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Comparative Study of SAP Technique Based Material Management Impact Compared to Conventional Manual Methods in Construction Practices

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Abstract – Material management plays a vital role in construction, significantly impacting project costs, efficiency, and overall success. In both commercial and residential projects, materials contribute over 60% of total expenditures, emphasizing the need for an efficient management system. Traditional manual tracking methods often result in inefficiencies, delays, and cost overruns. However, technological advancements, particularly System Application and Product (SAP) software, have revolutionized material management by optimizing procurement, inventory control, and consumption tracking. Implementing SAP enhances productivity, minimizes waste, and ensures timely project completion. An efficient material management system ensures the right quality and quantity of materials are procured, delivered, and handled effectively at a reasonable cost. This study compares traditional methods with SAP-based solutions, highlighting their advantages. A survey conducted across construction firms in Chennai provides insights into current material management practices. The research focuses on SAP's impact on cost control, inventory management, procurement efficiency, and overall operational effectiveness in the construction industry.

Keywords – SAP (System Application & Product) Material management, Conventional Material Management, Inventory Management, Procurement & Operational Cost Management.

I. Introduction

In the modern construction industry, material management plays a pivotal role, as materials contribute more than 60% of the total project cost. Effective material management is essential not only for controlling project expenses but also for ensuring timely project delivery and quality assurance. It involves the systematic planning, procurement, storage, distribution, and utilization of construction materials. Poor

material management can lead to significant project delays, cost overruns, and increased wastage. Traditional manual methods of material management often suffer from inaccuracies, data delays, and lack of real-time visibility, resulting in operational inefficiencies. In contrast, digital solutions such as SAP Material Management (SAP MM) offer integrated, real-time data management platforms that enhance procurement planning, inventory control, and logistics tracking. By providing centralized data storage, real-time updates, and improved communication, SAP MM has the potential to significantly improve construction project performance. Despite the growing adoption of digital tools, many construction firms still rely on conventional manual practices. This study aims to critically evaluate the differences between SAP MM-based material management and conventional methods in the construction sector. Specifically, it investigates their respective impacts on procurement efficiency, inventory control, labor cost reduction, and financial management.

By using SAP, 100% of data related to material management is centrally stored on a secure server, ensuring seamless access and real-time updates. An SAP system enhances communication within an organization by providing accurate and timely information whenever required. Compared to Traditional manual tracking methods (conventional MM), The study explores key processes involved in both SAP-based and traditional manual tracking methods in material management and their impact on construction efficiency.

The core processes involved include i.e.

Planning,

Procurement,

Logistics,

and Inventory Management.

Functions of Material Management

To achieve the material management, its functions can be categorized into primary and secondary functions.

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Primary Functions

Materials Requirements Planning.

Purchasing.

Inventory Planning and Control.

Ascertaining and Maintaining the Flow and Supply of Materials.

Quality Control of Materials.

Departmental Efficiency

Secondary Functions.

Standardization and Simplification.

Make and Buy Decisions.

Coding and Classification of Materials.

Forecasting and Planning

Challenges in (conventional) Manual Material Management

Absence of Real-Time Inventory Tracking

Inaccurate Demand Forecasting

Limited Digitalization in Material Management

Cost Overruns and Sustainability Issues

Operational Disruptions in Material Flow

Procurement Inaccuracies and Overstocking

Challenges in Compliance with Industry Standards

To Achieve Efficient Material Management in Construction firm

Enhancing efficiency and cost-effectiveness in material handling.

Balancing stock levels to avoid shortages and overstocking.

Enhancing procurement efficiency through automation and standardization.

Implementing strategies to reduce waste, promoting sustainability and cost savings.

Reducing expenses related to material storage and logistics to improve profitability.

Ensuring materials meet required standards to enhance construction quality.

Collaborating with reliable suppliers for timely and quality material supply.

Maintaining a steady flow of materials to prevent project delays.

Literature Review

N. B. Kasim, Peniel Ang Soon Ern (2010) had discussed process of material management. They have taken interview and questionnaire survey of A class contractors in Malaysia. The questionnaire survey was taken on implementation of ICT and interview was taken on acceptance of ICT for material management. They found that, main barrier of implementation of ICT is high cost and there was just average level of acceptance of ICT by the industries. In construction industries, for material management Microsoft office and handheld devices are widely adopted but bar code and RFID tools are not adopted

A.R. Patil (2013) mention that the efficient procurement of material represents a key role in the successful completion of the work. Poor planning and control of material, lack of material when needed, poor identification of material, re- handling and inadequate storage cause losses in labor productivity and overall delays that can indirectly increase total project cost.

Nawaj Kalim Hannur SushmaShekharKulkarni (2014) they have surveyed & studied current material management practices followed in the seven different construction companies in Pune, Maharashtra. They have suggested that there is need to change in process of material management. They have recommended using ICT Techniques to manage the material. By using ICT Techniques Purchase orders, Shipping

SAP Material Master for Beginners: The Essential Guide to Understanding and Using the Material Master in SAP ERP" by Matthew

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Johnson (2018) Johnson introduces readers to the fundamentals of the SAP Material Master, guiding beginners through its functionalities and applications within the SAP ERP system.

Materials Management with SAP (2024) Business Processes and Configuration (3rd Edition) Jawad Akhtar, Martin Murray. This updated edition explores the intricacies of materials management within the SAP environment, covering topics from procurement to inventory processes

Research Gaps in Material Management and SAP Implementation

Studies highlight the low adoption of advanced ICT tools like barcodes and RFID in material management, indicating a gap in exploring their potential benefits.

High costs associated with ICT-based material management tools deter construction companies, necessitating research on cost-effective solutions and financial feasibility.

Many companies still often using on manual tracking methods, leading to inefficiencies, delays, and increased costs, suggesting the need for better integration of automated systems like SAP

Research lacks insights into how modern material management techniques, including SAP, contribute to sustainable construction practices by minimizing waste and optimizing resources.

These gaps can enhance material management efficiency, improve better project outcomes

Need for Comparative Analysis of SAP vs. Other Material Management Systems

Inadequate Focus on Sustainability in Material Management

Lack of Studies on Real-Time Material Tracking

Gap in SAP Material Management Adoption for Small and Medium Enterprises.

