

## Inventory Management Practices – A Case Study of Fertiliser Company

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### Abstract

In any organization the inventory of materials plays vital role in working capital management. A small saving in the inventory will reflect a vital margin in profit of the organization. Inventory control means the availability of right materials of right quantities coordinated with lead time. Each and every component of inventory is important and managing the inventories to keep in an optimum level is a must. Inventory is one of the key determinants of the productivity of fertilizer industry. Inventory management plays an important role in the fertilizer industry both in production of new assets and operational maintenance of existing assets. Therefore, the continuous availability of inventory is a prime requirement for the uninterrupted working and better capacity utilization. This paper aims at examining the efficiency of inventory management in IFFCO. The study also highlights the correlation between the size of inventory and sales and output.

### Introduction

Management must be concerned with all aspects of the firms operations including production of goods, delivery of services, sales, marketing activities and supporting functions, such as personal training and data processing to handle these responsibilities most firms make extensive use of financial data and reports. As businesses become larger and more complex finance assumed the responsibility of dealing with problems and decisions associate with managing firm's assets.

Inventories generally constitute the second largest item after fixed assets in the financial statements particularly of manufacturing organisations. Para 23 of AS-2 on inventory

valuation issued by the Institute of Chartered Accountants of India states that inventories are normally classified in the financial statements as (a) Raw materials, (b) Work-in-progress, (c) Finished goods and (d) Stores and spares. Proper management of each of the above components is necessary/important to maintain and improve the health of an organisation. Efficient management of inventories will improve the profitability of the organisation. The seminar organized by the Indian Association of Materials Management at Calcutta on the importance of inventory noted that 90 per cent of the working capital in Indian Industries is locked up in inventories as against not more than 30 to 40 per cent in industrially advanced countries. It further observed that 64 paise in a rupee are spent on materials by Indian industries, 16 paise on labour and the rest of one rupee is the cost spent on overheads. The importance can be gauged from the fact that purchases account for nearly 50 per cent of an organisations' annual expenditure, that nearly 80 per cent of the working capital is tied up in inventory and the inventory carrying cost is almost 25 per cent per year, that materials represent 40 to 50 per cent sale price or 60 to 80 per cent of the production cost of a product and that even a saving of 5 per cent in material cost will substantially increase the profit margin of an enterprise. Effective Management of Inventory shall definitely improve return on investment - the primary motive of business enterprise. Inventories constitute the major element in the working capital of many business enterprises. Inventories constitute the most significant part of current assets of large majority of companies in India. On an average, inventories are approximately 60 % of current assets in public limited companies in India. Because of the large size of inventories

maintained by firms, a considerable amount of funds is required to be committed to them. It is impossible for a company reduces its levels of inventories to a considerable degree, e.g., 10-20 %, without any adverse effect on production and sales, by using simple inventory planning and control techniques. The reduction in excessive inventories carries a favorable impact on a company's profitability.

$$\text{Return on Investment} = \frac{\text{Profit}}{\text{Capital Investment}}$$

Return on capital is product of two factors, profit margin (profit / sales) and, capital turnover rate (sales/capital). In other words:

$$\text{Return on Investment} = \frac{\text{Profit Sales}}{\text{Sales Capital Investment}} \times \text{Capital Investment}$$

Normally, profit margin depends on external factors such as competition and Government restrictions which are beyond the control of management. For a given volume of business, the rate of return is maximum when the capital investment is minimum. Capital investment comprises two parts i.e. fixed assets and current assets. Investment of capital in fixed assets like land, building and plant and machinery is fixed and very little can be done to reduce it because of irreversible nature of decision. This leaves us with no choice except effective management of working capital, the major parts of which is invested in inventories.

### Profile of the company

Indian Farmers Fertiliser Cooperative Limited (IFFCO), one of the significant players of India's agriculture revolution and globally acclaimed largest fertilizer cooperative which has always been striving for socio-economic upliftment of the rural population of India. To ensure timely availability of quality fertilizers to the farmers, IFFCO was registered as a multi-unit cooperative society on 3rd November,

1967. The Society has grown in strength and stature from a modest membership of 57 societies in 1967-68 to 37,337 as on March 31, 2006. The initial equity capital of Rs. 6 lakh contributed by the cooperatives in 1967-68 has grown to staggering Rs. 456.87 crores in 2011-12 as on 31.3.2012 IFFCO is the largest producer in the country.

