujarat, India

### Abstract

India is the 6<sup>th</sup> largest consumer of petroleum. By the year 2010, India is expected to rank 4<sup>th</sup> in terms of consumption of energy. The contribution of the Indian oil and natural gas industry is nearly US\$ 13.58 billion. All of the refineries in India, apart from two are operated by the states. Indian petroleum demands are fed by the imports of oil and natural gas. Around 70% of the demands are fed by the imports oil and natural gas. The security pertaining to energy has become one of the primary concerns of the central government. Hence an attempt has been made to analyze the inventory management of selected oil refineries with help of mean, correlation between inventory and sales and ratio analysis.

**Keywords:** inventory, sales, turnover ratio, inventory and sales relationship

### Introduction

The need for resources in the history of humankind has always been the most important factor for political, technological, economic, social evolutions. In modern times, necessity for energy sources became more substantial than the industries in the past like production of ships, wood, constructions and even gold production. Among these energy sources, there is no vital source such as oil and yet, as James Buchan, famous British novelist quoted; today oil is almost as vital to human existence as water.

### Definition

Inventory management is a discipline primarily about specifying the shape and placement of stocked goods. It is required at different locations of a supply network to precede the regular and planned course of production and stock of materials.

### Review of Literature

The review of literature guides the researchers for getting better understanding of methodology used, limitation of various available estimation procedures and database, and lucid interpretation and reconciliation of the conflicting results.

**Kirtibhai V. Solanki (2008)** An Empirical Study of "Financial Performance of Selected Refineries of Indian Oil Corporation Ltd. in India" It was observed that trend of Income; Expenditures; Total Profit and Net Profit of IOCL were in Mixed trend during the Period From the years of 1997-98 to 2006-07.

**Dr.C.K.Sonara (2008)** Profitability Trends of Selected Indian Oil Refineries. The Research Paper has focused on Profitability Performance of Six Selected Refineries of Indian Oil Corporation Ltd. In India during the period from 2002-03 to 2006-07. This Research paper highlight on the Financial Performance and strength of selected refineries of IOCL.

### Statement of the Problem

In this context the researcher is interested in undertaking an analysis to find the inventory management of selected oil refinery. Hence the present study entitled "a study on inventory management of selected oil refineries in india.

### Objective of the Study

1. Evaluation of inventory management of the selected Oil Refineries.
2. Co-relation between total inventory and sales.

### Methodology

#### Sources of data

Secondary data used for the study. The required data for the study is collected from annual reports the period from 2006-07 to 2015-16. Also used books, journals, news-papers.

### Sample design

This is a list of selected petroleum (crude oil) Refineries companies in India which has been selected by researcher for her research work. List of companies are as under:

1. Indian oil corporation
2. Reliance Industries
3. Bharat petroleum Corporation Limited
4. Hindustan Petroleum Corporation Limited
5. Essar Oil Limited
6. Mangalore refinery and petrochemicals Limited
7. Chennai petroleum corporation limited

### Analysis of Inventory Management

The analysis can be measured with the help of the given data.

- i) Size of inventory
- ii) Inventory and sales volumes
- iii) Total Inventory to Current Assets of oil refineries
- iv) Inventory Turnover Ratio

### i) Size of Inventory

**Table 1:** Total inventory of refineries during study period (Rs.in in Crores)

Company year	BPCL	HPCL	IOC	MRPL	CPCL	Essar	Reliance	Total
2006-07	8661.26	8098.40	24702.69	2498.27	3214.77	3417.97	12136.51	62729.87
2007-08	10603.84	12020.28	30941.48	3624.30	4432.03	4890.92	14247.54	80760.39
2008-09	6823.92	8793.03	25149.60	1890.43	2470.28	2250.93	14836.72	62214.91
2009-10	12028.86	12579.22	36404.08	3114.36	4378.24	3969.44	26981.62	99455.82
2010-11	15375.08	16622.28	49284.52	4097.38	5112.98	5749.14	29825.00	126066.38
2011-12	15948.06	19454.53	56829.20	7817.58	6359.72	7681.67	35955.00	150045.76
2012-13	16690.37	16438.70	59314.39	6715.26	6386.52	10588.37	42729.00	158862.61
2013-14	19071.13	18775.41	64697.37	8448.96	6697.74	9309.96	42932.00	169932.57
2014-15	14457.85	12972.26	45543.85	3339.60	3805.09	5130.90	36551.00	121800.55
2015-16	13696.28	12709.12	38282.40	3196.72	3205.73	3951.10	28034.00	103075.35
Mean	13335.67	13846.32	43114.96	4474.29	4606.31	5694.04	28422.84	113494.42
SD	3799.80	3883.67	14293.02	2314.50	1492.92	2687.27	11513.00	38572.25
CV (%)	28.49	28.05	33.15	51.73	32.41	47.19	40.51	33.99