Limited Adoption of Advanced Technologies

High costs associated with ICT-based material management tools

Needs for Study

To Study how SAP MM can streamline procurement and logistics

To minimize delays and cost overruns in construction to savings the cost.

Identify ways to reduce implementation costs and enhance the affordability

To Analyze the Efficiency of SAP in Real-Time Material Management

To reducing waste and improving sustainability in construction projects.

Enables real-time material tracking and inventory control in comparison to traditional systems.

Identify best practices for effective material management that enhance productivity, cost efficiency, and project success.

Conduct a comparative analysis of SAP with other enterprise resource planning (ERP) tools Conventional methods.

Objectives of The Study

Conducting a comprehensive survey of various construction companies to assess and analysis their existing material management practices.

Investigating the extent to which construction companies have implemented the SAP system for material management.

Evaluating the effects of SAP system implementation on material management efficiency, accuracy, and overall project performance within the construction industry.

Perform a comparative analysis between conventional material management methods and those utilizing the SAP system.

To apply the value engineering concepts to achieve cost reduction in construction projects, ensuring that essential functions are maintained or improved while reducing overall costs.

II. Methodology

This study systematically selected construction companies involved in medium to large-scale projects. Selection criteria included project size, digital tool adoption, data availability, and geographic location.

Companies were categorized based on whether they used conventional manual methods or SAP-based material management systems.

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Primary data collection methods involved structured questionnaires, site interviews, direct observations, and internal report reviews. Focus areas included procurement efficiency, inventory control, labor cost management, and cash flow handling.

Quantitative analysis using statistical tools such as mean, median, and standard deviation enabled an objective comparison between conventional and SAP-based methods.

Direct on-site observation ensured the accuracy of data and minimized biases. The comparative evaluation highlighted operational advantages gained through SAP MM adoption.

The methodology involves site selection, analyzing current processes, comparing conventional and SAP systems, assessing SAP's impact performance within the construction industry. i.e. given below Diagram:1

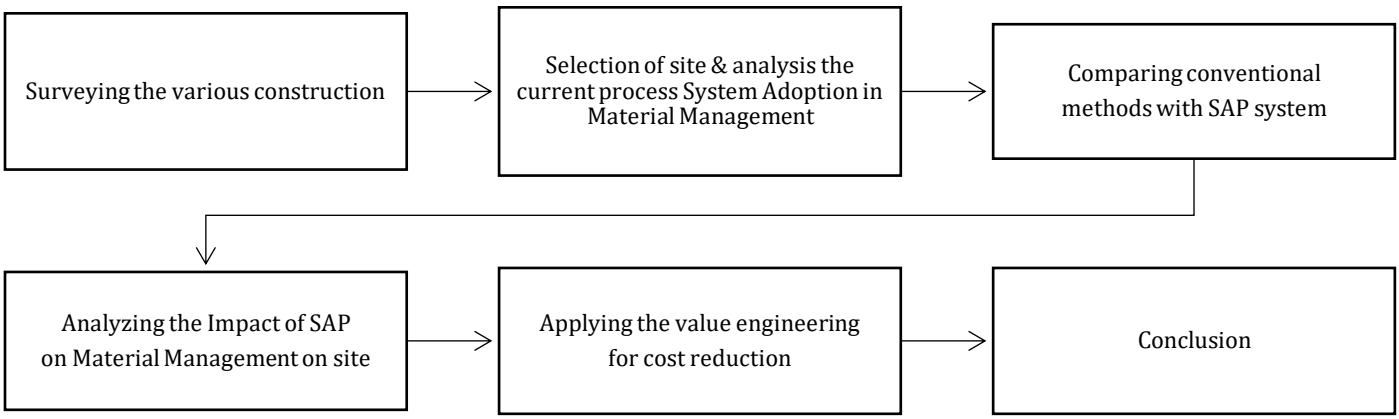

Diagram :1

MM - Survey of Different Construction Companies Table No:1

SI. No	Name of The Company	MM Process
1	Casagrand Builder Private Limited	SAP, ERP
2	Appaswamy Real Estates	SAP, Primavera
3	Sobha Limited is a multinational real estate developer	SAP, ERP, Primavera
4	chettinad cement corporation limited	Conventional
5	shridhar construction Pvt. Ltd	Conventional
6	JRM Construction	Conventional
7	SPL Infrastructure Pvt Ltd	Conventional

Selection of site and Analyze the Current MM – Process Table No:

Material management module of sap

SAP - System Application & Products

SAP- originally known as System Anwendungen Produkte in German This a comprehensive enterprise resource planning (ERP) software developed to centralize and streamline data management across various organizational departments. By integrating diverse business processes into a unified system, SAP enhances operational efficiency and decision-making SAP's modules oversee the procurement, storage, and transportation of materials, ensuring optimal inventory levels and timely availability. The software handles financial accounting, controlling, and reporting, providing real-time financial insights and supporting compliance with regulatory standards.

With integrated customer data and interaction histories, SAP enables better customer service and relationship management. Key Applications Managed by SAP

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Logistics and Material Management

Financial Management

Human Resources (HR)

Reporting and Analytics

Features of SAP MM

SAP MM is one of the modules of SAP that deals with material management and inventory management.

SAP MM speeds up the procurement and material management activities, making the business run smoothly with complete time and cost efficiency.

It deals with managing the materials (products and/or services) and resources of an organization with the aim of accelerating productivity and reducing costs.

It deals with the Procurement Process, Master Data (Material & Vendor), Account Determination & Valuation of Material, Inventory Management, Invoice Verification, Material Requirement Planning, etc.

Site No	Site Selection for Detail Study	Site Location	Type of Project	Material Management Process
1	Casagrand Builder Private Limited	Chennai	apartments, villas, and plots industrial & warehousing, and engineering & contracting	SAP, ERP
2	shridhar construction Pvt.Ltd	Chennai	Residential, commercial, Bridge and Roads	Conventional Manual

Sap Structure in Materials Management

The Organizational Structure in MM is made up of following Organizational Levels:

Client.

Company Code.

Plant.

Storage Location.