It has contributed 19.5 per cent to country's total nitrogenous fertilizer production and 24.4 per cent to total phosphatic production during the year 2011-12. Apart from its own growth and service to farmers, IFFCO has contributed towards creation and development of other organizations like Krishak Bharati Cooperative Ltd. (KRIBHCO), Godavari Fertilizers and Chemicals Ltd. (GFCL) and Industries Chemiques Du Senegal (ICS) that produces phosphoric acid in Senegal. It has also contributed to the equity of Indian Potash Limited (IPL), Maharashtra State Cooperative Ltd., Indian Tourism Cooperative Limited (COOPTOUR) and National Film and Arts Cooperative Limited (NAFFAC).

### Objective of the study

Inventory is the largest asset among current assets in manufacturing concerns. So, the study of different components of inventory (raw materials, work-in-progress and stores and spares) assumes greater significance in cost management and enhancement of profitability. The following are main objectives of the study:

- (i) To study the degree and significance of relationship between raw materials consumed & stock of raw material, works cost & stock of work-in-progress, sales & stock of finished goods and sales & total inventory.
- (ii) To make component-wise analysis of inventory items in order to identify the component requiring more attention of management.

### Limitations of the study

- (i) The study is confined to a period of 10 years only i.e. from 2001-02 to 2011-12 and based on secondary data only.
- (ii) The study focuses on inventory control practices to the extent of data available in annual reports only.

### Research Methodology

The study is based on the published annual reports of the company. The period of study ranges from 2001-02 to 2011-12. The data compiled from annual reports are analysed by employing the following tools:

#### Correlation (r)

Correlation is a statistical tool with the help of which we study the extent, nature and significance of association between the given variables. Correlation between cost of raw materials consumed & stock of raw materials, works cost & stock of work in progress, cost of production & stock of finished goods and spares consumed & stock of spares has been computed in this study.

$$r = \frac{N \sum dx dy - (\sum dx)(\sum dy)}{\sqrt{N \sum dx^2 (\sum dx)^2} \sqrt{N \sum dy^2 (\sum dy)^2}}$$

#### Coefficient of Determination (r<sup>2</sup>)

The coefficient of determination which explains the variation in dependent variable arisen out of independent variable is calculated for stocks of raw materials, work in progress, finished goods and stock of spares. The coefficient of determination is obtained by squaring the coefficient of correlation as.

$$r^2 = \frac{N \sum dx dy - (\sum dx)(\sum dy)}{\sqrt{N \sum dx^2 (\sum dx)^2} \sqrt{N \sum dy^2 (\sum dy)^2}}$$

### Test of Significance of Correlation

The variables studied becomes more meaningful if they justify the test of significance. The correlation ascertained is tested for its significance by the following formula:

$$t = \frac{r}{\sqrt{1-r^2}} \sqrt{n-2}$$

The calculated values are compared to tabular values at different levels of confidence for n-2 degrees of freedom.

Coefficient of correlation and probable Error (P.Er)

The probable error helps to determine the reliability of the value of coefficient of correlation. The probable error of the coefficient of correlation is obtained as follows:

$$P.Er = \frac{0.6745 \sqrt{1-r^2}}{\sqrt{1-r}}$$

"If the value of r is more than six times of the probable error, the coefficient of correlation is practically certain i.e. the value of r is significant" If the value of r is less than the probable error, there is no evidence of correlation i.e. the value of r is not significant at all.

#### Geometric mean (G.M.)

The compound rates of growth of numerous variables are worked out by geometric mean as:

$$G.M. = \frac{\text{Antilog} \left[ \frac{\sum \log X}{N} \right]}{N}$$

#### Coefficient of Variation (CV)

Coefficient of variation developed by Karl Pearson is the most commonly used measure of relative variation. It is used in such problems

where we want to compare the variability of two or more than two series

The formula for the coefficient of variation is as:

$$\text{C.V.} = \frac{\sigma}{\bar{x}} \times 100$$

### Analysis and findings

Before the start of study, it is pertinent to verify that the variables are correlated and further correlation should be significant in order to prove the study useful. Table I depicts that all the variables under the study are positively correlated. The least correlation + 0.082 exists between cost of stores and spares consumed and stock of stores and spares. The extent of correlation is highest (i.e. 0.9308) in case of raw materials consumed and stock of raw materials, followed by correlation of 0.8975 in case of inventory and current assets.

The probable error depicts that the value of r exceeds the six times of probable error in case of inventory & current assets, raw material consumption & stock of raw materials, sales & stock of finished goods and sales & total inventory. The probable error establishes the relationship between these variables as significant. The t-values holds that the correlation between these variables is significant at 99.5% confidence level for 8 degrees of freedom. In case of stores and spares, the correlation value of 0.082 between consumption of stores & spares and stock of stores and spares is minor and probable error & t-test both prove it insignificant at 90% for 6 degrees of freedom. However, in case of works cost & stock of work-in-progress, it signifies that relationship between stock of work-in-progress and works cost is significant at 95% for 8 degrees of freedom.

