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MRP Inputs, Process, and Outputs

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MRP Inputs, Process, and Outputs

1. Role of the Master Production Schedule (MPS) as an MRP Input

The Master Production Schedule (MPS) is a critical input to MRP because it details what finished goods must be produced, in what quantities, and at what specific times. MPS drives all downstream material calculations and determines the gross requirements for dependent-demand items. Understanding its format, time fences, stability requirements, and planning horizon ensures accurate MRP computations. A well-structured MPS reduces nervousness, prevents cascading schedule changes, and ensures that MRP operates with realistic demand signals. For CPIM, it is essential to understand how MPS directly influences component-level demand and the precision needed in defining finished-goods schedules.

2. Importance of the Bill of Materials (BOM) in MRP

The Bill of Materials (BOM) is a structural blueprint used by MRP to explode parent-item demand into component-level requirements. A valid BOM provides details on components, subassemblies, quantities per unit, and hierarchical relationships. Accurate BOM data ensures correct material planning, cost estimation, and production sequencing. Errors such as incorrect quantities, missing components, or outdated revisions can lead to shortages, excess inventory, and inefficient order releases. For CPIM, understanding BOM types—modular, indented, single-level, multilevel, phantom—and their application in MRP is vital, along with the impact of engineering change control on BOM precision.

3. Inventory Records Accuracy and Its Impact

MRP relies heavily on accurate inventory records to compute net requirements. These records include on-hand balances, safety stock levels, allocated quantities, and scheduled receipts. Discrepancies between system records and physical stock lead to incorrect planning signals, such as unnecessary order releases or unplanned shortages. Techniques such as cycle counting, ABC control, and perpetual inventory management improve accuracy. For CPIM success, you must understand how inventory accuracy acts as a key input to MRP, influences system reliability, and supports operational stability, especially when determining net requirements for dependent-demand items.

4. Understanding Lead Times as MRP Inputs

Lead times determine when orders must be released to ensure availability at the planned receipt date. MRP uses several types of lead times: processing, move, queue, setup, and wait. Incorrect lead times distort planned orders, cause delays, inflate safety stock, and reduce customer service performance. CPIM candidates must understand cumulative lead time, critical path considerations, and the role of lead-time offsets in scheduling. Accurate lead times allow MRP to synchronize material availability with production schedules and prevent bottlenecks. This concept also includes understanding variability and strategies for reducing or stabilizing lead times.

5. Gross Requirements and Demand Explosion

Gross requirements represent the total demand for an item before adjustments for inventory or scheduled receipts. MRP generates gross requirements by exploding parent

demand through the BOM structure. Understanding explosion logic, low-level coding, and demand propagation helps ensure correctness in dependent-demand calculations. Gross requirements include not only MPS-driven demand but also dependent demands, transfers, and external orders. In CPIM, it is important to differentiate between independent and dependent demand and understand how MRP uses gross requirements as starting points for further calculations in the planning process.

6. Netting Logic and Net Requirements Calculation

Net requirements represent the quantity that must be planned after considering on-hand inventory, scheduled receipts, allocations, and safety stock. Netting logic ensures that MRP accounts for all available supply before generating new planned orders. CPIM requires understanding how adjustments are made when supply exceeds or falls short of demand, how priority rules are applied, and how lot-sizing affects net requirements. This concept also covers the importance of time-phased records and how netting occurs at each period in the planning horizon. Proper netting avoids shortages while minimizing excess inventory.

7. Planned Order Receipts in MRP

Planned order receipts represent the future supply that MRP schedules to arrive in specific time periods to meet net requirements. These are system-suggested, not yet released, and subject to review and approval by planners. CPIM candidates should understand how MRP calculates timing using backward scheduling, lead-time offsets, and lot-sizing rules. Planned order receipts influence downstream dependent demand as they become part of

scheduled receipts. Their accuracy ensures smooth production flow, reduced expediting, and minimized inventory variances. Understanding how changes in demand or lead time affect planned receipts is core to MRP planning.

8. Planned Order Releases and Timing Logic

Planned order releases are the manufacturing or purchase orders that MRP suggests issuing at a specific time to ensure availability by the planned receipt date. Release timing depends on cumulative lead time, lot-sizing, and the time-phased requirements plan. For CPIM, understanding backward scheduling, pegging relationships, firming strategies, and release control mechanisms is crucial. This concept ensures planners know when and how to push orders into execution. Planned order releases must also account for constraints, shop-floor capacity, and supplier responsiveness to prevent delays and ensure on-time completion of parent items.

9. Lot-Sizing Techniques in MRP

Lot-sizing determines how much to order when a net requirement occurs. Various techniques include lot-for-lot (L4L), fixed order quantity (FOQ), economic order quantity (EOQ), period order quantity (POQ), and part-period balancing (PPB). Each method influences inventory levels, ordering frequency, and cost structures. CPIM emphasizes understanding trade-offs between setup costs, holding costs, and demand variability. Lot sizing affects planned order releases and the overall stability of the MRP plan. Accurate selection of lot-sizing methods helps align supply with demand while minimizing waste, costs, and unnecessary production variability.

10. Pegging and End-Item Visibility

Pegging provides visibility into which parent orders or MPS items drive demand for a specific component. Unlike allocation or where-used reports, pegging is time-phased and shows exact dependencies. Pegging helps planners identify the root cause of material shortages, prioritize critical components, and evaluate the impact of changes in schedules. It is essential for exception management, troubleshooting, and decision-making during MRP replanning. For CPIM, mastering pegging helps understand the full chain of demand relationships and supports effective communication across departments such as procurement, production, and customer service.

