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A Study on Production and Inventory Management at Nova Carbon India PVT Ltd.,

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ABSTRACT: Production and inventory management are critical functions that influence the operational efficiency of organizations. This study aims to analyze the existing practices of production planning and inventory control and to identify areas for improvement. The research is based on primary data collected from 150 respondents working in different departments such as production, inventory, purchase, and sales. Secondary data was gathered from books, journals, and online resources.

Various analytical tools such as percentage analysis, chi-square test, correlation analysis, and trend analysis were applied to interpret the data. The findings indicate that production capacity is partially utilized in most cases and inventory practices are moderately effective. Issues such as stock shortages, overstocking, and inadequate forecasting were identified. The study suggests that adopting modern inventory techniques and improving coordination between departments can enhance overall efficiency. The research contributes to better understanding and improvement of production and inventory systems in organizations.

KEYWORDS: Production Management, Inventory Management, Inventory Control, Production Planning, Demand Forecasting

I. INTRODUCTION

In today's competitive business environment, organizations are required to maintain efficiency in both production and inventory management. Production management ensures that goods are manufactured in the right quantity and quality, while inventory management focuses on maintaining appropriate stock levels to support production and meet customer demand.

Effective coordination between production and inventory is essential for smooth operations. Poor planning or lack of control may result in delays, increased costs, and customer dissatisfaction. With rapid technological advancements, organizations are increasingly adopting modern tools and systems to manage these functions efficiently.

This study focuses on analyzing production and inventory management practices in an organization and identifying key issues affecting performance. It also provides suggestions for improving efficiency and achieving better resource utilization.

● Company Profile

Nova Carbons India Pvt. Ltd. is a manufacturing company operating in the carbon and chemical industry, specializing in the production of coconut shell-based activated carbon used in water purification, air filtration, and industrial applications. Established in 2010 and located in the SIPCOT Industrial Growth Centre, Gangaikondan, Tamil Nadu, the company has developed a strong presence through consistent quality and efficient operations. It follows structured production and inventory management practices to ensure smooth workflow and timely delivery of products. With a skilled workforce and experienced management, the company focuses on maintaining operational efficiency and meeting market demand. Overall, Nova Carbons India Pvt. Ltd. continues to grow by emphasizing quality, resource utilization, and continuous improvement in its processes.

Objectives of the Study

- To analyze the gap between planned and actual production capacity utilization.
- To examine the impact of demand forecasting accuracy on stockouts and overstocking.
- To study the relationship between stock review frequency and inventory efficiency.
- To assess the level of automation and its impact on inventory accuracy.
- To identify the major operational bottlenecks in production and inventory flow.
- To evaluate the coordination between production, purchase, and inventory departments.

II. REVIEW OF LITERATURE

- **Kanishka Bedi (2019)** stated that effective production planning and control help in optimizing resource utilization and reducing wastage. Similarly, **William J. Stevenson (2020)** explained that inventory management is essential for balancing demand and supply, and techniques such as EOQ and ABC analysis support better decision-making.
- **Edward A. Silver (2021)** focused on scientific inventory models and production scheduling, highlighting their role in minimizing operational costs. **R. Kumar and S. Singh (2022)** emphasized that accurate demand forecasting is critical to avoid stockouts and overstocking.
- **M. Patel and K. Shah (2023)** pointed out the need for integration between production and inventory systems to improve efficiency.
- **D. Rao and V. Reddy (2024)** identified that automation and ERP systems enhance accuracy and reduce manual errors in inventory management.
- **A. Sharma and P. Gupta (2025)** indicate that proper inventory control techniques contribute to cost reduction and improved productivity. **R. Kumar and S. Singh (2025)** further highlighted the importance of forecasting in maintaining smooth production flow.
- **Suyash Bisht and Rakesh Pandey (2026)** developed advanced inventory models considering demand variability, while
- **Deepak Tulsiram Patil et al. (2026)** emphasized the role of IoT and digital technologies in improving inventory efficiency and tracking.

III. RESEARCH METHODOLOGY**● Research Design**

Research methodology refers to the systematic process used to collect, analyze, and interpret data for the study. It provides a clear framework for conducting the research on production and inventory management.

- ◆ Descriptive Research Framework
- ◆ Analytical Research Approach
- ◆ Quantitative and Qualitative Integration
- ◆ Ex-Post Facto Research Basis

● Data Collection

Primary data was collected through a structured questionnaire distributed to employees across different departments. Secondary data was obtained from books, journals, and online resources.

