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Rough-Cut Capacity Planning and MPS Validation

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Rough-Cut Capacity Planning and MPS Validation

1. Purpose and Role of RCCP

Rough-Cut Capacity Planning (RCCP) ensures that the preliminary Master Production Schedule (MPS) is feasible by comparing required capacity against available capacity at critical resources. It acts as an early-warning tool to detect overloads or shortages before moving into detailed capacity planning. By validating whether planned production volumes can be met using key labor, machine centers, or suppliers, RCCP allows planners to fine-tune the MPS. RCCP reduces the cost and disruptions associated with infeasible schedules, making it a crucial component in Sales & Operations Planning (S&OP) and MPS processes.

2. Key Resource Identification

RCCP focuses on "critical resources," which could be constraint work centers, bottleneck machines, skilled labor groups, or long-lead suppliers. Identifying these resources is essential because capacity issues at these points will significantly affect the overall schedule. Planners must analyze product structures, routing steps, and operational loads to determine which resources need to be monitored. Only the most capacity-sensitive resources are included, making RCCP efficient while still providing reliable feasibility assessments. Correct identification prevents planners from overlooking bottlenecks that could cause customer service failures or expedited costs later.

3. MPS Stability and Time Fences

Time fences—frozen, slushy, and liquid zones—define how flexible the Master Production Schedule is. RCCP ensures

adherence to these zones by validating whether scheduled changes within each time fence are realistic from a capacity standpoint. In the frozen zone, capacity adjustments are minimal, so planners must ensure the schedule is highly reliable. In the slushy zone, limited changes can be evaluated through RCCP. In the liquid zone, RCCP helps forecast capacity feasibility for future demands. Understanding time fences ensures disciplined planning, customer service stability, and minimized production volatility.

4. Bill of Resources (BOR)

A Bill of Resources (BOR) is used in RCCP to determine which resources are consumed when producing a specific item. Unlike a Bill of Materials (BOM), which focuses on components, the BOR outlines required machine hours, labor hours, or key constraints. BOR simplifies capacity estimation by focusing on only the most critical resources. RCCP calculations multiply the planned production quantities in the MPS by the BOR resource requirements. Mastery of BOR enables accurate capacity validation, identifies bottlenecks, and helps in evaluating the impact of schedule variations on resource utilization.

5. Resource Profiles and Load Patterns

Resource profiles illustrate how capacity demand from an item is distributed across time as it progresses through production stages. Some products consume capacity immediately, while others use it weeks later depending on routing. RCCP uses these profiles to allocate load across future periods accurately. Understanding resource profiles allows planners to anticipate when bottleneck resources

will be stressed and adjust the MPS accordingly. It also helps evaluate overlapping production, lot-sizing effects, and lead-time-offset impact. Without these profiles, load estimation would be inaccurate and lead to infeasible schedules.

6. Capacity Bills

Capacity bills provide a structured summary of resource usage for all manufactured items at a family or product level. They help in top-down RCCP during S&OP and are refined further for MPS-level RCCP. These bills consolidate resource requirements across multiple BOM levels into a single representation of needed capacity. Using capacity bills, planners can quickly assess whether production plans align with resource capabilities. Mastery ensures consistency between aggregate planning, MPS, and shop floor capacity execution. They also support rapid scenario planning when evaluating new demand or operational changes.

7. Load vs. Capacity Comparison

The core of RCCP involves comparing the calculated load (capacity required) with available capacity. Load is derived from MPS quantities multiplied by resource requirements; capacity includes regular hours, overtime, shifts, and subcontracting options. Excess load indicates overloads requiring corrective action, while under-utilization may represent inefficiencies or lost revenue opportunities. Understanding this comparison enables planners to determine whether the MPS is feasible, evaluate alternatives such as rescheduling, capacity adjustments, or lot-size changes, and proactively avoid production disruptions.

8. Rated vs. Demonstrated Capacity

Rated capacity is the theoretical maximum output based on standard hours, shifts, and efficiency assumptions. Demonstrated capacity reflects actual historical performance, factoring in downtime, delays, and real efficiency levels. RCCP uses demonstrated capacity for more accurate feasibility assessments. Understanding the difference prevents unrealistic schedules based on inflated capacity assumptions. Planners must periodically update demonstrated capacity to keep RCCP aligned with operational reality. This distinction helps improve schedule reliability and reduces firefighting during production execution.

