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Leveraging Oracle ASCP and AI for Material Liability Management in Modern Supply Chains

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Abstract: ***Material liability for a customer arises from excess inventory resulting from mismatches between customer demand and material supply. This often occurs when companies order materials based on inaccurate demand forecasts or customer orders, leading to surplus inventory. Different business models influence how material liability is calculated: in Make-to-Stock (MTS), liability is linked to internal decisions or customer forecasts; in Make-to-Order (MTO), liability arises from excess material when a customer changes orders; and in discrete manufacturing, liability may involve multiple customers, complicating the allocation process. Liability is calculated by netting supply (e.g., purchase orders, inventory) against demand (e.g., sales orders, forecasts). Oracle Advanced Supply Chain Planning (ASCP) and Oracle E-business (EBS) can streamline this process by identifying excess materials. However, challenges arise in assigning liability when excess material is shared among multiple customers or product families. In cases of demand rescheduling or cancellations, material liability can be distributed based on demand volume or percentage allocations. AI can enhance this process by improving demand forecasting, automating netting calculations, and detecting anomalies in customer behavior. It can also support automated overrides, making liability adjustments more accurate. Frequent updates and manual overrides further ensure liability accuracy, especially in complex manufacturing environments. This journal explains liability concept and how could be derived by customizing Oracle EBS and ASCP application. This also highlights the assumption and corresponding limitation which could further enhance by plugging AI-capabilities.***

Keywords: Liability, Material Liability, Supply Chain, Oracle EBS, Oracle ASCP

1. Introduction

Every business model consists of three key components: the customer, the manufacturing process, and the supplier. Suppliers provide the raw materials that are transformed through value-added processes to meet customer needs. For example, a car manufacturing company purchases raw steel from a supplier, which is then cut and welded to form the car body, ultimately sold to car dealers. However, during these processes, excess material is often generated.

A major challenge for companies is monitoring supply levels and ensuring they remain within guidelines. When customer demand changes negatively within a short time frame (referred to as the planning horizon, which starts from the current day and extends to the next 'x' days), there is often little time to adjust supply orders. This period is known as the non-cancellation or firm window, during which neither suppliers nor manufacturers will accept cancellations. As a result, a liability report is needed to address inventory liability and mitigate the risk of Slow Moving Inventory (SMI).

Excess material is often caused by inaccurate demand signals from customers, leading to overordering from suppliers. In such cases, the excess material must be attributed to the responsible customer, and reimbursement for the material or the invested funds is required—this is referred to as "material liability for a customer.

2. Manufacturing Business Model

To understand material liability, it is essential to consider the different business models and how they relate to liability calculation:

- Make to Stock (MTS): In this model, products are produced in advance, before any customer orders are placed. There may be an agreement between the customer and manufacturing plant to develop certain products based on safety stock or forecast. Sometimes, products are built based on internal projections rather than customer forecasts. If built according to a customer forecast, it is easier to attribute liability to that customer. However, if the decision is based on internal projections, the internal team may bear responsibility for customer liabilities.
- Make to Order (MTO): Here, products are manufactured only after a customer places an order. In this case, there is usually a contract between the manufacturer and customer. If the customer changes product specifications, they could be held liable for any resulting excess inventory.
- Project Manufacturing: In this model, materials are purchased from suppliers for specific projects, making it easier to calculate liability if excess materials arise.
- Discrete Manufacturing: This model involves combining multiple customer demands and purchasing materials in bulk. If excess inventory results, multiple customers may share responsibility, but it is harder to accurately trace material liability.
- Business to Business (B2B) and Business to Consumer (B2C): Liability calculations differ based on customer type. For B2C, the process may be more time-consuming, whereas in B2B, excess material can be more easily attributed to an OEM, since they typically have unique part numbers.

Material Consideration for Liability: Materials may exist at various stages, including in stock, in the work-in-process (WIP) area, or awaiting receipt from suppliers. Supplier materials can be categorized into two types: those that can be canceled without penalty and those that cannot. When calculating customer material liability, the scope may include

in-stock material, material in WIP, and non-cancelable supplier orders.

3. Material Liability Calculation with Oracle ASCP

3.1 Calculating Excess Material

There are two key parameters to calculate excess material:

3.1.1 Calculation Horizon: This defines the period over which excess material is calculated, and it could range from a fixed number of days (e.g., 365 days) to a shorter or more flexible period, such as 60 days, depending on the part's cumulative lead time. Within this horizon, all forms of supply—such as purchase orders, work orders, and inventory—are netted against demand, which includes sales orders, forecasts, and other relevant customer demands.

3.1.2 Supply and Demand Types: Depending on the need, various types of supply and demand can be considered to give an accurate picture of potential excess material.