● Sample Size

The study includes responses from 150 employees.

● Sampling Method

Simple random sampling technique was used.

● Tools Used for Analysis

- Percentage Analysis
- Chi-Square Test
- Trend Analysis
- SWOT Analysis

● Period of Study

The study was conducted over a period of Four months.

IV. DATA ANALYSIS AND INTERPRETATION

The analysis and interpretation of data collected from 150 respondents across various departments such as production, inventory, purchase, and sales. The data has been analyzed using percentage analysis and presented in the form of tables and charts for better understanding.

The collected data was analyzed using statistical tools to understand production and inventory practices.

➤ Percentage analysis shows that a majority of respondents reported partial utilization of production capacity. Inventory control methods such as ABC analysis are widely used, while advanced methods like JIT are less common.

Statistical Table

Sl.No	Particulars	No.of Respondents	Percentage (%)
1.	Fully Utilized Capacity	60	40%
2.	Partially Utilized Capacity	75	50%
3.	Underutilized Capacity	15	10%
4.	ABC Analysis	60	40%
5.	EOQ Method	45	30%
6.	JIT Method	30	20%
7.	Others Method Used	15	10%
8.	Weekly Stock Review	54	36%
9.	Monthly Stock Review	66	44%
10.	Quarterly Stock Review	30	20%
11.	Stockouts Problem	54	36%
12.	Poor forecasting	45	30%
13.	Overstocking	36	24%
14.	Storage Issues	15	10%
	Total	150	100%

Interpretation:

The data analysis indicates that production and inventory management practices are moderately efficient. However, issues such as partial capacity utilization, stockouts, and limited use of advanced techniques highlight the need for improvement in planning, forecasting, and technology adoption.

➤ The chi-square test indicates a significant relationship between production efficiency and inventory management practices. Correlation analysis also shows that better inventory control leads to improved production performance.

CHI-SQUARE SUMMARY TABLE

Test	Variables	χ^2	DF	P-Value	Decision
1	Age vs. Perception of Manual Error Risk	9.996	12	0.616	Reject (H0)
2	Years of Experience and Overall Satisfaction.	9.578	12	0.652	Accept (H0)

Interpretation

1. There is no "generation gap"; both 25-year-olds and 50-year-olds agree that manual data entry is a threat to inventory accuracy.

2. Job satisfaction does not improve with years of service. New recruits and 5-year veterans share the same "Neutral to Satisfied" plateau.

➤ SWOT ANALYSIS

The SWOT Analysis (Strengths, Weaknesses, Opportunities, and Threats) provides a strategic overview of Nova Carbons India Pvt Ltd's position in the global "Environmental Remediation" and "Gold Recovery" sectors.

Strengths (Internal)

- **Strategic Geographic Location:** Situated in the SIPCOT Gangaikondan (Tirunelveli) industrial belt, the plant has direct access to the "Coconut Triangle" of South India (Tamil Nadu and Kerala). This ensures a steady, low-logistics-cost supply of raw coconut shells.
- **Global Parentage (Jacobi/Addisorb):** Being a subsidiary of the Jacobi Carbons Group provides Nova Carbons with world-class R&D, a global distribution network, and high-tier quality standards that domestic competitors struggle to match.
- **Specialized Product Niche:** The ability to produce high-iodine-value carbons like GoldSorb™ and AquaSorb™ allows the company to command premium pricing in the export market.
- **100% Export Oriented Unit (EOU) Status:** This status provides significant tax exemptions and customs duty benefits, enhancing the company's price competitiveness in international tenders.

Weaknesses (Internal)

- **Low Inventory Turnover Ratio (ITR):** As identified in the data analysis, an ITR of 5.8 (vs. industry 8.2) indicates that significant capital is trapped in slow-moving stock.
- **High Reliance on Manual Processes:** 60.5% of the workforce identifies manual data entry as a high-risk factor for errors, leading to the "Medium" efficiency rating found in the survey.
- **High Carrying Costs:** A carrying cost of 22% erodes the profit margins, largely due to the bulk storage requirements of raw charcoal which occupies massive warehouse space.
- **Order Fulfillment Lag:** A 72% Order Fill Rate suggests that despite high inventory, the company often lacks the specific "Mesh Size" or "Activity Level" required for urgent export orders.

