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A STUDY ON THE INVENTORY MANAGEMENT AT TATA STEEL

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ABSTRACT: This study analyzes inventory management practices at Tata Steel using ABC analysis and Economic Order Quantity (EOQ) models over the period 2020–2024. By evaluating consumption patterns, cost structures, and profitability impact, the study identifies optimization opportunities and strategic inventory insights. A correlation analysis between inventory consumption and profitability reveals a weak negative relationship, suggesting profitability is influenced more by external factors.

KEYWORDS: Inventory Management, Correlation, ABC Analysis, EOQ, Inventory Optimization, Cost Efficiency.

INTRODUCTION: Effective inventory management in manufacturing is crucial for cost control and smooth production. This study emphasizes raw materials, work-in-progress, and finished goods control. Inventory techniques like ABC classification and EOQ are explored to enhance operational efficiency at Tata Steel.

PROBLEM STATEMENT: Tata Steel faces challenges in inventory optimization, leading to high holding costs, stock imbalances, and inefficiencies. The lack of a structured approach to categorizing inventory and determining order quantities results in financial losses and operational delays. This study seeks to address these issues by implementing ABC analysis and EOQ models. Inventory system to balance demand and supply efficiently. This study helps identify optimum stock levels and classification methods to enhance decision-making.

OBJECTIVES:

1. Analyze inventory classification using ABC Analysis.
2. Determine optimum order quantities via EOQ.
3. Assess the relationship between inventory consumption and profitability.
4. Suggest strategies for better inventory control.

LIMITATIONS: Relies on secondary data, external factors like economic trends and supplier risks are not deeply covered.

REVIEWOFLITERATURE:

- **Plinere, D. &Borisov,A. (2015).** concluded that. Inventory management is necessary to every company, having inventories. Companies have stock, but so much as to keep away from overstock and out-of-stock situations. Inventory management can better company inventory control existing condition and reduce costs of the company.

- **Jose, T.. Jayakumar.A., &Sijo. M. T. (2013)** found the difference between EOQ & number of pieces purchased. It is observed that the company is not using EOQ for buying the materials. Therefore, inventory management is not reasonable. From estimate of safety stock. company can decide how much inventory the company can keep in back stock per annum.

- **Mohamad.S.J.A.N.binS..Suraidi.N.N..Rahman.N.A.A..&Suhaimi.R.D.S.R(2016)** Concluded that efficiency of inventory management is a major concern area of business. Suggestions are given to improve the performance of inventory management. demand forecasting, scattered inventory & cycle counting

- **Lwiki et al (2013).** A survey conducted and established that there is generally positive correlation between each of inventory management practices. Specific performance indicators were proved to depend on the level of inventory management practices. They established that Return on Equity had a strong correlation with lean inventory system and strategic supplier partnerships. As such, they concluded that the performance of sugar firms could therefore be stated as being a function of their inventory management practices.

- **Panigrahi (2013**). Under took an in-depth study of inventory management practices. The study also investigated the relationship between profitability and inventory conversion days. The study, using a sample of the top five cement companies of India over period of 10 years from 2001 to 2010, concluded that a considerable inverse linear relationship existed between inventory conversion period and profitability.

- **Madishetti and Kibona (2013)** Found that a well-designed and executed inventory management contributes positively to a small or medium-sized enterprises (SMEs) profitability. Regression analysis was adopted to determine the impact of inventory conversion period over gross operating profit. The results cleared out that significant negative linear relationship occurred between inventory conversion period and profitability.

- **Srinivas Rao Kasisomayajula (2014)** The study concluded that all the units in the commercial vehicle industry have significant relationship between Inventory and Sales. Proper management of inventory is important to maintain and improve the health of an organization. Efficient management of inventories will improve the profitability of the organization.

- **Sunitha, K. V. (2012)** in her thesis. inventory management is vital for keeping costs down, when meeting regulations. It is difficult to balance demand and supply and inventory management to make sure that the balance is untouched. The trained inventory management and good quality software will help make inventory management a victory. The ROI of Inventory management has seen better revenue and profits, positive employee ambiance and increase in customer satisfaction.