After collecting the relevant data, a netting calculation is performed. This involves allocating existing supply to meet demand until all demand is fulfilled. Any leftover material is considered excess and tagged as material liability. This process can become complex in cases with multi-level bills of materials (BOMs), where different parts of the BOM relate to various customer demands, especially in mass production environments that do not follow project manufacturing models.

To simplify this process, Oracle Advanced Supply Chain Planning (ASCP) [1] and Oracle E-Business Suite (EBS) can be utilized.

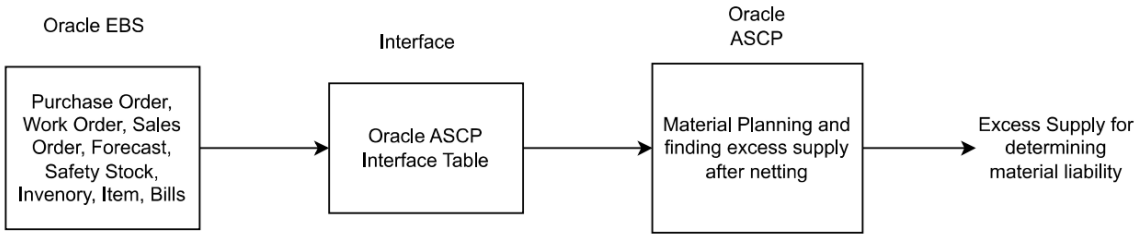

Figure 1: Oracle EBS and ASCP Mapping

- Oracle EBS Application: This includes transactional data such as purchase orders, sales orders, work orders, inventory, and BOMs, which serve as input for liability calculation.
- Interface with Oracle ASCP: Oracle ASCP collects data from EBS through a data collection program, which is then used for material planning. Custom logic can be applied during this data collection phase to fine-tune supply and demand selections based on business needs. This is also referred to as 'Collection Hook'[3]
- Oracle ASCP Application: As a material planning tool, Oracle ASCP helps identify supply shortages and excesses by netting supply against demand. Any remaining excess supply is flagged as material liability, with Oracle storing these records under special demand identifiers for safety stock. This solution can efficiently determine excess supply and liability without the need for custom inventory logic.

3.2 Methods for Allocating Excess Material Based on Business Models

Different approaches to calculating material liability are used depending on the business model:

3.2.1 Product Family-Based Allocation (Make-to-Order, MTO): In MTO businesses, materials are manufactured or purchased after receiving firm customer orders. Each part may have a customer-specific category (product family). Excess material can be grouped at the product family level to assign liability to the corresponding customer.

3.2.2 Project-Based Allocation (Project Manufacturing): In project manufacturing, materials are often purchased for specific projects, making it easier to allocate excess inventory. Each project is tied to a specific customer, allowing excess material to be attributed accordingly.

3.2.3 Internal Liability for Mass Production (Make-to-Stock, MTS): In MTS or mass production scenarios, excess material cannot easily be tied to a customer. In such cases, internal liability is calculated to hold the company's planning team accountable.

3.2.4 Demand Cancellation and Rescheduling: Customer liability can be determined by storing daily snapshots of demand data, including canceled or postponed orders. In cases where multi-level BOMs are involved, a percentage of excess material can be allocated to each customer based on their demand volume. If there is only a single-level BOM, excess material can be directly tagged to the canceled demand without the need for percentage-based allocation.

3.2.5 Percentage-Based Allocation for Sales Channels: When the same parts are sold to multiple customers, assigning exact liability becomes challenging. In such cases, liability is approximated, and a percentage is allocated to each customer based on their sales volume.

3.2.6 Opportunity-Based Liability: As a last resort, material liability can be reclassified as an opportunity. If the excess material could still be used or sold to a customer, the manufacturer might offer it to the customer at a discounted price rather than treating it as a loss.

Custom programs and additional attributes can be defined to manage these allocation methods. Parameters such as percentage allocation for each customer or historical data ranges can be set, and Oracle PL/SQL in Oracle ASCP can be used to perform the liability calculations.

3.3 Publishing Material Liability

Regular communication with customers regarding material liability is crucial for transparency and maintaining good relationships. Liability reports should be updated frequently to give customers insight into potential claims. A weekly update or a monthly meeting is recommended for ongoing discussions about material liability.

A screen or interface for overriding liability calculations is essential to handle unique scenarios that the standard process may not capture. For instance, if a customer cancels an order for Model A but rebooks an order for Model B, and both models share the same materials, the system may incorrectly tag excess material to the canceled demand. A manual override feature would allow users to adjust liability before sending reports to the customer.

This override screen could be developed using Oracle APEX [2] , a low-cost platform that integrates well with Oracle databases used for Oracle EBS or Oracle ASCP. While Oracle APEX is typically free with Oracle databases, it is advisable to confirm this before proceeding with development.

