Valuation in Oil Sector – Significance and Review

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Oil accounts for about 37 per cent of the total energy consumption in the world. Prices of oil and petroleum products have risen drastically worldwide during 2004-05 due to shortage of supply and increased demand, creating an imbalance in the world economies and thereby enhancing inflationary tendencies. Oil is expected to be the dominant energy source worldwide with a share of about 39 per cent of total energy consumption across the globe by 2025. With an upsurge in the global crude oil prices and the huge quantum of working capital tied up in inventories, the accounting policy for control and valuation of inventories in oil sector is very important to ensure strict compliance with accounting standards and at the same time to minimise the costs of holding inventories. The study in this article provides a glimpse of the accounting policy being followed by some of the oil companies in India, the constituents of costs and Net Realisable Values, inventory valuation criterion, adherence to accounting standards, some techniques of inventory control, importance of economic order quantity, need for control over inventory carrying costs and effects of errors in inventory valuation.

As per Accounting Standard (AS) 2 on "Valuation of Inventories" issued by the ICAI, inventories are defined as *assets held for sale in the ordinary course of business or in the process of production for such sale or in the form of materials or supplies to be consumed in the production process or in rendering of services.* An efficient system of inventory management is essential for the success of any enterprise.

Organisations worldwide look for systems and tools for inventory controls and processes to reduce storage and transportation costs and manage and use inventory to the optimum.

Generally, inventories constitute second major item in the total assets of an enterprise (specially in case of manufacturing companies). In case of oil sector companies it accounts for about 30-40 per cent of the total assets of the company. Any effort for inventory control may, thus, yield significant benefits for the enterprise. Rising crude oil prices breaching the 66$ per barrel mark continue to remain the biggest concern for domestic as well as global economy.

With valuation of inventories having a direct bearing on the profits of an organisation the importance of accuracy, consistency and fairness in the valuation and depiction in financial accounts of an enterprise becomes eminent. The said elements are extremely important in inventory reporting for decision-making both inside (management) and outside the organisation. This information is primarily required by management for decision-making regarding timing for placement of order and ordering quantity (i.e. Economic Order Quantity (EOQ) decisions).

Review Of Legal Provisions

On the above subject under the US GAAP, an amendment to AICPA's Accounting Research Bulletin (ARB) 43, Chapter 4, has been introduced by Financial Accounting Standards Board (FASB) in the form of FAS 151 "Inventory Costs". The provisions of this statement are effective for inventory costs incurred during fiscal years beginning after 15th June 2005. Earlier application is permitted for inventory costs incurred during fiscal years beginning after the date this statement is issued. The provisions of this statement shall be applied prospectively.

Similarly, the International Accounting Standards Board (IASB), introduced International Accounting Standard (IAS) 2 "Inventories" the revised version (2003) of which is effective from 1st of January 2005.

In India, the council of the Institute of Chartered Accountants of India (ICAI) has issued Accounting Standard (AS) 2 "Valuation of Inventories". This revised standard came into effect in respect of accounting periods commencing on or after 01.04.1999 and is mandatory in nature. The statement deals with the ascertainment of the cost of inventories and any write down thereof to the Net Realisable Value.

Every organisation is required to depict in its significant accounting policies, the accounting policy it follows for valuation of inventories in accordance with Accounting Standard (AS) 1 "Disclosure of Accounting Policies".

Accounting for Inventories

The objective of accounting for goods in inventories is the matching of appropriate costs against revenues in order that there may be a proper determination of realised income. The inventory at any given date is the balance of costs applicable to goods on hand remaining after matching of absorbed costs with concurrent revenues. This balance is carried to future periods provided it does not exceed an amount properly chargeable against the revenues expected to be realised from ultimate disposition of goods carried forward.

Inventories are valued at Actual Cost or the Net Realisable Value, whichever is lower.

For this purpose the term 'Actual Cost' shall comprise the following:

(a) All purchase costs;
(b) Costs of conversion; and
(c) Any other costs incurred for bringing the inventories to their present location or condition.