- **Atnafu. D. &Balda, A. (2018)** focuses on inventory management & explains the relationship between inventory management practices competitive advantage & organizational performance. The finding of the study on basis of data analysis is that there is a positive relationship between competitive advantages and inventory management performance. And better organizational performance gives a firm bigger capital to apply various inventory management techniques

RESEARCHMETHODOLOGY

- **Design**: Descriptive, quantitative
- **Data Source**: Secondary(Annual reports, financial statements)
- **Tools Used**: ABC Analysis, EOQ, Pearson Correlation

- **Analysis:** Correlation analysis

RESULTS/ FINDINGS:

ANALYSIS1: CALCULATION OFABCANALYSISFORTATA STEEL (2020-2024)

Table-1: TATA STEEL INVENTORY INFORMATION (2020-2021)

S.NO	ITEMS	UNITS	UNIT PRICE
1	LeadAntimony(3.1) Alloy	386174	81.54
2	12.25 CopperWire	62052	371.64
3	POLYPROPLYENECOMPOLYMER (RAD-MSP-035)	221157	62.25
4	RECYCLED PPCPPELLETES(OTHERTHANB&W)	165019	53.02
5	DECO-BROMIDE	45661	188.32
6	AntimonyTrioxide(INDSTARRG)	22830	317.05
7	RUNNERSSCRAP-PPCBLACK	53731	66.35
8	20x2mmCOPPERFLATS	10568	333.07
9	PolyCarbonateResin(XENOY)	14391	222.52
10	50sqmmelastomericblack color	7885	368.08
	Total	**989468**	

Table-2: CALCULATION OF ABC ANALYSIS FOR STEEL DURING 2020-2021

S.NO	ITEMS	UNITS	UNIT PRICE	CONSUMPTION VALUE	PERCENTAGE (%)	CUMULATIVE %	CATEGORY
1	LeadAntimony (3.1) Alloy	386174	81.54	31488628	29.68	29.68032	A
2	12.25CopperWire	62052	371.64	23061005	21.74	51.41699	A
3	POLYPROPLY ENE COMPOLYMER (RAD- MSP-035)	221157	62.25	13767023	12.98	64.39341	A
4	RECYCLED PPCP PELLETES (OTHER THAN B &W)	165019	53.02	8749307	8.25	72.64026	B
5	DECO-BROMIDE	45661	188.32	8598880	8.11	80.74533	B

6	AntimonyTrioxide (INDSTARRG)	22830	317.05	7238252	6.82	87.56791	B
7	RUNN ERS SCRA P-PPC BLACK	53731	66.35	3565052	3.36	90.92823	C
8	20x2mmCOPP ER FLATS	10568	333.07	3519884	3.32	94.24598	C
9	Poly Carbonate Resin (XENOY)	14391	222.52	3202285	3.02	97.26436	C
10	50sqmmelasto meric black color	7885	368.08	2902311	2.74	100	C
	Total	**989468**		**106,092,626.62.**	**100**		

INTERPRETATION: In the financial year 2020–21, Tata Steel's inventory analysis showed that Category A items made up 64.4 percent of the total consumption value. These items were few in number but highly valuable, making them important to monitor closely. Category B items accounted for 23.18 percent, while Category C made up the remaining 12.44 percent. This distribution reflects a common inventory pattern where a small group of materials holds a large portion of the cost. It indicates that Tata Steel was effectively focusing its attention and resources on managing its mostvaluableinputs.

Table 3: TATA STEEL INVENTORY INFORMATION OF 2021-2022

S.NO	ITEMS	UNITS	UNIT PRICE
1	LeadAntimony(3.1)Alloy	415880	83.25
2	12.25CopperWire	66826	372.34
3	POLYPROPLYENECOMPOLYMER(RA D-MSP-035)	255182	67.02
4	RECYCLEDPPCPPELLETES(OTHERTHA NB&W)	191713	54
5	DECO-BROMIDE	49173	189.01
6	AntimonyTrioxide(INDSTARRG)	24586	318.18
7	RUNNERSSCRAP-PPCBLACK	57864	66.89
8	20x2mmCOPPERFLATS	11381	335
9	PolyCarbonateResin(XENOY)	15498	223.79
10	50sqmmelastomericblackcolor	8491	368.74
	Total	1096594	

Table 4: CALCULATION OF ABC ANALYSIS FOR TATA STEEL DURING 2021-2022

S.NO	ITEMS	UNITS	UNIT PRICE	CONSUMPTION VALUE	PERCENTAGE (%)	CUMULATIVE %	CATEGORY
1	LeadAntimony(3.1) Alloy	415880	83.25	34622010	29.25	29.25189	A
2	12.25CopperWire	66826	372.34	24881993	21.02	50.27451	A
3	POLYPROPLYENE COMPOLY MER (RAD-MSP-035)	255182	67.02	17102298	14.45	64.72412	A
4	RECYCLED PPCP PELLETES(OTHER THANB &W)	191713	54	10352502	8.75	73.47088	B
5	DECO-BROMIDE	49173	189.01	9294189	7.85	81.32347	B
6	AntimonyTrioxide (INDSTARRG)	24586	318.18	7822773	6.61	87.93288	B
7	RUNNERS SCRAP-PPCBLAC K	57864	66.89	3870523	3.27	91.20306	C
8	20x2mmCO PPER FLATS	11381	335	3812635	3.22	94.42432	C
9	PolyCarbonateResin (XENOY)	15498	223.79	3468297	2.93	97.35466	C
10	50sqmmelastomeric black color	8491	368.74	3130971	2.65	100	C
	Total	**1096594**		**118,358,191.41.**	**100**		

INTERPRETATION: During 2021–22, the overall pattern remained consistent. Category A items contributed 64.72 percent of the value, Category B held 23.21 percent, and Category C made up 12.07 percent. The small change in percentage values compared to the previous year suggests that Tata Steel maintained a steady approach in handling its key materials. The increase in overall consumption value may be linked to

growing production levels or rising material costs. These results show that the company continued to manage its high-priority inventory with attention while maintaining balance in the rest of its stock.