4. Assumptions

a) Excess material can result from inefficient business operations, material planning, or buyer mistakes. In this case, it is assumed that plant operations are efficient and do not contribute to excess inventory.
b) Real-world manufacturing and supply chain operations often involve a mix of business models, and liability calculations should be adjusted accordingly. For example, a manufacturer may produce both custom steel enclosures for specific customers (Make-to-Order, MTO) and generic enclosures for general sale (Make-to-Stock, MTS). In such cases, excess material can arise from both models, requiring a tailored approach to liability.
c) When dealing with forecasts, a bucket-to-bucket comparison of the gross forecast is used to identify periods where forecast reductions occur, which are then treated as demand reductions. However, this approach can overstate demand reductions in cases where:
   - The forecast shifts to another time period.
   - The forecast is consumed by a pick-ship order, and the shipment has already occurred.
d) Excess material that cannot be allocated to any customer after netting, percentage-based allocation, or tagging as an opportunity needs to be manually assigned by users. These manual adjustments will be factored into the next liability calculation to ensure accuracy.

5. Use Artificial Intelligence (AI) for calculating liability

a) Demand Forecasting and Anomaly Detection: AI-powered predictive analytics can forecast customer demand more accurately, reducing the occurrence of excess materials. Machine learning models can detect anomalies in demand signals, identifying sudden spikes or drops in customer orders and flagging potential issues before they lead to excess inventory.
b) Automating Netting Calculations: Netting calculations, which compare supply and demand, can be automated and improved using AI algorithms. AI can efficiently process complex supply chain data, including multi-level bills of material, and calculate excess materials that are potentially subject to liability. AI models can handle intricate supply-demand matching with higher precision than rule-based systems, minimizing calculation errors and manual intervention.
c) Automating Liability Allocation in complex business model: In complex manufacturing environments (e.g., discrete manufacturing or project manufacturing), AI can streamline the process of allocating liability across multiple customers. AI models can be trained to identify patterns in demand, customer-specific orders, supplier and product families automating the process of tagging excess material to individual customers. In scenarios where multiple customers are responsible, AI can apply percentage-based allocation more efficiently by analyzing historical demand and customer relationships.
d) Automated Overrides and Manual Adjustments: AI can assist in identifying patterns where human intervention is needed, such as when a customer cancels one order but rebooks another. It can flag these cases and provide suggestions for overriding actions, simplifying the work for the internal team while ensuring the material liability calculation remains accurate. On the same line, we could use cases to identify cases when customer shifts demand from one-week to another or one month to another. Such anomalies could be found by aggregating demand into monthly or quarterly buckets. Further, whenever user does override the liability, AI could follow the pattern and might recommend next time so there will fewer human efforts.

6. Conclusion,

In conclusion, calculating material liability is a critical process for managing excess inventory and minimizing financial risk in manufacturing. Excess material often results from inaccurate demand forecasts, order changes, or supply chain inefficiencies. Understanding different business models—Make-to-Stock (MTS), Make-to-Order (MTO), project-based manufacturing, and discrete manufacturing—is crucial for identifying and assigning material liability. Each model presents unique challenges, such as tagging excess inventory to specific customers, managing multiple levels of demand and supply, and accounting for shared material in mass production.

Oracle ASCP and Oracle EBS provide powerful tools for streamlining the netting of supply and demand, identifying excess inventory, and calculating material liability. These systems automate much of the process, allowing businesses to track inventory, sales orders, and purchase orders efficiently. However, the complexity increases in scenarios involving multiple customers or varying production models, where manual overrides and custom logic may be required to accurately assign liability.

AI presents a promising solution to enhance the accuracy and efficiency of material liability calculations. With its ability to analyze vast amounts of data, detect anomalies in demand patterns, and automate netting and liability allocation, AI reduces manual intervention and minimizes errors. It can also

identify opportunities for reuse or sale of excess material, turning potential liabilities into opportunities.

Ultimately, a combination of advanced planning tools like Oracle ASCP, custom logic, and AI can significantly improve the accuracy of material liability calculations. Frequent communication with customers and the use of manual override options ensure that liability is assigned fairly, reducing financial risks and fostering better supply chain management.

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Author Profile

Dipak Dilip Kulkarni received a bachelor's degree in engineering degree from Shivaji University in 2005, he has recently completed 'Master of Business Administration' from 'University of Colorado Denver' in 2022. He has extensive experience in IT, working with multiple Fortune 500 companies in the last 19 years. During this tenure, he has worked for multiple Fortune 500 companies, within the US and outside of the US. He specializes in Supply Chain Management, Material Planning, and Demand management; worked on various Oracle applications. Currently, working with 'Crenlo Engineered Cabs' as 'IT director' from Atlanta, Georgia, United States