The square root of the growth rates of raw materials consumption, works cost, sales, consumption of spare parts and current assets

are 4.011, 8.74, 7.66, 5.563 and 3.59, respectively against the actual rates of 62.95, 57.45, 58.63, 11.21 and 12.86. This clearly portrays the scope for improvements in the area of inventory management of the company. The claim for improvements is further strengthened by the coefficient of determination ( $r^2$ ). The unexplained variations are to the extent of 13 per cent in raw materials stock, 57 per cent in stock of work-in-progress, 36 per cent in stock of finished goods, 99 per cent in stock of stores and spares revealed by determination. On the average, 19 per cent unexplained variations exist in aggregate inventory. In the modern age of information technology and fast means of transport, the communication lead time and transport lead time can be drastically reduced which can further substantially reduce investment in inventories and such released funds can alternatively be exploited to ameliorate the position of the company.

### Circular Ratios and Holding Period

In order to maximize the wealth of shareholders, all the components of inventory should be promptly circulated. Quick conversion of raw materials into sales improves the liquidity and profitability of the company which in turn reduces the future dependence on bank borrowings leading to reduction of interest charges.

Inventory turnover ratio is inversely related to holding of inventory in term of days raw material turnover. The Tandon Committee set-up by Reserve Bank of India recommended the holding standard for inventory in terms of months consumption.

As depicted by Table III, raw materials turnover ratio has risen from 5.76 in 2001 to 19.36 in 2007 and came down to 15.19 in 2012. The holding period has slid down from 63.32 days in 2001 to 24.03 in 2012. The work-in-progress stock as shown by Table really non-significant, and moreover control of work-in-progress depends upon the technological processes and

efforts of production engineer rather than Materials Manager. The stock of finished goods has been in excess of standard over the entire period of study. Though it came down near to standard of 36.5 days in 2008 but again spurted to 62 days in 2010. As regards stores and spares turnover ratio, the position is highly unsatisfactory. This is the area where the company should promptly initiate action. The holding period of stores and spares ranged from 1921 days (5.26 years) to 1460 days (4 years). The committee on inventory control of Bureau of Public Enterprises suggested that the holding of stores and spares should not exceed 12 months consumption in any enterprise. The study of turnover ratios and holding period reveals that as regards raw material inventory, the company is required to make slight efforts. In case of finished goods major efforts are required to be undertaken as the holding is almost twice of the standard. In case of spare parts inventory, drastic improvements must take place quickly. Either the stock of stores and spares is excessively procured in relation to anticipated usage or the stock of stores and spares has become obsolete which is not disposed off immediately.

### Structure and Composition of Inventory

If investment in current assets is to be reduced, the components of inventory must be cracked down being the controllable assets as compared to receivables. The study (as revealed in Table IV) points out that Geometric mean of all the components of inventory is more as compared to the beginning year of the study. The increase in the stock of all the components has enhanced the proportion of inventory in current assets from 26.74 in 2001 to average of 43.05. The standard deviation 4.486 and 3.528 reveals that more variation exists in the management of finished goods stock-and stores and spares, respectively. The coefficient of variation is relative measure which depicts that though in absolute terms raw materials discloses less variation (as revealed by standard deviation of

1.55) but relatively it is most inconsistently managed, followed by stock of finished goods and stock of stores and spares.

### Store and Spares - A Special focus

The proverbial saying "Many a little makes a mickle" highlights the importance of small savings. Economies in each area are pre-requisite for an efficient concern.

Table V shows that consumption of stores and spares as percentage of opening stock ranges maximum to 24.67 in 2010. In other words even in all the years amount of opening stock is too excessively high to meet the requirements of consumption still in all the years purchases were made of stores and spares. So, the management of the company is required to concentrate on the irrational purchases. The inventory control practices reveal that correlation ranges from very high to moderate among inventory items and the correlation is significant in case of all the components of inventory except stores and spares. The growth rates of stock of raw materials, work-in-progress, finished goods and total inventory is more than the ideal situation and provides clues for improvements. The stock of stores and spares requires the immediate attention of management in order to stop ruthless purchases. The amount of excess stock of stores and spares runs in crores whose carrying cost is borne unnecessarily. The company should be guided by "Pennywise pound foolish".