The following costs need to be excluded while determining the costs of inventories:

- Abnormal costs and wastages;
- Storage costs unless forming an integral part of production;
- Administrative overheads not contributing to bringing the inventory to their location or condition;
- Selling and Distribution costs.

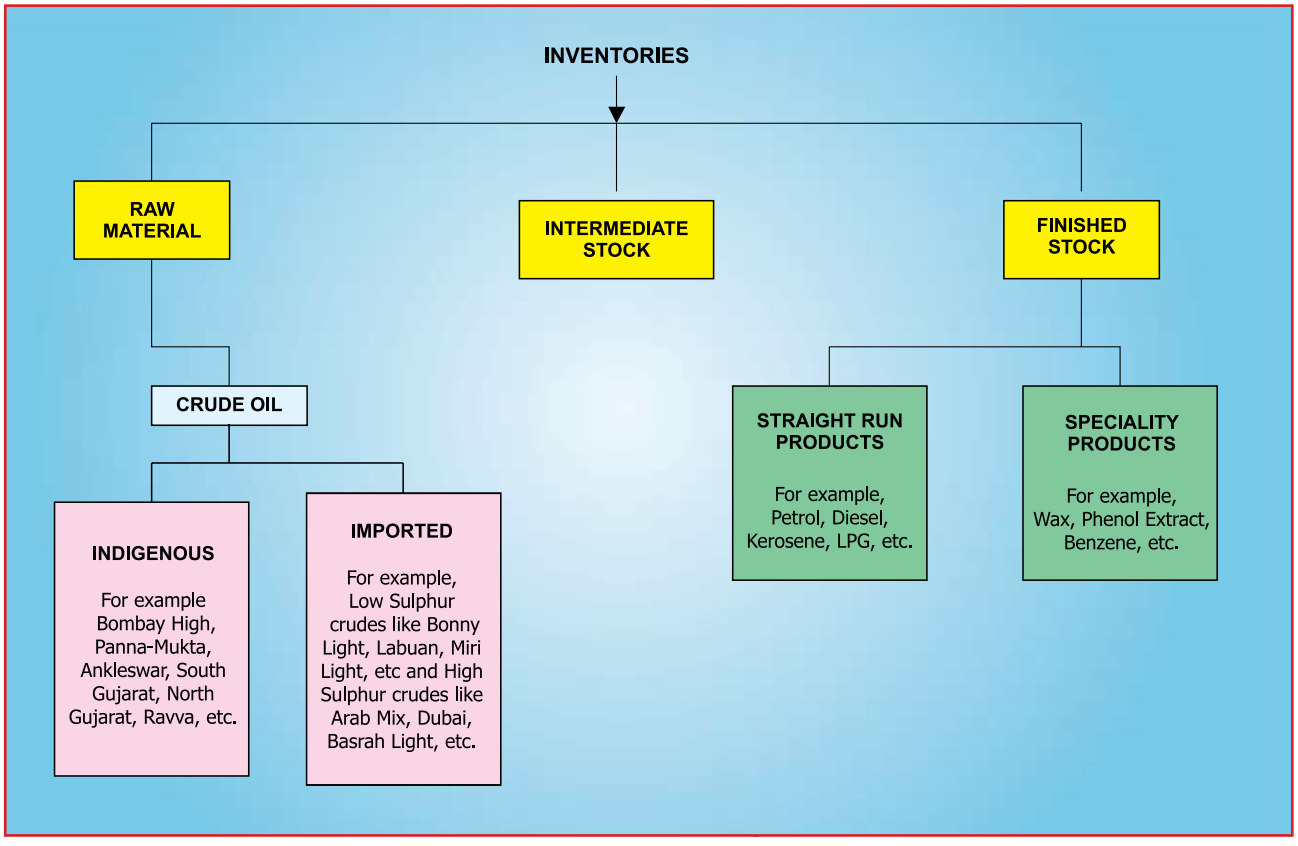
The cost of inventory of items that are not ordinarily interchangeable and are capable of being segregated shall be on 'Specific Cost' basis. For example, the cost of any identifiable petroleum product returned to an oil processing company (refinery) by an oil marketing company shall be considered at specific cost i.e. Refinery Transfer Price (RTP) *plus* cost of freight involved. This shall then be compared with its Net Realisable Value for the purpose of valuation.