**Source:** Annual Reports of selected oil refineries for the year 2006-07 to 2015-16

Table-1 shows the size of total inventory of oil refineries during the period from 2006-07 to 2015-16. BPCL had Rs.8661.26 crores in the year 2006-07, increased to Rs.19071.13 crores in the year 2013-14(Excluding the year 2008-09). Then the inventory was Rs.14457.85 and decreased up to Rs.13696.28. The HPCL had Rs.8098.40 crores inventory in the year 2006-07 and increased by Rs.19454.53 (excluding the year 2008-09) then it decreased up to Rs.16438.70 crores in the year 2012-13. Also it gradually increased Rs. 18775.41 crores in 2013-14 then after it decreased up to Rs.12709.12 crores in the year 2015-16. The MRPL had Rs. 2498.27 crores inventory in the year 2006-07 and increased by Rs.7817.58 crores (excluding the year 2008-09). Then it decreased up to Rs.6715.26 crores in the year 2012-13 and increased by Rs. 8448.96 crores. Then after it decreased up to Rs.3196.72 in the year 2015-16. The CPCL had Rs.3214.77 crores inventory in the year 2006-07 and increased up to Rs. 6697.74 crores in the year 2013-14. Then it decreased up to Rs.3205.73 in the year 2015-16. The Essar had rs.3417.97 crores in the year 2006-07.Then it increased up to Rs.10588.37crores in the year 2012-13(excluding the year 2008-09). Then after it decreased up to Rs. 3205.73 crores in the year2015-16. The Reliance had Rs.12136.51 crores inventory in the year 2006-07 and increased up to Rs.42932.00. Then it decreased up Rs.36551.00 and stable up to Rs.28034.00 in the year 2015-16. The IOC has higher average inventory and MRPL has lower inventory average due to virtue of size. Co-efficient of variation indicates the level of consistency. The most consistent company was IOC.

### ii) Inventory and Sales Relationship

Generally it is accepted that the increase in volume of sales obligate the firm to maintain proper level of inventory. The chief criterion of inventory soundness is the turnover defined as the annual sales divided by the year ended inventory. The relationship between inventory and sales has been studied in following table.

Table-2 represents relationship between total inventory and total sales of selected oil refineries of India. The total inventory increase when there was rise in sales. Correlation between total inventory and sales of oil refineries is 0.87 which is near to 1, therefore it can be concluded that there was

positive correlation between sales and inventory. Percentage of total inventory to sales was varied between 7.94% in 2008-09 and 13.13% in 2010-11.

**Table 2:** Inventory and sales relationship of sampled units (Rs. In Crores)

Year	Total Inventory	Total inventory to sales (%)	Sales
2006-07	62729.87	10.87	577276.31
2007-08	80760.39	12.16	664336.75
2008-09	62214.91	7.94	783315.80
2009-10	99455.82	12.82	775899.56
2010-11	126066.38	13.13	960299.61
2011-12	150045.76	11.54	1300451.85
2012-13	158862.61	10.77	1474740.71
2013-14	169932.57	10.95	1551578.07
2014-15	121800.55	8.65	1407969.27
2015-16	103075.35	9.20	1120732.25
R	0.87 (Between Total inventory and Sales)		