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**Table 1 Correlation and Test of Significance of Correlation.**

Variables of correlation	Coefficient of correlation (r)	Probable error	Probable error x 6	T Values	
				Calculated Value	Tabular Value
	1	2	3	4	5
Inventory and current assets	+0.8975	0.0415	0.2490	13.05	3.355
Raw material consumption and	+0.9308	0.0285	0.1719	6.69	3.355*
stock of raw materials	+0.6560	0.1358	0.8150	2.13	1.943**
Works cost and stock of work-in-progress				3.73	3.355*
Sales and stock of finished	+0.7972	0.0777	0.4664	0.20	1.440***
Stores and spares consumed and stock of stores and spares	+0.082	0.2369	1.4212	4.69	3.355"
Sales and total inventory	+0.8566	0.0568	0.3408		

t values at 99.5% or 8 degrees of freedom.

\*\*t values at 95% for 6 degrees of freedom,

\*\*\*t values at 90% for 6 degrees of freedom

**Table II Growth Rates of Variables and Coefficients of Determination**

Variables	Growth Rates	Coefficient of Determination	Square root of growth rates
Raw material consumption	16.087	0.8663	4.011
Stock of raw material	62.95		
Works cost	76.49	0.4303	8.74
Stock of work-in- progress	57.45		
Stock of finished goods	72.09	0.6355	7.66
Sales	58.63		

Consumption of stores and spares	30.948	0.0067	5.563
Stock of stores and spares	11.21		
Total inventory	79.13	0.8055	3.59
Current assets	12.86		

**Table III Inventory Turnover Ratios and Inventory Holding.**

Year ending March 31st	Raw material		Work-in-progress*		Finished goods		Stores and spares	
	Turnover Ratio	In Days	Turnover Ratio	In Days	Turnover Ratio	in Days	Turnover Ratio	In Days
2001	5.76	63.32	NA**	NA**	7.00	52.00	NA**	NA**
2002	10.39	35.13	NA**	NA**	5.00	73.00	NA**	NA**
2003	10.24	35.64	10.23	0.36	4.78	76.36	0.19	1921
2004	15.69	23.26	879	0.42	6.77	53.91	0.20	1825
2005	14.64	24.93	955	0.38	6.06	60.23	0.20	1825
2006	18.20	20.05	874	0.42	4.72	77.33	0.20	1825
2007	19.36	18.85	934	0.39	5.26	69.39	0.16	2281
2008	17.08	21.37	1520	0.24	9.99	36.50	0.23	1586
2010	17.73	20.59	355	1.03	5.83	62.60	0.25	1460
2012	15.19	24.03	249	1.46	6.66	54.80	0.22	1659
Standard recommended by Tandan Committee	0.75 Months		- Negligible		1 Month		12 Month***	

\* Ratio of W.I.P. turnovers ratio is calculated on the works cost which is computed from financial accounts by backward method

\*\* NA refers to figures Not Available

\*\*\* Standard given by Committee on Inventory control, Bureau of Public Enterprises, Govt. of India.

**Table IV Components of Inventory as Percentage of Current Assets.**

Year ending March 31st	Raw material	Works-in- progress	Finished goods	Stores and spares	Total
2001	6.04		14.00	6.69	26.74
2002	10.15	-	24.33	12.48	46.96

2003	10.12	0.09	23.42	18.87	52.50
2004	8.38	0.09	15.75	15.55	39.77
2005	9.78	0.07	19.49	14.23	43.57
2006	8.04	0.14	29.55	11.65	49.38
2007	8.97	0.08	22.48	11.37	42.92
2008	10.55	0.07	25.77	10.47	46.86
2010	9.56	0.47	23.99	8.26	42.28
2012	12.07	0.41	18.91	8.13	39.52
Total	99.66	1.42	217.69	117.7	430.5
Geometric mean(X)	9.37	0.1775	21.769	11.77	43.05
Standard deviation ()	1.55	0.1537	4.486	3.528	6.70
Coefficient of variation	6.045	1.15	4.852	3.336	6.42

**Table V Unjustified Purchases of Stores And Spares**  
(Amount in Rs. In lacs)

Year ending March 31	Opening Stock	Purchases	Closing stock	Consumption	Consumption as % of opening stock
2003	18286.10	7787.63	22197.37	3876.36	21.19
2004	22197.37	12709.24	29692.45	5214.16	23.49
2005	29692.45	6128.33	29785.90	6034.88	20.32
2006	29785.90	1971.07	26013.37	5743.60	19.28
2007	26013.37	3441.69	25261.93	4193.13	16.12
2008	25261.93	3586.65	23240.74	5607.84	22.20
2010	23240.74	4586.84	22093.84	5733.74	24.67
2012	22093.84	3408.76	20833.29	4669.31	21.13

Though the schedules of annual reports do not make ready reference to the consumption of stores and spares still the information is derived as:

$$\text{Consumption} = \text{Purchases} + \text{Opening stock} - \text{Closing stock}$$

After deriving the consumption of stores and spares, Table No. V is prepared.

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