Apart from above, the cost of inventory shall be calculated at First-in-First-out (FIFO) basis or Weighted Average cost basis. An alternative Last-in-First-out (LIFO) earlier allowed under IAS 2 and ARB 43, has now been done away with.

Classification of Inventories

In case of Oil sector companies (specially those in the business of refining), inventories may broadly be classified as follows:

(a) Raw Materials;
(b) Intermediate Stock or work-in-progress; and



(c) Finished Goods Stock.

Note: It may be noted that the type of crude oil to be processed and products that may be produced may vary from refinery to refinery, depending upon their configuration and design

Valuation Criterion

Classification wise valuation of inventories as shown in Figure 1 on the previous page may be summarily explained as follows: -

(A) Raw Material:

Raw Material includes Crude oil stock that may include high sulphur crude or low sulphur crude or both. This may further be categorised into:

- **Indigenous crude oil** that may either be offshore such as from Bombay high, Panna-Mukta, etc., or on-shore crude oil such as South Gujarat, North Gujarat, Assam, etc.
- **Imported crude oil** such as Bonny Light, Labuan, Arab Mix, Dubai crude, etc. The main sources of procurement of imported crude oil are countries like Nigeria, Iran, Saudi Arabia, Kuwait, Malaysia, etc.

Crude oil is valued at 'Actual cost' or 'Replacement cost' whichever is lower. As per Accounting Standard 2, in case of raw materials when there has been a decline in the cost of raw materials and they are to be written down to NRV, the replacement cost of raw material may be considered as the best available measure of their Net Realisable Value.

The criteria for crude oil valuation shall, thus, be:

- If 'Actual Cost' is less than 'Replacement Cost' then valuation shall be at 'Actual Cost'; or
- If 'Actual Cost' is more than 'Replacement Cost' then:
  - If 'Actual Cost' is less than the 'Net Realisable Value' then valuation shall be at 'Actual Cost';
  - If 'Actual Cost' is more than the 'Net Realisable Value' then the valuation shall be at 'Replacement Cost'.

The term 'Actual Cost' comprises the following:

- In case of indigenous crude oil, the total costs involved in bringing the crude oil to their present location or condition. It shall include all payments made for purchase of crude oil to oil supplying companies, transportation costs if any, cess, ocean freight, insurance, etc. in case of offshore crude oil; and
- In case of imported crude oil, shall include all costs incurred in the course of import of crude oil up to the point of storage or processing which shall comprise FOB, Marine freight, Marine Insurance, Wharfage and other

	Scenario-A	Scenario-B	Scenario-C	Scenario-D	Scenario-E
Crude oil cost	10000	10000	10000	10000	10000
Conversion cost	200	200	200	200	200
Total cost	10200	10200	10200	10200	10200
Realisable Value of product	11500	9500	11500	9000	9600
Replacement cost of crude oil	10500	10200	9500	9500	9500
Valuation as per AS-2	10000	10000	10000	9500	9500
Reason	Replacement cost of crude oil is higher than the actual cost.	Replacement cost of crude oil is higher than the actual cost.	Though the replacement cost of crude oil is lower than the actual crude cost, realisable value of products is more than actual crude oil cost.	Though the realisable value of products is lower than the actual as well as replacement cost, the crude oil cost will not be valued lesser than the replacement cost.	Since realisable value and replacement cost are lower than the cost, valuation made based on replacement cost of the crude oil, which is lower than realisable value of products

Table1

landing charges, Customs Duty, Transportation costs and Entry Tax if applicable.

The above shall constitute purchase costs.

The term 'Replacement Cost' of crude refers to the prevailing price of same type of crude in the market at the time of finalisation of annual accounts, in order to determine the change in the cost of crude with respect to the balance sheet date.