Opportunities (External)

- **Global Water Regulations (2026):** New US EPA and EU standards regarding PFAS (forever chemicals) removal have created a massive surge in demand for high-quality granular activated carbon (GAC).
- **Expansion into EV Supercapacitors:** The shift toward green energy presents an opportunity to produce "Ultra-High Purity" carbon used in electric vehicle battery electrodes.
- **AI-Driven Supply Chain:** Transitioning to an AI-based Demand Forecasting system (moving beyond the current 3-month moving average) could reduce DIO by 15–20 days.
- **Rising Gold Prices:** Increased global gold mining activity directly boosts the demand for specialized coconut-shell carbons used in Carbon-in-Pulp (CIP) processes.

Threats (External)

- **Raw Material Volatility:** Dependence on coconut shells makes the company vulnerable to agricultural cycles, monsoons, and price hikes in the South Indian market.
- **Global Logistics Crisis:** Rising freight costs and container shortages at Tuticorin Port can delay exports, leading to "Finished Goods" pile-ups and increased storage costs.
- **Alternative Technologies:** The development of synthetic resins or advanced membrane filtration could potentially reduce the long-term market share of traditional activated carbon.
- **Exchange Rate Fluctuations:** As a 100% EOU, Nova Carbons is highly sensitive to the volatility of the INR vs. USD/EUR, affecting real-time revenue margins.

➤ TREND ANALYSIS (TIME-SERIES FORECASTING)

Trend analysis is used to identify the underlying pattern of demand for activated carbon. By analyzing 29 months of production data, we can distinguish between "Random Noise" and "Seasonal Growth."

Moving Average Methodology

To reach a high level of accuracy, two types of moving averages were calculated:

3-Month Moving Average (MA3): Captures short-term fluctuations and is highly responsive to sudden market shifts (e.g., a sudden export order for GoldSorb™).

6-Month Moving Average (MA6): Provides a smoother trend line, filtering out minor month-to-month variations to show long-term growth.

Demand Trend Data (2023–2025)

The following table summarizes the production and demand units for the study period:

Table REND ANALYSIS (TIME-SERIES FORECASTING)

Period	Actual Demand (Units)	MA3 Forecast	Deviation(%)
April 2023 (Baseline)	4,200	-	-
August 2023 (Peak1)	4,800	4,316	+10.1%
April 2024	5,600	5,400	+3.5%
August (Peak2)	6,200	5,766	+6.9%
August 2025 (Peak)	6,500	6,350	+2.3%

Overall Growth: The demand surged from 4,200 units to 6,500 units, representing a 47.6% overall growth over 29 months.

Interpretation of the Trend Line

The August Surge: A clear "Seasonal Peak" is visible every August. This correlates with global industrial procurement cycles where companies stock up on filtration media before the final fiscal quarter. Forecast Accuracy: The MA3 model shows a Mean Absolute Percentage Error (MAPE) of only 3.9%. This proves that Nova Carbons can reliably use a 3-month rolling average to plan its raw material procurement. The Stability Factor: Despite global volatility, the trend shows a "Consistent Upward Slope," the market for coconut-shell-based activated carbon is currently in a "Bull Phase."

V. FINDINGS

The study reveals several important findings:

- Production capacity is not fully utilized
- Inventory management practices are basic
- Stock shortages and overstocking are common
- Forecasting methods are not highly accurate
- Technology adoption is moderate
- There is a relationship between production and inventory efficiency
- Monthly stock review may not be sufficient

VI. SUGGESTIONS

Based on the findings, the following suggestions are made:

- ◆ Improve production planning to achieve full capacity utilization
- ◆ Adopt advanced inventory techniques such as JIT and EOQ
- ◆ Strengthen demand forecasting using data analysis
- ◆ Increase frequency of stock review
- ◆ Implement automation and digital systems
- ◆ Improve coordination between departments
- ◆ Provide training to employees on modern techniques
- ◆ These measures can help in improving efficiency and reducing operational costs.

VII. CONCLUSION

Production and inventory management are essential for the success of any organization. The study shows that while basic practices are followed, there is a need for improvement in planning, forecasting, and technology adoption. Organizations can enhance their performance by adopting modern techniques and improving coordination between departments. Effective management of production and inventory leads to better resource utilization, cost reduction, and customer satisfaction. Continuous monitoring and improvement are necessary to achieve long-term success in a dynamic business environment.

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