Purchasing Organization0

SAP Material Management - Structure, Procurement Cycle, and Transaction Codes in site No :1 Table No: 3

SI.No	SAP Structure	Description
1	Client	The highest level in SAP, representing an independent environment.
2	Company Code	Represents a legal entity for financial reporting.
3	Plant	A physical or logical subdivision for production, procurement, or inventory.
4	Storage Location	Defines where materials are stored within a plant.
5	Purchasing Organization	Responsible for procurement activities.
6	Purchasing Group	Represents a group of buyers responsible for procurement.

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SI. No	Procurement Cycle	Description
1	Requirement Determination	Identifying material needs.
2	Purchase Requisition (PR)	Requesting materials internally.
3	Source Determination	Selecting vendors from master data.
4	Purchase Order (PO) Creation	Issuing a formal order to the supplier.
5	Goods Receipt (GR)	Receiving and verifying materials.
6	Invoice Verification	Checking and approving supplier invoices.
7	Payment Processing	Processing payments via FI module.

SI. No	Category	Transaction Code
1	Material Master	MM01 / MM02 / MM03
2	Purchasing	ME21N / ME22N / ME23N
3	Purchase Requisition	ME51N / ME52N / ME53N
4	Goods Receipt	MIGO (goods movement)
5	Invoice Verification	MIRO / MIR7
6	Inventory Management	MB1B / MB51 / MB52
7	Material Requirement Planning (MRP)	MD04 / MD02
8	Vendor Management	XK01 / XK02 / XK03
9	Reporting	MB5B / ME2L / ME80FN

Conventional Module Material Management Structure- Procurement Cycle, and Transaction Codes in Site No: 2

Table No: 4

SI. No	Module	Description
1	Procurement	Acquiring raw materials, equipment, and other resources needed for construction projects.
2	Inventory Control	Ensuring optimal stock levels to prevent shortages or excess materials.
3	Warehousing	Storing, handling, and allocating materials properly within designated locations
4	Logistics	Managing the transportation and delivery of materials to project sites.
5	Supplier Management	Maintaining vendor relationships, negotiating contracts, and ensuring material quality compliance.

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SI. No	Procurement Cycle	Description
1	Material Requirement Planning (MRP)	Identifying material needs based on project schedules.
2	Purchase Requisition (PR)	Internal document requesting specific materials for procurement.
3	Vendor Selection	Choosing suppliers based on price, quality, and availability.
4	Purchase Order (PO) Issuance	Sending a formal purchase request to the selected vendor.
5	Goods Receipt & Inspection	Receiving and verifying materials against the purchase order
6	Invoice Processing & Payment	Approving and processing supplier invoices for payment.

i.e. Unlike SAP, conventional material management does not use predefined transaction codes. It follows a structured approach,

Manual entry of material data in registers or spreadsheets

Procurement records maintained in Excel or hard copies

Handwritten or digital forms shared via email

Manual invoice matching with POs and delivery receipts

Forecasting via spreadsheets or project schedules

Supplier lists maintained in documents or ERP systems in manual

Manual reporting using Word documents Excel, or printed logs.

Traditional Conventional) Structure in MM

The organizational structure typically encompasses the following key components:

Procurement

Inventory Control

Warehousing

Logistics

Supplier Management

Movement Types for MM

103 – Gate Entry

105 – Goods Receipt

106 – Goods Receipt Reverse

541 – Material Transferred to Contractors Stock

542 – Material Reverse from Contractors Stock

281 – Goods Withdrawal (Consumption)

282 – Consumption Reverse

301 – Stock Transfer from Plant.

Detail Working of SAP

SAP Login Screen

Log on to the SAP server. The SAP login screen will prompt you for the User ID and the Password. Provide a valid user ID and

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password and press enter. The user id and password are provided by the system administrator. The login screen appears as follows:

This image showcases the standard fields you'll encounter when logging into SAP, such as:

Client: Specifies the client number.

User: Your SAP username.

Password: Your SAP password.

Language: The language code for the session.

Purchase Requisition (PR)

A purchase requisition is an internal document used in SAP MM to request the procurement of materials or services. It serves as the first step in the procurement process.

Gathering Requirements for Purchase Requisition (PR)

Before creating a PR, the following requirements must be gathered:

Material and Service Details

Description of the material or service required

Quantity and unit of measurement

Required delivery date and location

Source of Supply (Optional)

Preferred vendor details (if available)

Existing contract or purchase agreement references

Budget and Cost Allocation

Assigned cost Centre or project code

Budget approval (if required)

Procurement Type and Urgency

Routine or emergency purchase

One-time or recurring procurement

Procurement Types in SAP MM

There are several types of procurement processes in SAP MM, including:

Internal Procurement

Materials are procured from another department or plant within the company.

Example**:** Stock transfer between two company locations.

External Procurement

Materials or services are purchased from external vendors

Standard Procurement – Buying from an external supplier.

Subcontracting – Raw materials are provided to a vendor, and they return finished goods.

Consignment – Vendor stocks materials at your location, and you pay only when consumed.

Stock Transfer – Transfer of stock from one warehouse/plant to another.

Third-Party Procurement – Vendor delivers directly to the customer instead of the company.

PR Purchase Requisition

PR is raised in system by execution team as per the requirement of material. Following fields are required to be entered while raising PR.

Material Code

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Required Quantity

Plant No for which material is required

Requisitioner Name.

Class of material

Creation Process in SAP

Transaction Code (T-Code): ME51N

Enter required material/service details.

Specify delivery date and purchasing group.

Assign cost Centre and plant details.

Save the PR and generate the document number.