The term 'Net Realisable Value' refers to the estimated realisation from the sale of products produced from the crude oil in stock as at the valuation date. This is done on the basis of actual product pattern considered from the Inventory Logistics Plan (ILP) drawn for the subsequent month(s) following the date of the balance sheet. The prices prevailing or expected to prevail during the next month are considered for this purpose.

In all the above cases, weighted average costs are arrived at and a comparison is done amongst them as aforementioned.

The above valuation criteria may be well understood with the help of an illustration as has been stated in Table 1 on the previous page.

The calculation of 'Net Realisable Value' may be done following the method stated Table 1. This may be understood by considering a hypothetical illustration stated in Figure 2:

Considering a crude oil stock of 1500 Metric Tonnes (MT) at the end of the financial year 2004-05 (i.e. as on 31.03.2005), realisable value calculation, considering Inventory Logistics Plan (ILP), may be done as shown in Table 2.

Realisable Value of Production	Qty in MT	Rate Per MT	Value Rs. Lacs
ILP-**April**			
Estimated Crude Processing	**1000**		
LPG	50	25000	13
Petrol	100	32000	32
Diesel	400	30000	120
Kerosene	200	24000	48
ATF	30	26500	8
Others	50	20000	10
Intermediate Stock Differential	100	22000	22
Total	**930**	**27150**	**252**
Losses & Wastages	70		
Total Crude Processing	**1000**	**25200**	**252**
ILP-MAY **Estimated Crude Processing**	**1500**		
LPG	85	25000	21
Petrol	125	32000	40
Diesel	610	30000	183
Kerosene	275	24000	66
ATF	70	26500	19
Others	100	20000	20
Intermediate Stock Differential	145	22000	32
Total	**1410**	**27000**	**381**
Losses & Wastages	90		
Total Crude Processing	**1500**	**25400**	**381**
Average Realisation May Thus Be:			
ILP April	1000	25200	252
ILP May	500	25400	127
Total	**1500**	**25267**	**379**
Less: Operating Cost / Mt Of Crude Processing (Budgeted Figure May Be Considered)		300	
Average Net Realisable Value Per Mt Net Of Operating Cost For Comparison Purposes			24967

Table 2

(B) Intermediate Stock:

Intermediate stock refers to the stock of goods that are in semi-finished form and are held between manufacturing stages. At every point of time there are certain goods that are neither fully complete nor may be categorised as raw materials. Such goods fall in this category.

The valuation of such goods is done as follows:

'Actual Cost *plus* conversion costs' or 'Net Realisable Value' whichever is lower.

'Actual Cost' in case of intermediate stock shall include conversion costs. The practice followed by most of

the oil companies is to consider intermediate stock as half-processed (or 50 per cent processed). The actual cost of such stock may, thus, be calculated by arriving at the value of Equivalent Crude used in such stock after considering the proportion of relevant losses. Similarly, the proportion of all relevant conversion costs involved is added to the total cost.

'Net Realisable value' in the present case is calculated considering the same basis as in case of crude oil. This NRV is then adjusted for the proportion of losses and conversion costs in order to bring it on a common platform with actual cost and, thus, form the basis for comparison.

(C) Finished Stock:

Finished stock consists of those goods that are complete in all respects and are ready for sale or distribution in the market.

These finished goods may be either Straight Run Products such as Petrol, Diesel, Kerosene, LPG, etc. or Speciality Products such as Benzene, Toluene, Paraffin Wax, etc.

The valuation followed in this case is as follows:

'Actual Cost *plus* conversion costs' or 'Net Realisable Value' whichever is lower.

Since the oil industry involves a single input (crude oil) and multiple outputs through one or several processing levels, it becomes quite difficult to assess the actual cost of production using the direct cost allocation method. In this regard, a generally accepted practice is the elimination of profit percentage from the selling price of the products.

Since the dismantling of Administered Price Mechanism (APM) i.e. 01.04.2002, the prices of all petroleum products except Kerosene (PDS) and LPG (Domestic) are market driven though the government has still not fully deregulated market price determination of Petrol and Diesel.

In case of LPG (Domestic) and Kerosene (PDS), government provides subsidies in the final price to the consumers. The rate of subsidy has been fixed on the basis of import parity rates. Oil companies have been prevented from revising the rates even though the international prices of these commodities have been increasing substantially.