**Source:** Annual Reports of selected oil refineries for the year 2006-07 to 2015-16

### iii) Total Inventories to Current Assets of oil refineries

Total amount of working capital funds invested in inventories could be known by calculating inventories to total current assets. Table -3 shows the total inventories as a percentage to total current assets. It is found that percentage of total inventories to current assets were consistent throughout the study period of all refineries. BPCL had 63.54% the highest investment in inventory in the year 2006-07. Then it decreased to 44.63% in the year 2008-09. The investment of inventory increased 51.00% in the year 2009-10. And lowest inventory had 40.43% in 2011-12. The HPCL had 70.64% highest investment in inventory in the year 2006-07. While 27.36% lowest investment in inventory in the year 2010 -11 and 2011-12. The IOC had 63.24% the highest investment in inventory in the year 2006-07. In 2015-16, it had 42.85% of current assets invested as inventory. Percentage of total inventories to currents assets of MRPL in the year 2006-07 was 56.06% which is highest during the study period. In 2008-09 it had 31.51% and in the year2015-16was 16.08%.The CPCL had 72.44 total inventories to currents assets. In the year 2009-10, it reported 77.45% the highest investment in inventory. And lowest investment in inventory was 62.92%. In essar 73.71%

investment in inventory in the year 2006-07. then it reported that the lowest investment was 9.72% in the year 2015-16. It is observed in Reliance that in every year investment in inventory was less than 40%. in the year 2006-07, the investment in inventory was 40.57%. and the lowest investment in inventory was 27.12% in the year of 2008-09. and the inventory was 30.95% in the year 2015-16.

The average percentages of total inventories to current assets of BPCL, HPCL, IOC, MRPL, CPCL, Essar and Reliance were 49.14, 48.70, 53.05, 40.05, 69.85, 43.88 and 32.63 percent

respectively. Overall percentages of oil refineries was 48.19%. The year wise average mean of total inventories to current assets in the year 2006-07 found the highest of 62.89%.

The co-efficient of variations (CVs) for BPCL, HPCL, IOC, MRPL, CPCL, Essar and Reliance were 12.95, 29.11, 13.92, 36.31, 6.41, 44.43, and 16.24 percent respectively. Overall CV of all selected oil refineries was 15.96 percent respectively. It showed that the investment in the inventory by all selected oil refineries was quite consistent.

**Table 3:** Total Inventories to Current Assets of Selected oil Refineries during the study period (In percentage)

Company year	BPCL	HPCL	IOC	MRPL	CPCL	Essar	Reliance	Average
2006-07	63.54	70.64	63.24	56.06	72.44	73.71	40.57	62.89
2007-08	53.81	62.29	58.46	53.41	72.00	64.76	33.22	56.85
2008-09	44.63	54.98	56.47	31.51	67.33	39.61	27.12	45.95
2009-10	51.00	60.94	61.30	39.89	77.45	44.56	43.25	54.06
2010-11	49.93	27.36	59.15	41.65	67.72	49.66	31.11	46.65
2011-12	40.43	27.36	46.97	54.91	62.92	52.31	27.17	44.58
2012-13	43.49	43.00	46.23	52.58	68.97	50.17	29.68	47.73
2013-14	48.10	47.25	48.39	34.60	72.90	37.32	31.72	45.75
2014-15	47.71	47.00	47.48	19.78	64.03	16.99	31.47	39.21
2015-16	48.78	46.23	42.85	16.08	72.78	9.72	30.95	38.20
Mean	49.14	48.70	53.05	40.05	69.85	43.88	32.63	48.19
SD	6.37	14.18	7.38	14.54	4.48	19.50	5.30	7.69
CV (%)	12.95	29.11	13.92	36.31	6.41	44.43	16.24	15.96

**Source:** Annual Reports of selected oil refineries for the year 2006-07 to 2015-16

#### iv) Inventory Turnover Ratio

Inventory turnover ratio is the method of reviewing performance and controlling inventories periodically to check the inventory turnover of each type of raw material supply and finished goods. This ratio helps in ascertaining the efficiency of management of inventory. Ordinarily the higher the rate of inventory turnover, the larger amount of profit, the smaller the amount of working capital tied up in inventory, more current transaction. Therefore, a high turnover ratio is always desirable in normal conditions. This ratio may be calculated as under:-

$$\frac{\text{Sales}}{\text{Average Inventories}}$$

Table-4 had shown the calculation of inventory turnover ratio of selected oil refineries. Turnover ratio of BPCL in the year 2006-07, was 12.14 times which increased to 13.45 times in