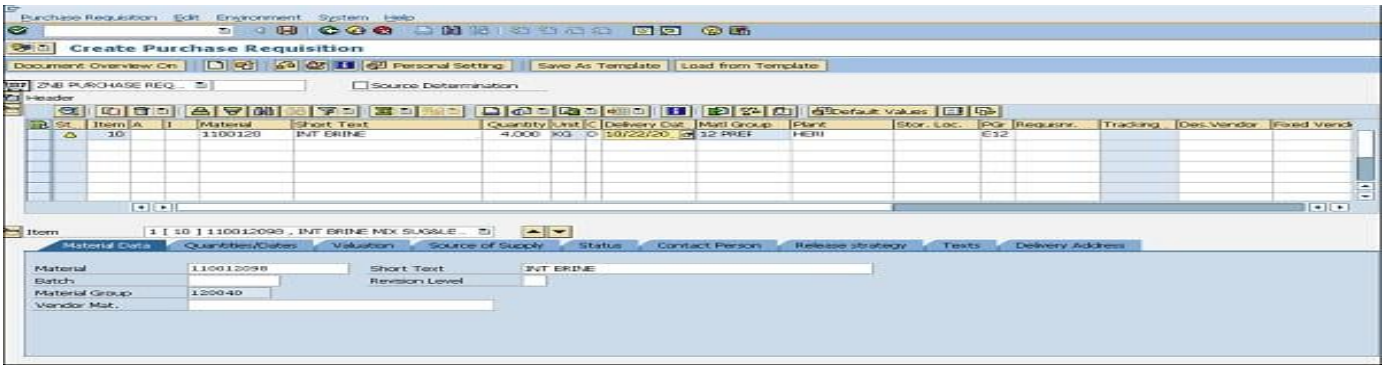

Figure 1: Purchase Requisition

Purchase order (po)

The process begins when a Purchase Requisition (PR) is approved at all necessary levels. Once released, the PR becomes visible to the Purchase Department, enabling them to proceed with procurement. The Purchase Department then prepares the PO for the required materials, ensuring that specifications, quantities, and pricing align with the organization's needs. The PO undergoes a multi-level approval process to validate its accuracy and compliance with budgetary constraints. Upon final approval, the PO is officially released and forwarded to the respective supplier, who then arranges for the delivery of materials.

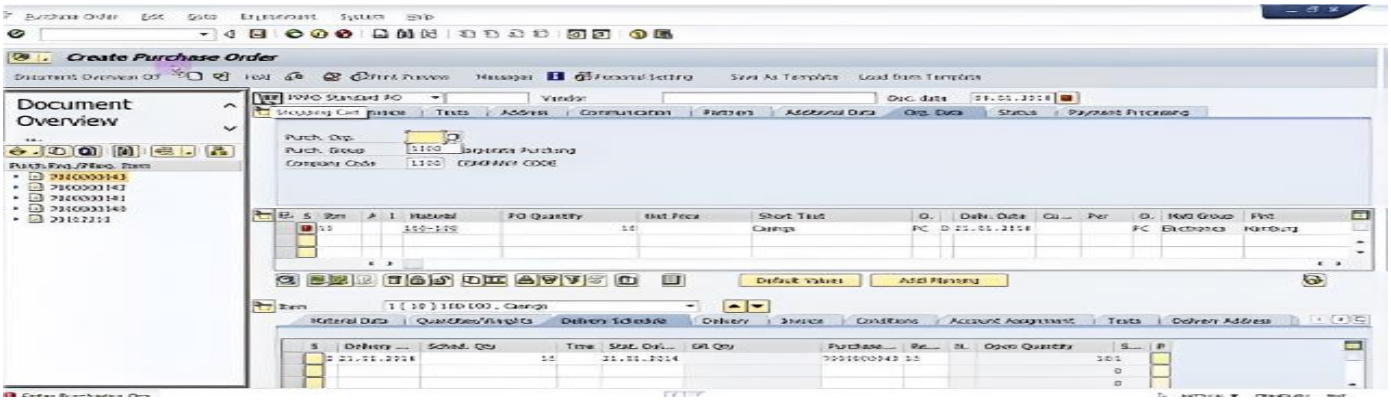

Figure 2: Purchase Order (PO)

Gate entry

Purchase Order (PO) is issued, the supplier arranges for the delivery of materials to the designated site. Upon arrival at the project site, the security personnel at the gate plays a crucial role in documenting the initial receipt of materials. Upon the material's arrival, the security guard records the details in the Inward Register, assigning a Gate Entry Number on the Delivery Challan. In the SAP system, the Goods Receipt Note (GRN) is posted using the MIGO transaction code.

The movement type associated with gate entry posting is 103, which signifies that the material has arrived but is yet to undergo a quality inspection or final acceptance.

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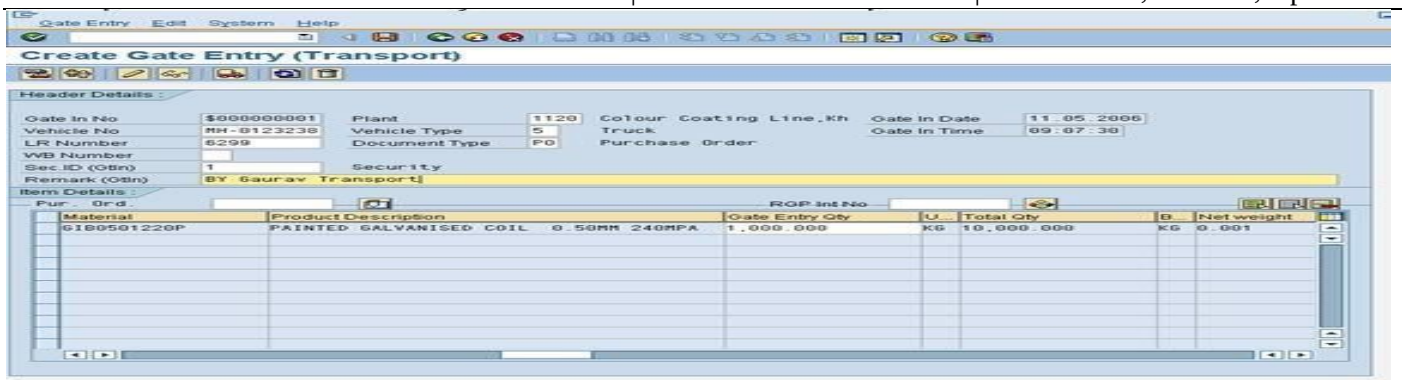

Figure 3: Gate Entry

Goods receipt number

The Goods Receipt (GR) phase is critical, marking the point at which the ordering party receives and verifies the condition and quality of delivered materials. This step ensures that the materials meet the specified requirements before they are added to inventory. Upon delivery to the site, the materials are checked against the Delivery Challan and the Purchase Order (PO) to confirm accuracy. The Goods Receipt Number (GRN) is then posted in the SAP system using the MIGO transaction code.