In the case of Refining Companies, the Refinery Transfer Price (RTP) is determined under the concept of Import Parity Price (IPP). Such a price is based on the landed cost of the product at the nearest refinery port (plus transportation cost, if any) for the import of such product. This adjusted price is referred to as 'Ex-Refinery Price' and is inclusive of refining margin. Thus, the refineries are being paid the RTP as per the international prices, which has resulted in the under-recoveries to the Oil Marketing Companies (OMC) and affected their profits.

For Oil Marketing Companies, the final 'Ex-Storage Point Price' is arrived at by adding to the RTP, the marketing margin and marketing costs comprising basic marketing costs, working capital costs, storage losses, etc. The cost of product for marketing companies shall be the price at which these companies receive the product from refining companies.

The 'Net Realisable Value' shall be the price of the product prevailing in the market on the first of the subsequent month.

Disclosure Requirements

The disclosure requirements in relation to inventory valuation shall comprise the following:

- The accounting policies adopted in inventory valuation, including the cost formula used;
- In case of any change on the above basis, the nature of such change and if material, the effect of such change in income should be disclosed in accordance with the Accounting Standard 5 "Net Profit, Prior period items and Changes in accounting policies";
- Carrying amount of inventories carried at 'Net Realisable Value' (or Replacement Cost in case of raw materials, as the case may be);
- Total carrying amount in inventories and its classification.

Disclosure requirements under Section 145A of Income Tax Act, 1961

Section 145A of the Income Tax Act, 1961 introduced by the Finance Act,

1998 for the financial years 1998-1999 onwards, requires that for the purpose of determining "Profits and Gains from Business and Profession" valuation of purchase and sale of goods and inventory:

(a) Shall be in accordance with the method of accounting regularly followed by an enterprise; and

(b) Shall include in the value of purchase and sale of goods or inventory, any amount of duty, cess, tax, etc. as a part of the cost of such goods or inventory.

In this regard, the ICAI has issued a "Guidance Note on the Accounting Treatment of Modvat/Cenvat" effective from 01.04.2000, whereby it has been recommended that the depiction/disclosure of inventories in the books of accounts should be done on "gross basis" without taking into consideration the credit for CENVAT. The revised Accounting Standard 2 also supports this view.