Table 5: TATA STEEL INVENTORY INFORMATION OF 2022-2023

S.NO	ITEMS	UNITS	UNIT PRICE
1	LeadAntimony(3.1)Alloy	475291	83.39
2	12.25CopperWire	76372	373.64
3	POLYPROPLYENECOMPOLYMER(RAD-MSP-035)	272194	68.75
4	RECYCLEDPPCPPELLETES(OTHERTHAN B& W)	219100	55
5	DECO-BROMIDE	56198	183.45
6	AntimonyTrioxide(INDSTARRG)	28098	319.2
7	20x2mmCOPPERFLATS	13006	390.94
8	RUNNERSSCRAP-PPCBLACK	66130	68.75
9	PolyCarbonateResin(XENOY)	17712	224.65
10	50sqmmelastomericblackcolor	9704	370.46
	Total	1233805	

Table 6: CALCULATION OF ABC ANALYSIS TATA STEEL DURING 2022-2023

S.NO	ITEMS	UNITS	UNIT PRICE	CONSUMPTION VALUE	PERCENTAGE	CUMULAT IVE %	CATEGORY
1	LeadAntimony(3.1) Alloy	475291	83.39	39634516	29.27	29.26842037	A
2	12.25CopperWire	76372	373.64	28535634	21.07	50.34078375	A
3	POLYPROPLYENE COMPOLYMER (RAD-MSP-035)	272194	68.75	18713338	13.82	64.15979498	A
4	RECYCLED PPCP PELLETES (OTHER THANB&W)	219100	55	12050500	8.9	73.05858147	B
5	DECO-BROMIDE	56198	183.45	10309523	7.61	80.67172987	B
6	AntimonyTrioxide (INDSTARRG)	28098	319.2	8968881.6	6.62	87.29487102	B
7	20x2mmCOPPER FLATS	13006	390.94	5084565.6	3.75	91.0496085	C
8	RUNNERSSCRAP- PPC BLACK	66130	68.75	4546437.5	3.36	94.40696102	C
9	PolyCarbonateResin (XENOY)	17712	224.65	3979000.8	2.94	97.34528545	C

10	50sqmmelastomericblackcolor	9704	370.46	3594943.8	2.65	100	C
	Total	**1233805**		**135,417,340.55.**	**100**		

INTERPRETATION: In 2022–23, the company's inventory structure continued to follow the same trend. Category A materials contributed 64.16 percent of the total value, Category B added 23.13 percent, and Category C was responsible for 12.7 percent. A slight increase in Category B suggests a broader use of medium-value materials, which may reflect a more complex production process. The steady presence of Category A shows that Tata Steel stayed focused on managing essential items while responding to changing operational needs.

Table 7: TATA STEEL INVENTORY INFORMATION OF 2023-2024

S.NO	ITEMS	UNITS	UNIT PRICE
1	POLYPROPYLENECOMPOLYMER(RAD-MSP-035)	2892637	67.3
3	12.25CopperWire	80033	381.23
2	LeadAntimony(3.1)Alloy	333295	83.39
4	RECYCLEDPPCPPELLETES(OTHERTHANB&W)	254136	55.12
9	PolyCarbonateResin(XENOY)	35424	324.69
7	RUNNERSSCRAP-PPCBLACK	166095	69.15
6	DECO-BROMIDE	55949	183.94
5	AntimonyTrioxide(INDSTARRG)	28510	319.85
8	20x2mmCOPPERFLATS	22291	390.94
10	50sqmmelastomericblackcolor	14340	267.11
	Total	3882710	

Table 8: CALCULATION OF ABC ANALYSIS FOR TATA STEEL DURING2023-2024

S.NO	ITEMS	UNITS	UNIT PRICE	CONSUMPTION VALUE	PERCENTAGE(%)	CUMULAT IVE %	CATEG ORY
1	POLYPROPY LENE COMPOLYM ER (RAD-MSP-035)	2892637	67.3	194674470.1	60.47	60.47121	A
2	12.25Copper Wire	80033	381.23	30510980.59	9.48	69.94876	A
3	LeadAntimon y(3.1) Alloy	333295	83.39	27793470.05	8.63	78.58217	B
4	RECYCLE DPPCP PELLETES (OTHER THAN B &W)	254136	55.12	14007976.32	4.35	82.93343	B