The choice of movement type during this posting determines how the stock is updated in the inventory. Movement type 103 is used to record the receipt of goods into a blocked stock, indicating that the materials have arrived but are pending inspection or approval. No accounting document is generated at this stage. Once the materials pass inspection, movement type 105 is employed to release the goods from blocked stock to unrestricted stock. i.e. Movement type used for Posting GRN is 105.

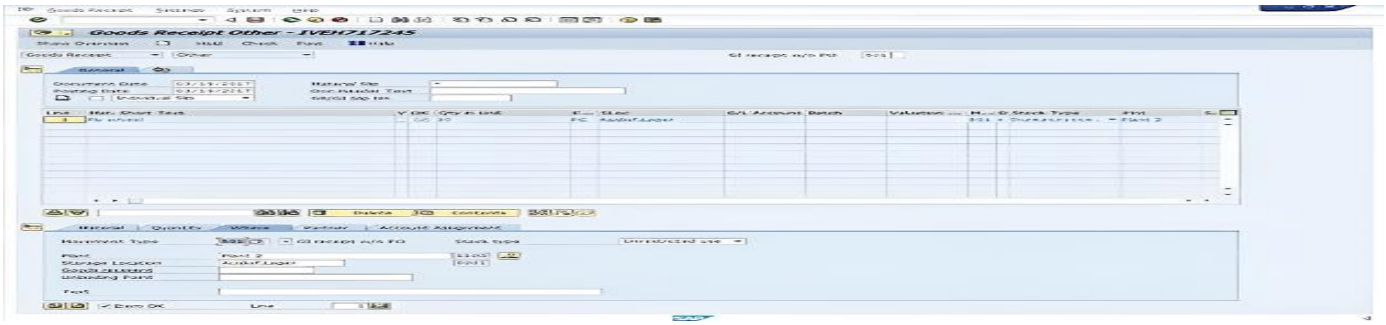

Figure 4: Goods Receipt Number (GRN)

Material issued to and reversed from contractor

After posting the Goods Receipt Note (GRN) in the SAP system, materials are issued to contractors, transferring responsibility and ownership to them. This transfer is executed using movement type 541, which moves the materials from the company's unrestricted stock to the contractor's stock. Notably, this movement does not generate an accounting entry, as the materials are still owned by the company but are physically located with the contractor. When materials are returned from the contractor's stock to the company's inventory, movement type 542 is utilized.

The SAP transaction code MIGO is employed for both issuing materials to contractors and reversing such issuances. This transaction code facilitates the execution of various goods movements, material including those involving movement types 541 and 542.

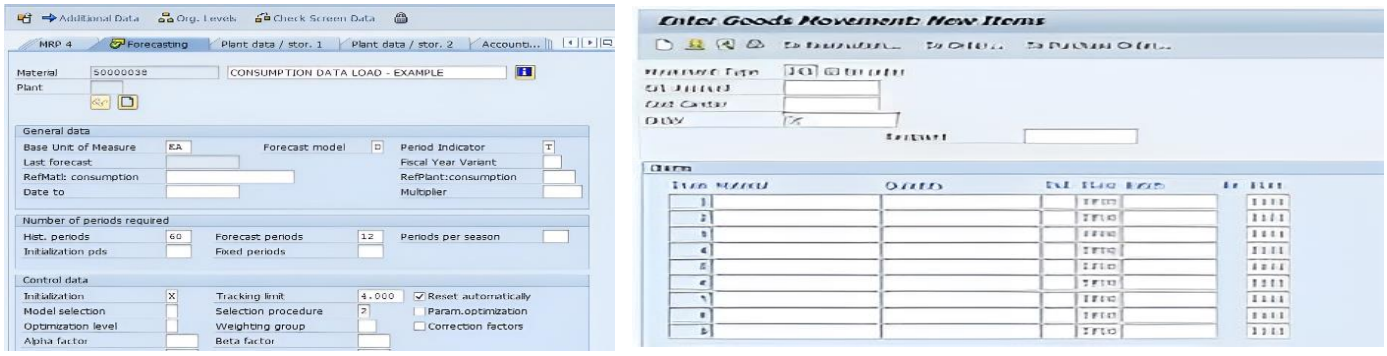

Figure 5: Material Issued to Contractor

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Material issue slip

Issue slip of consumed material against respective activity is prepared & submitted by Engineer In charge of respective building to store in charge. Following details are mentioned on issue slip Figure:6

Issue slip No – 681

Project Code

Network No.

Plant No.

Vendor Code

Activity No.

Activity Description

Material No.

Material Description

Quantity of Required Material

Unit

Reservation No.

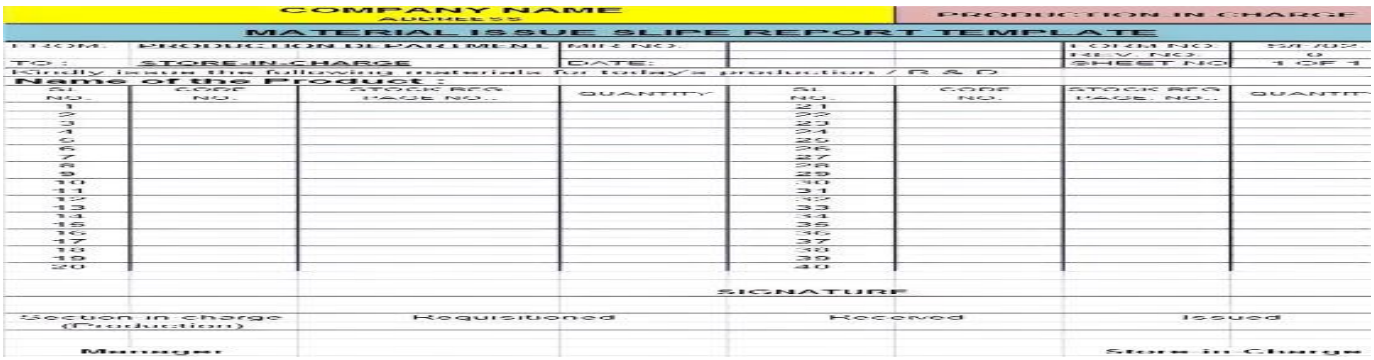

Figure 6: Material Issue Slip (sample)

Material withdrawal consumption

The consumption of materials is systematically recorded to maintain accurate inventory and financial records. Upon receiving a material issue slip from the Engineer in Charge, the Store In-Charge proceeds to document the material consumption in the SAP system. This is accomplished using the MIGO transaction code, a versatile tool for various goods movements. The specific movement type employed for material withdrawal due to consumption is 281

Figure7: Material Withdrawal (Consumption)

Work procedure in conventional material management

Conventional method of MM (Material management) is a critical function within construction companies, ensuring that materials are available when needed, in the correct quantities, and at optimal costs. Traditionally, many construction firms have relied on conventional methods for material management.