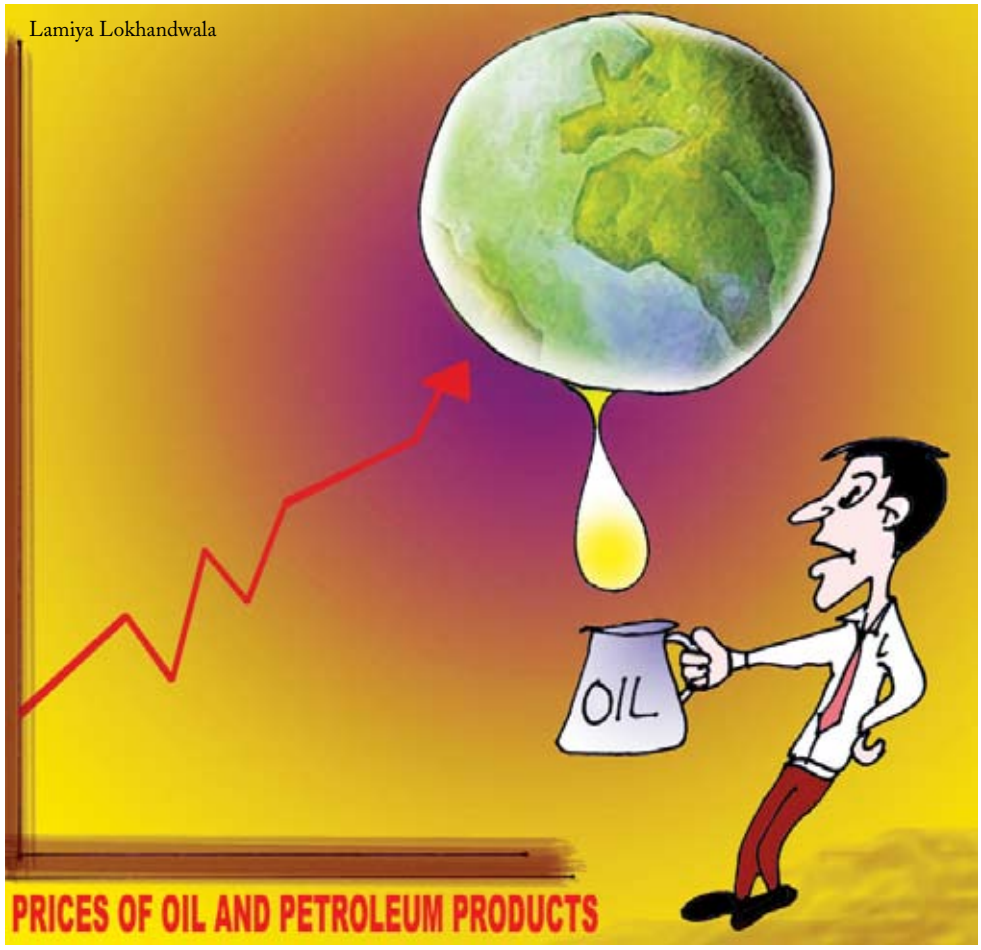
Significance Of EOQ

As the heading connotes, Economic Order Quantity is that level of quantity at which the total relevant cost is minimum.

Economic Order Quantity (EOQ) is an optimum ordering quantity that gives maximum economy in the purchasing or ordering of any material. The relevant costs in determination of EOQ are:

(a) **Ordering cost** which involves the cost for preparation of orders for receiving goods and other costs for securing the supplies of materials;

(b) **Inventory Carrying costs** which involve the costs of holding and maintaining inventories and can be divided into two categories:



- **Storage costs**, which involve:
  - Tax, depreciation, repair & maintenance of building;
  - Insurance against fire and theft;
  - Pilferage and obsolescence costs; and
  - Serving costs such as labour costs.
- **Opportunity costs** consisting of (interest on capital) funds utilised to finance the acquisition of inventories that would otherwise have earned a return.

(c) **Stock-Out costs** involving loss of contribution, loss of goodwill, cost due to Shut-downs/restarts due to shortage of raw materials, etc.

The primary objective of inventory management and control should, thus, be identification of EOQ so that all the above costs may be minimised.

The most commonly used mathematical approach for calculation of EOQ is given by the following equation:

Where,

$$EOQ = \sqrt{\frac{2AB}{C}}$$

A = Annual Usage of inventory (units)

B = Buying / Ordering cost per order; and

C = Inventory Carrying Costs per unit per annum.

This technique of inventory control may be highly useful in case of oil sector considering the huge quantum of working capital in inventories since a small percentage reduction

in working capital tied-up in inventories shall mean a substantial saving amount. But complete benefits of such a technique are yet to be earned taking into account the volatility involved in prices and demand in hydrocarbon industry.

A Comparative Analysis of Inventory Usage

An analysis of efficiency in the use of inventory may be done by an enterprise with the help of turnover ratios.

Inventory Turnover Ratio is highly useful in identifying as to how many times a company's inventory has been sold during the year.

Although, the higher the ratio the better it is but it varies from company to company. The above ratio may be higher

$$\text{Inventory Turnover Ratio} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$$

$$\text{Average Inventory} = \frac{\text{Opening Stock + Closing Stock}}{2}$$

in Oil Marketing Companies in comparison to Oil Refining Companies.

A comparative study below of the trend of Inventory Turnover Ratios over a period of 3 years, of 4 major oil sector companies in India, provide an insight into the efficiency in inventory utilisation by them.

It is evident from the above table that over the period of three years all the oil sector companies show a decline thereby indicating that oil companies are keeping more and more stock though sales are not increasing at par with stock increase. Amongst the four oil majors, BPCL has the highest inventory turnover whereas RIL has the lowest ITR.