11. Scheduled Receipts and Open Orders

Scheduled receipts represent supply orders that have already been released and are expected to arrive in specific periods. They include purchase orders, production orders, and transfer orders already in the pipeline. MRP incorporates scheduled receipts before generating new planned orders. Understanding how scheduled receipts affect netting, material availability, and planning updates is critical for CPIM. Planners must also monitor delays, expedite requests, and partial deliveries. Incorrect scheduled receipt data disrupts MRP outputs and may lead to excess ordering. Properly managing open orders helps maintain supply consistency and operational stability.

12. Safety Stock and Its Role in MRP

Safety stock protects against uncertainties in demand, lead time, and supply reliability. In MRP, safety stock acts as a buffer and is treated as a minimum inventory requirement

during netting. CPIM requires understanding various safety stock methods—fixed safety stock, time-phased, statistical, and service-level-based approaches. Excessive safety stock increases carrying costs, while insufficient safety stock increases risk of stockouts. Understanding how safety stock interacts with planned orders, inventory accuracy, and BOM level is essential for effective MRP planning. Proper safety stock helps maintain continuity in production and customer service performance.

13. Time Buckets and Time-Phased Planning

MRP operates on a time-phased planning grid divided into time buckets (days, weeks, etc.). Time buckets help organize gross requirements, net requirements, and planned orders. Understanding how planning horizons, bucket sizes, and cumulative lead times influence MRP accuracy is vital for CPIM preparation. Short buckets provide more precision but increase computational effort, while long buckets simplify planning but reduce detail. Time-phasing ensures that material availability aligns with production timing. Mastery of time buckets allows planners to identify material shortages earlier and make adjustments before disruptions occur.

14. MRP Explosion and Multi-Level Planning

The MRP explosion process converts parent-item requirements into component-level requirements using the BOM structure. It occurs level by level, guided by low-level codes that prevent duplicated calculations. Explosion considers quantities-per, lot-sizing, lead times, and scheduled receipts. Understanding this multi-level planning

is crucial for CPIM because it links the MPS to all dependent-demand items. Accurate explosion ensures that subassemblies and components are planned correctly and prevents shortages that can halt production. Planners must recognize how changes in upper-level requirements cascade down through multiple BOM levels.

15. Handling Scrap, Yield Loss, and Attrition in MRP
Scrap, yield loss, and attrition affect actual material consumption and must be considered in MRP calculations. MRP compensates by increasing gross requirements or adjusting BOM quantities to reflect expected losses. CPIM candidates need to understand scrap factors, yield percentages, and how to maintain accurate BOM revisions. Failure to account for scrap can lead to shortages, rework, and production delays. Proper modeling of losses ensures realistic material plans, reduces expediting costs, and supports more predictable production outcomes. Yield considerations are especially important in industries like electronics, food, and pharmaceuticals.

16. Exceptions and Action Messages
MRP generates exception messages to alert planners to conditions requiring action—reschedule in, reschedule out, cancel, release, or expedite orders. Exception messages help reduce planning effort by focusing attention on critical issues. Understanding their priority, interpretation, and relevance is crucial for effective decision-making. CPIM emphasizes the difference between action messages and planned orders, and how exception management improves schedule stability. Proper use of exception messages

minimizes nervousness and reduces unplanned changes in production. This ensures better coordination among departments and improves overall planning performance.

17. Order Pegging and Component Criticality

Order pegging shows specific connections between parent and child orders. It helps identify which parent items are disrupted when a component is short. CPIM requires understanding how pegging aids root-cause analysis, shortage resolution, and prioritization of constrained materials. Pegging is important for maintaining service levels during disruptions. By identifying high-impact items, planners can make informed decisions on order releases, expediting, and supplier communication. Effective pegging analysis prevents line stoppages, helps manage critical components, and ensures that resources are allocated to the most important production needs.

18. BOM Accuracy and Engineering Change Control

MRP performance depends on accurate BOM structures. Engineering changes, design updates, or process improvements must be reflected immediately in the BOM. CPIM candidates must understand engineering change notices (ECNs), effectivity dates, and BOM revision control. Inaccurate BOMs cause misaligned demand, excess procurement, and unexpected shortages. BOM accuracy also supports cost estimation, quality control, and regulatory compliance. Proper engineering change control ensures that materials planning aligns with the actual production process and prevents disruptions caused by outdated component specifications or incorrect planning data.

19. Regenerative vs. Net Change MRP Processing

MRP systems use two main processing modes: regenerative and net change. Regenerative MRP recalculates the entire plan periodically, ensuring full accuracy but requiring more processing time. Net change MRP updates only items affected by recent changes, providing faster results but potentially accumulating inaccuracies. CPIM focuses on understanding when each method is appropriate, how performance trade-offs are managed, and how planning intervals influence stability. These concepts help planners maintain efficient MRP runs while ensuring data reliability. Selection depends on system load, frequency of changes, and the need for planning precision.

20. MRP Outputs and Their Interpretation

The main outputs of MRP include planned order releases, planned order receipts, rescheduling messages, pegging reports, and exception messages. Understanding how these outputs interact and how planners should interpret them is critical for CPIM performance. MRP outputs serve as decision-making tools, not final instructions. Effective planners analyze outputs to adjust schedules, coordinate with purchasing, manage capacity constraints, and ensure material availability. Knowing how to evaluate output stability, identify risks, and communicate with cross-functional teams ensures successful execution of the MRP plan and supports overall operational performance.

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