Material Estimation:

At the project's outset, estimators manually calculate the types and quantities of materials required, often using historical data and personal experience.

Procurement Planning:

Based on the estimates, procurement teams manually identify potential suppliers, solicit quotations, and negotiate terms without the aid of digital databases.

Purchase Order Creation:

Purchase orders are manually drafted, approved, and dispatched to suppliers, typically through physical documents or basic electronic communication.

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Material Delivery and Inspection:

Upon delivery, materials are inspected for quality and quantity. Records are maintained in physical logs or simple spreadsheets.

Storage and Inventory Management:

Materials are stored on-site or in warehouses, with inventory levels tracked manually, increasing the risk of errors and mismanagement.

Distribution to Worksites

Materials are allocated to specific tasks or sites based on manual scheduling and coordination.

Waste Management:

Excess materials or waste are manually recorded, and disposal or recycling is arranged without systematic tracking.

However, the adoption rate varies, with some firms still relying on traditional methods due to factors like cost, resistance to change, and lack of technical expertise.

Increased Manpower Requirements

Extended Timeframes for Material Management

Increased Paperwork

Manual Execution of Numerous Activities

Higher Risk of Errors and Inaccuracies

Safety Risks Associated with Manual Handling

Challenges of Conventional Methods:

Inefficiencies:

Manual processes are time-consuming and prone to human error, leading to delays and increased costs.

Lack of Real-Time Data:

Without digital systems, real-time tracking of inventory and material usage is challenging, hindering timely decision-making.

Limited Collaboration:

Manual methods restrict seamless communication among project stakeholders, affecting coordination and project outcomes.

Manual material management in construction projects involves a series of Labor- intensive processes that are susceptible to various inefficiencies and challenges. Many construction companies are transitioning to digital material management systems. These platforms offer real-time tracking, automated procurement processes, and enhanced collaboration tools, leading to improved efficiency and profitability.

Comparison between Conventional Material Management and SAP Material Management. Table No: 5

Aspect	**Conventional Material Management**	**SAP-Based Material Management**
Data Entry and Processing	Manual data entry, increasing the likelihood of human errors.	Automated data entry with validation checks, reducing errors.
Inventory Tracking	Physical counts and manual logs, leading to potential inaccuracies.	Real-time inventory tracking with automated updates
Procurement Process	Lengthy procurement cycles due to manual approvals and paperwork.	Streamlined procurement with electronic approvals and reduced paperwork.
Reporting and Analytics	Limited reporting capabilities with delayed data compilation.	Advanced real-time reporting and analytics for informed decision-making.

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Required Staff	Min staff required is 3No	1 No of staff Required
Error Handling	Errors may go unnoticed longer, leading compounded issues.	Immediate error detection and alerts for prompt resolution.
Compliance and Audit Trails	Challenging to maintain comprehensive audit trails manually.	Automated audit trails ensuring compliance and easy traceability.
Operational Cost	Affordable for small construction companies whose turnover is below **100 Cr.**	Affordable for construction companies whose turnover is above **250 Cr**.
Vendor Management	Manual vendor evaluations, which can be inconsistent.	Systematic vendor performance tracking and management.
Material Requirements Planning	Reactive planning based on immediate needs	Proactive planning with predictive algorithms to forecast demand.

comparative analysis materials management

The comparative charts and tables with metrics like cost savings, time efficiency, error rates, or inventory accuracy and before and after SAP comparison with conventional manual methods through questionnaires, site interviews, direct observations.

Results from Quantitative Analysis using SAP MM in Construction Projects Table No: 6

Procurement Efficiency

Question	Response Summary	Insights
How do you manage procurement?	60% SAP, 30% ERP, 10% Manual	Majority prefer SAP for procurement.
Key procurement challenges?	50% supplier delays, 30% high costs, 20% payment issues	Supplier delays are the biggest challenge.
Does digital procurement improve efficiency?	80% Yes, 20% No	Strong agreement on efficiency improvements.

Inventory Control

Question	Response Summary	Insights
How do you track inventory?	70% SAP MM, 20% Excel, 10% Manual	SAP MM is the preferred tool.
Major causes of material waste?	40% Poor planning, 35% theft, 25% damage	Poor planning is the top cause of waste.
Does SAP MM help in reducing waste?	75% Yes, 25% No	Most respondents find SAP MM beneficial.

Labor Cost Savings

Question	Response Summary	Insights
What factors increase labor costs?	45% overtime, 30% inefficiency, 25% labor shortage	Overtime is the biggest cost factor.
How often do you provide training?	50% quarterly, 30% yearly, 20% never	Regular training helps in labor cost reduction.
Does workforce planning help in cost	85% Yes, 15% No	Strong consensus on proper workforce

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Question	Response Summary	Insights
savings?		planning benefits.

Cash Flow Management

Question	Response Summary	Insights
Major cash flow challenges?	50% delayed payments, 30% high costs, 20% poor planning	Payment delays are the top issue.
Do you use forecasting in cash flow?	70% Yes, 30% No	Forecasting is widely used for financial planning.
Does SAP MM improve financial tracking?	80% Yes, 20% No	Most users find SAP MM beneficial for financial monitoring.