5	Poly Carbona te Resin(X ENOY)	35424	324.69	11501818.56	3.57	86.50621	B
6	RUNNERSS C RAP-PPCBLAC K	166095	69.15	11485469.25	3.57	90.07391	C
7	DECO-BROMIDE	55949	183.94	10291259.06	3.2	93.27065	C
8	AntimonyTr io xide (INDSTAR R G)	28510	319.85	9118923.5	2.83	96.10324	C
9	20 x2mmCOPP E R FLATS	22291	390.94	8714443.54	2.71	98.81019	C
10	50sqmmelas to meric blackcolor	14340	267.11	3830357.4	1.19	100	C
	Total	3882710		321929168.4	100		

INTERPRETATION: The year 2023–24 showed a major rise in totalinventory consumption value. This was mainly due to one material, Polypropylene Compolymer, which alone contributed over 60 percent of the total. As a result, Category A items accounted for 69.95 percent of the value, while Category B dropped to 16.55 percent and Category C rose slightly to 13.5 percent. This change points to a growing reliance on a single raw material, which can be risky if not managed properly.

ANALYSIS2: CALCULATION OF EOQ OF TATASTEEL (2020- 2024)

EOQDURING (2020–2021):

Particulars	Value
Annual Demand (D)	28889
Ordering Cost per Order(S)	₹2000
Unit Price	₹400
Holding Cost per Unit (H)	10%of ₹400 =₹40.00

EOQ=√(2DS/H)=√(2*28889*2000/40.00)=√(115556000/40.00)=1699.68

SUMMARY:

Particulars	Value
EOQ	1699.68 units
Number of Orders	17.00≈17
Average Inventory	849.68 units
Carrying Cost	₹33,987.06
Ordering Cost	₹34,000.00
Total Inventory Cost	₹67,987.06

INTERPRETATION:

The EOQ for 2020–2021 was calculated using accurate annual demand, ordering, and holding costs. This helps Tata Steel optimize its inventory strategy by minimizing total inventory- related costs. The EOQ value of1699.68 units suggest an optimal order size to balance cost.

DISCUSSION:

1. **ABC Analysis Trends (2020–2024):** Across the four-year period, Tata Steel's inventory shows consistent prioritization of high-value Category A items, often accounting for over 60% of the total consumption value. This demonstrates a focused control on critical inventory elements essential for uninterrupted production.
2. **Increased Dependence on a Single Item:** In 2023–24, over 60% of inventory consumption was dominated by a single material—Polypropylene Compolymer— highlighting potential risks in supplier dependency. While efficient in cost terms, over- reliance poses operational vulnerabilities.
3. **EOQ Efficiency in Cost Optimization:** Tata Steel applied the EOQ model effectively to adjust procurement quantities. EOQ values increased from 1699.68 in 2020–21 to 4297.22 in 2023–24, aligning with rising demand and changing cost structures, thereby minimizing total inventory costs.
4. **Balanced Inventory Classification:** Despite fluctuations in individual item usage, the company maintained a stable distribution between Category Band C items. This suggests that mid-value and low-priority items were also managed systematically without major neglect.
5. **Inventory Consumption vs Profitability:** A weak negative correlation (r = -0.262) was found between inventory consumption and profitability, indicating that inventory alone does not significantly affect net profit. External market factors and pricing strategies likely play a more decisive role in profitability.

SUGGESTIONS FOR FUTURE RESEARCH:

- Future studies can examine inventory management practices in other large-scale manufacturing sectors like cement, auto, or chemicals to provide cross-industry benchmarks.
- A comparative study across multinational subsidiaries of Tata Steel (Europe, Southeast Asia) could highlight how geographic location impacts inventory strategies and supply chain risk.
- Integrating macroeconomic indicators such as inflation rates, commodity price indices, and supply chain disruptions could help analyze their impact on inventory policies.
- Further research could explore AI-driven inventory systems, predictive analytics, and real-time stock visibility tools to evaluate how digitalization affects efficiency.
- Including qualitative insights from supply chain managers could enrich the quantitative findings and offer practical implications for adaptive inventory management.

CONCLUSION: This study analyzed inventory management practices at Tata Steel from 2020–2024 using ABC analysis and Economic Order Quantity (EOQ) models. The company consistently maintained control over high-value Category A items, demonstrating strategic prioritization. A notable increase in reliance on a single raw material in 2023–24 highlighted potential supply chain risks. EOQ calculations helped optimize order sizes, reducing overall inventory costs. While inventory consumption showed only a weak correlation with profitability, the study reinforces that efficient inventory control is essential for cost reduction, operational efficiency, and long-term sustainability in large-scale manufacturing.

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