2015-16. The HPCL turnover ratio increased from 11.28 times in 2006-07 to 13.96 times in 2015-16. The IOC had 9.37 times in 2008-09; it was the highest inventory turnover. The highest inventory turnover of MRPL was 12.97 times in 2006-07 that reduced 9.3 times in 2011-12. The CPCL turnover ratio was 7.76 times in 2006-07 which decreased 7.42 times in 2015-16. The Essar had 4.40 times in 2007-08; which was lowest turnover ratio. And the highest turnover ratio was 11.74 in 2009-10. Reliance stepped up from 10.04 times in 2006-07 to 10.12 times in 2007-08 and then decreased to 7.22 times in 2015-16. The BPCL had the best mean of 13.69 times which was greater than overall mean of all selected oil refineries as well. The year wise analysis show that the highest average inventory turnover ratio was 11.65 times was in the year 2008-09. The co-efficient variance indicated CPCL was the most consistent, whereas overall CVs was 7.53%. It showed more fluctuation of inventory turnover ratio on overall basis.

**Table 4:** Inventory Turnover Ratio of selected oil refineries during the study period (In Times)

Company year	BPCL	HPCL	IOC	MRPL	CPCL	Essar	Reliance	Average
2006-07	12.14	11.28	8.14	12.97	7.76	9.18	10.04	10.22
2007-08	12.63	10.53	8.07	10.64	7.33	4.40	10.12	9.10
2008-09	16.69	12.07	9.37	13.87	9.26	10.52	9.75	11.65
2009-10	13.95	10.23	8.10	12.74	7.29	11.74	9.92	10.57
2010-11	11.07	9.14	7.07	10.78	8.04	9.67	8.74	9.22
2011-12	13.53	9.88	7.97	9.03	7.91	8.69	10.03	9.58
2012-13	14.71	11.51	8.10	9.04	6.73	9.70	9.16	9.85
2013-14	14.54	12.67	7.40	9.47	7.54	9.91	9.11	10.09
2014-15	14.20	13.00	8.20	9.75	7.97	11.52	8.28	10.42
2015-16	13.45	13.96	9.56	12.13	7.42	11.55	7.22	10.76
Mean	13.69	11.43	8.20	11.04	7.73	9.69	9.24	10.14
SD	1.55	1.52	0.76	1.77	0.67	2.13	0.94	0.76
CV (%)	11.31	13.29	9.30	16.04	8.66	22.03	10.22	7.53

**Source:** Annual Reports of selected oil refineries for the year 2006-07 to 2015-16

### Findings

- It is observed that 80% sampled companies are consistent in size of inventory only one MRPL was highly fluctuate company in terms of size of inventory. The C.Vs. of MRPL was 51.73% under study period, but average C.V. was 33.99% only. So MRPL need do take a corrective action about inventory management.
- There was positive correlation between total inventory and sales of selected oil refineries under a study period. The r-value was 0.87 nearest to one.
- Overall CV of all selected oil refineries was 15.96 percent respectively. It showed that the investment in the inventory by all selected oil refineries was quite consistent.
- Overall inventory turnover ratios of selected units were 10.14 times. Compared to overall BPCL, HPCL, and MRPL was higher inventory turnover ratio and IOC,CPCL, Essar and Reliance was lower inventory turnover.

### Suggestions

- The MRPL should take a corrective action about inventory management.
- The IOC, CPCL, Essar and Reliance should tried to increase the turnover ratio.

### Acknowledgement

It is truth that some person help us without any expect a large number of individuals have rendered their assistance directly or indirectly for completion of the present article. It gives me real direction here the assistance extended to me by various persons to carry out my research article.

First, all express my deep sense of gratitude to my guide professor Dr. K.G. Judal for providing me proper guidance. My sincere and grateful thanks go to my husband hardik patel. I express my thanks to all those who have directly or indirectly helped me to completed this article.

### References

1. Kirtibhai V Solanki. Thesis on an Empirical Study of the Financial Performance of Selected Refineries of Indian Oil Corporation Ltd. in India. 2008; pp.121-322.
2. Dr. C.K. Sonara. Profitability Trends of Selected Indian Oil Refineries, Economic Challenger, 2008; pp. 55-59.
3. Drebin Allon R, Harold JR. Managerial Accounting –An introduction, 3<sup>rd</sup> Edition, Philadelphia: W.B. Saunder Company, 1975; p.155.
4. H.Kreps Cliften Jr., Richard F Wacht. Financial Administration, Honsdale Illinois, 1975; P.45.