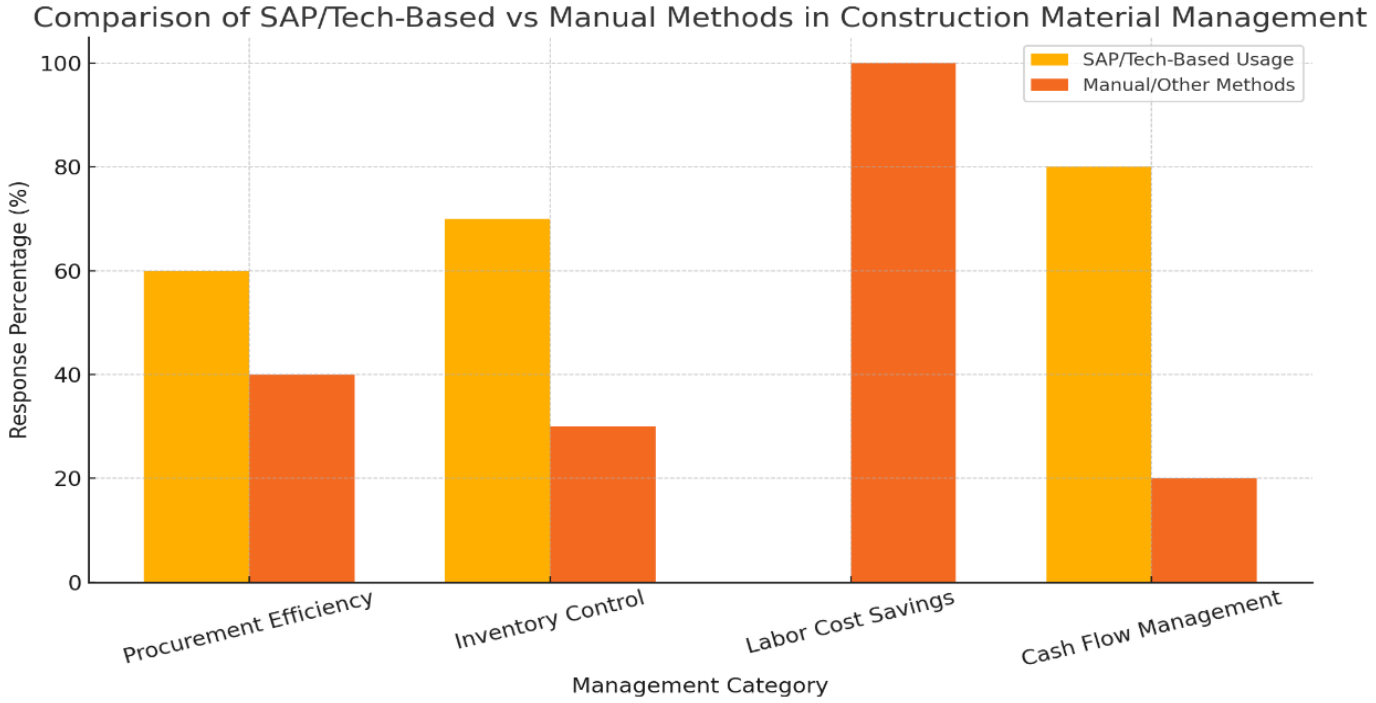

Figure: 7 Comparison of SAP based vs Manual Method in construction Material

Material Management System Usage in

Construction Projects Table No :7

System Type	Estimated Usage Percentage	Remarks
Conventional Manual Methods	**40% – 50%**	Still widely used, especially by small to medium enterprises (SMEs).
SAP-Based Systems	**30% – 40%**	Common among large firms and advanced project environments.
Other ERP Systems	**10% – 20%**	Includes tools like Oracle, Microsoft Dynamics, Tally ERP, etc.

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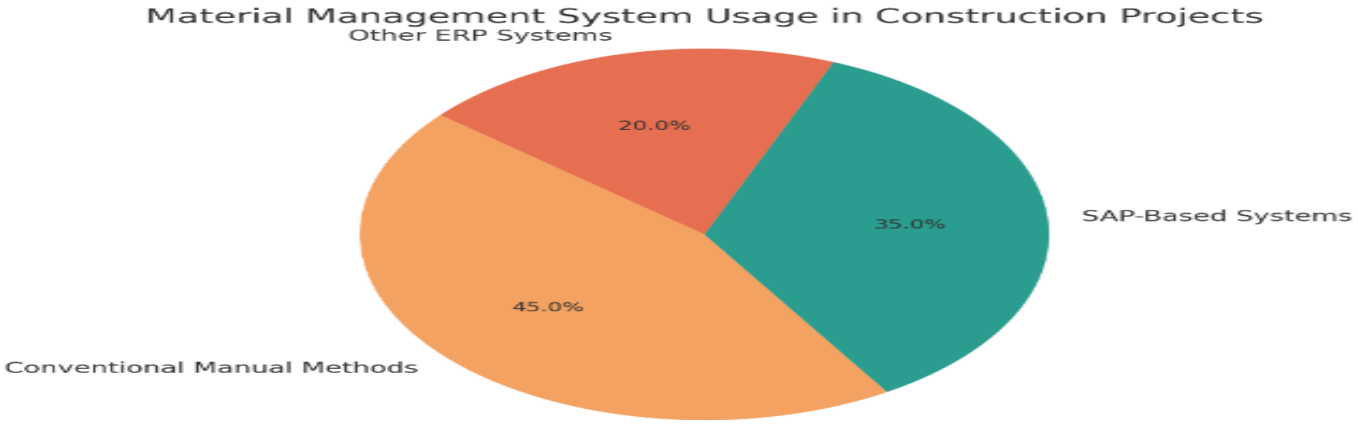

Figure: 8 software usage percentage

Sample Financial Report for Project Progress Documentation for before SAP Table No: 8

Item	**Estimated Cost (₹)**	**Actual Cost (₹)**	**Variance (₹)**	**Remarks**
Cement	12,00,000	11,50,000	-50,000	SAP minimized wastage
Steel	15,00,000	14,80,000	-20,000	Bulk order discount
Bricks	6,00,000	6,30,000	+30,000	Delay in procurement
Labor	8,00,000	7,90,000	-10,000	Real-time tracking
Equipment	10,00,000	10,20,000	+20,000	Extra transport
Total	₹51,00,000	₹50,70,000	₹30,000	Cost saved with SAP

This structured analysis provides a data-driven understanding of how SAP MM impacts procurement, inventory, labor cost, and cash flow in construction projects. This study evaluates the impact of SAP Material Management implementation in construction projects by comparing it to conventional manual methods. Key performance metrics such as cost savings, time efficiency, error rates, and inventory accuracy were analyzed before and after SAP adoption. Quantitative data collected through structured questionnaires and site observations were used to develop comparative charts and tables.