In order to keep this ratio at a higher level, an effective system of inventory controls may be exercised by the oil sector.

Errors In Inventory Valuation and Their Impact on Profitability

Valuation of inventory has an impact on the profits of two financial years– the year in which it appears as 'Closing Stock' and the subsequent year in which it appears as 'Opening Stock'. Thus, an error in one accounting period shall have an impact on profits of two accounting years. An error in inventory valuation shall directly affect the Gross Profits of an organisation.

An overstatement in inventory valuation shall lead to an overstatement of profits for that year and also the understatement of profits for the subsequent year and vice-versa. It is worth mentioning that the combined profits of the said two years shall, however, remain unchanged. Inventory errors, thus, result in timing differences.

Any such errors in inventory valuation occurring after the balance sheet date or closing of accounts, materially affecting the true and fair view of the state of affairs, should be disclosed in the Director's Report as part of "Events occurring after balance sheet date" in accordance with the Accounting Standard AS 4 'Contingencies and Events occurring after Balance Sheet date'.

	IOCL	BPCL	HPCL	RIL[1]
YEAR 2003-2004	9.26	12.30	10.99	7.63
YEAR 2002-2003	10.15	13.26	12.45	8.03
YEAR 2001-2002	11.17	12.80	11.89	12.48

[1] Note: Reliance Industries Ltd. considered as a whole, of which petroleum business is a major segment.

Conclusions

A sound system of inventory control is essential for every organisation specially in case of manufacturing concerns.

The main purpose of inventory control is to minimise the costs of funds employed or tied-up in inventories and at the same time maintain an uninterrupted supply of raw materials for production at minimum possible inventory carrying and holding costs.

Valuation of inventories, on the other hand, depicts the total amounts tied-up in the inventories and thereby form the basis for inventory control. Proper inventory valuation, thus, attains more significance.

The global economy has witnessed a sharp rise in the international price of crude oil over the last one year or so from around $30 a barrel in 2003-04 to $45 a barrel in 2004-05 reporting an increase in crude oil prices by about 50 per cent. But crude oil prices hitting an all time high of $66 per barrel mark in the second week of August 2005 has given the biggest oil shock of the last 25 years. With increased volatility

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in crude oil trading, New York Mercantile Exchange (NYMEX) data shows outstanding options contracts to buy crude oil for December 2005 delivery at a whooping $80 a barrel, there is a hazard that the economic growth of most world economies might go for a toss.

Such a situation can not only bring down the economic growth in India to levels as low as 2-3 per cent per annum, but can also increase inflation to alarming heights of 13-15 per cent per annum.

Though the Organisation of Petroleum Exporting Countries (OPEC), the producer of about 40 per cent of world's crude oil, is pumping crude oil as much as it can to increase inventories and production, yet the efforts do not seem to pay off. The situation, thus, remains grim.

Suggestions

ü Optimum capacity utilisation:

Having been confronted with such a precarious state of affairs, efforts need to be made to rethink upon our present inventory levels and an endeavour should be made to attain optimum utilisation of available refining capacities in order to meet as much energy demand as possible.

ü Usage of better Inventory Control Techniques:

Opportunities may be explored by usage of various inventory control techniques like EOQ, for reducing ordering and carrying costs and thereby attaining a healthy inventory turnover ratio. Since inventory valuation has a direct bearing on the profits of an organisation (specially in case of manufacturing concerns) and profits in turn have a bearing on the share prices of the organisation, it may be said that inventory valuation has a bearing on the market prices of shares and, thus, needs to be dealt with utmost caution.

ü Strict legal compliance - Role of Chartered Accountants and other auditors:

It is evident that Accounting Standards need to be strictly followed for a true and fair depiction of the state of affairs. Chartered Accountants engaged in the audit of companies falling under the oil sector, need to keep in mind the above implications and in a country like India where most of the oil sector companies are Government of India undertakings, the issue of Inventory Valuation and Control attains apex importance. Chartered Accountants should, thus, be more stringent and cautious while auditing in the oil sector, so that an accurate, relevant, true and fair view may be presented in the interest of the nation. ❐