Item	**Planned Cost (INR)**	**Actual Cost (INR)**	**Variance (%)**	**Remarks**
Cement (OPC 53 grade)	₹4,00,000	₹4,40,000	+10%	Overstocking due to mis-planning
Reinforcement Steel	₹9,75,000	₹9,42,500	-3.3%	Efficient usage
Fine Aggregate	₹75,000	₹82,500	+10%	Wastage due to poor handling
Coarse Aggregate	₹72,000	₹69,600	-3.3%	Balanced
Admixtures	₹60,000	₹58,500	-2.5%	Efficient usage
Total	₹15,82,000	₹15,92,100	+0.63%	Minor overages

Results demonstrate significant improvements in procurement efficiency, material tracking, and reduction of manual errors with SAP MM. These are the impact compared to conventional method over SAP in construction practices. The primary obstacles to SAP adoption include its high initial investment, reaching up to 2 crores, and the lack of consensus among board members. Implementing SAP is financially viable for construction firms with an annual turnover exceeding 250 crores.

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Advantages and disadvantages of material management by sap

Advantages of material management by SAP

Enhanced Inventory Management and Cost Reduction, Real-time tracking of Materials

Improved Procurement Efficiency, Time can be reduced while manage the materials.

SAP MM automates inventory processes, reducing manual errors and ensuring accurate stock levels.

By optimizing procurement processes and minimizing material wastage.

SAP MM contributes to lowering operational costs. lead to faster operations and reduced delays.

Disadvantages of material management by SAP

High Implementation Costs for SAP MM involves substantial investment in software, hardware, and skilled personnel.

Operating SAP MM effectively necessitates personnel with specialized technical expertise.

Need for Technically Skilled Workforce to Strong Estimation Department Required

Not Affordable for Small Construction Companies limiting their access to advanced material management solutions.

SAP MM demands considerable system memory and processing power for additional infrastructure investments.

Advantages and Disadvantages of Conventional Material Management

Advantages:

Low Initial Cost, No need for expensive software or system implementation.

Easy to understand and manage without requiring extensive training or technical expertise.

Companies can modify their processes as per their specific needs without system restrictions.

No Digital Infrastructure Required Physical records and manual tracking make it accessible even in areas with limited technology.

Hands-on tracking and management provide better physical oversight of material handling.

Disadvantages:

Manual data entry increases the chances of miscalculations, lost records, and incorrect stock tracking.

Procurement, inventory updates, and reporting take longer due to manual work.

Materials are not tracked in real-time, leading to shortages or excessive stock.

Generating reports requires manual effort, making decision-making slow and unreliable.

Managing large-scale projects with manual processes is difficult and inefficient.

III. Discussion

Material management is a critical function in construction companies, as construction materials often account for over 60% of total project costs.

Traditionally, many construction firms have managed materials manually. However, to enhance profitability and efficiency, there's a growing shift towards adopting advanced material management software. In a 2025 survey of seven construction companies in Chennai, the following observations were made:

Casagrand Builder Private Limited Construction implemented SAP, PROJECT SYSTEM (PS) for their material management processes

Appaswamy Real Estates utilized ERP and Primavera for material management.

Sobha Limited is a multinational real estate developer using SAP, ERP, Primavera for MM process

Chettinad cement corporation limited utilized Conventional and MRP for the material management.

The remaining five companies continued to rely on conventional manual methods. This distribution indicates that approximately 37.5% (3 out of 8) of the surveyed companies have adopted advanced software solutions like SAP and ERP and for material management, while 62.4% (5 out of 8) still employ manual methods.

It's noteworthy that the adoption of such advanced software is often linked to the company's turnover. Firms with turnovers exceeding minimum 100 crore to 250 cores find it more economical to implement these systems.

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Regarding satisfaction with their current material management processes:

Casagrand Builder Private Limited Construction reported satisfaction with their SAP- based system (system application product)

Companies like Shridhar Construction Pvt Ltd, JRM Construction, SPL Infrastructure Pvt, Ltd and Chendur Infrastructure Pvt Ltd expressed dissatisfaction with their existing methods. (Manual method for MM process)

IV. Conclusion

A survey revealed that all construction companies engage in material management, with many relying on traditional methods. Comparing these conventional approaches to SAP-based systems shows that SAP can lead to significant cost savings over the duration of a project.

Implementing SAP in material management effectively reduces human errors, decreases administrative time, and enhances the planning of material procurement. However, the initial setup costs for SAP are substantial, potentially making material management expenses higher than those associated with traditional methods. Each company does not use advanced technique but at least they carry out material management by conventional method.

The study highlights a growing shift in the construction industry toward advanced material management systems like SAP, which offer superior efficiency, accuracy, and project performance compared to conventional manual methods. While many construction firms in Chennai still rely on traditional approaches.

There is a clear trend toward adopting digital solutions to streamline procurement, optimize inventory control, and improve overall project execution. Companies implementing SAP report higher satisfaction due to reduced errors, better resource utilization, and enhanced decision-making capabilities. Although some firms have yet to transition, the benefits of SAP adoption such as increased productivity, cost savings, and improved operational transparency make it a crucial tool for modern construction material management.

The comparative analysis between conventional material management methods and SAP-based systems highlights to maximize profitability, transitioning from conventional material management to advanced techniques is essential. The SAP system enables real-time tracking of material consumption, inventory levels, and material locations, providing higher management with accurate data also facilitates efficient inventory monitoring on-site while minimizing human errors.

The primary obstacles to SAP adoption include its high initial investment, reaching up to ₹2 crore, and the lack of consensus among board members. Implementing SAP is financially viable for construction firms with an annual turnover exceeding ₹250 crore. SAP implementation can lead to a 75% reduction in manpower costs and an 80% decrease in time spent on material management activities.

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