9. Rough-Cut Methods: BOR-Based RCCP

BOR-based RCCP calculates load using resource data from the BOR. It is the most precise RCCP method because it uses detailed product-specific resource requirements. It is ideal when a few constraint resources dominate production feasibility. Mastering this method ensures accurate MPS validation and alignment with real constraints. It also allows planners to perform what-if analysis on changes in demand, routing, or resource availability. BOR-based RCCP is widely used in discrete manufacturing, where resource consumption varies significantly between products.

10. Product Mix RCCP

Product mix RCCP uses average resource usage values for a product family rather than item-specific BOR data. It is efficient when many products share similar processes or when MPS is planned at a family level. This method

balances accuracy with simplicity and is useful in earlier stages of planning. Understanding it helps planners validate feasibility before detailed bills are created. It also supports S&OP integration by offering a quick way to estimate capacity needs under varying demand mixes.

11. Capacity Ledger Concepts

A capacity ledger tracks available capacity, scheduled adjustments, shift changes, and previous period carry-overs. It functions like an inventory ledger but for capacity. RCCP uses this ledger to ensure consistency over time and prevent double-counting or unrealistic capacity assumptions. Planners need to understand how ledger entries—such as holidays, preventive maintenance, or labor shortages—affect available capacity. Mastery ensures accurate load comparisons and avoids unexpected constraints during production.

12. MPS Validation Logic

MPS validation ensures that planned production quantities align with available material, lead times, and capacity. It checks whether the schedule respects time fences, lot sizes, BOM structures, and capacity constraints. RCCP is a major part of this validation, but planners must also consider inventory positions, safety stock, forecast accuracy, and customer priorities. Mastering MPS validation ensures the schedule is realistic, stable, and achievable without triggering excessive rescheduling or expediting.

13. Finite vs. Infinite Capacity Approaches

RCCP typically uses an **infinite capacity** approach, assuming unlimited capacity to identify load patterns. However,

planners must also understand finite capacity thinking, which highlights how bottlenecks truly constrain production. RCCP identifies overloads, but decisions to resolve them require finite-capacity reasoning. Understanding both approaches allows planners to anticipate operational realities and make informed schedule adjustments, such as smoothing load or adding overtime.

14. Load Smoothing and Capacity Leveling

Load smoothing evens out demand on critical resources by redistributing work across periods without violating constraints. It stabilizes production rates, reduces overtime, and minimizes schedule turbulence. Capacity leveling adjusts available capacity to match the planned load, such as adding shifts or subcontracting. RCCP highlights where smoothing or leveling is needed. Mastery of these techniques ensures MPS stability, reduces bottlenecks, and improves reliability of downstream scheduling.

15. Bottleneck Analysis in RCCP

RCCP helps identify bottlenecks early in the planning cycle. Understanding bottleneck behavior, such as variability, setup-time impact, and capacity recovery, enables planners to make better decisions regarding product mix and scheduling. Early detection of bottlenecks allows the organization to adjust MPS quantities, sequence production better, or plan overtime. RCCP's bottleneck focus prevents last-minute disruptions and improves long-term capacity utilization.

16. Lead-Time Offsetting

Lead-time offsetting ensures that capacity loads are allocated to the correct time bucket based on the product's cumulative lead time. RCCP uses this to place resource usage in the right periods—preventing unrealistic assumptions that capacity is consumed when the MPS quantity is due. Understanding offsetting ensures that planners see bottlenecks early enough to correct them. It also aligns capacity planning with material planning and production flow.

17. What-If Analysis and Scenario Modeling

RCCP supports scenario planning by evaluating how changes in demand, resource availability, or product mix affect capacity feasibility. “What-if” analysis helps planners test the impact of overtime, subcontracting, schedule smoothing, or adding equipment. Mastery of scenario modeling enables proactive decision-making and improves responsiveness in volatile environments. It strengthens the connection between S&OP decisions and MPS execution.

18. Integration of RCCP with S&OP

RCCP bridges aggregate planning in S&OP with the detailed MPS. It validates whether agreed-upon volumes can be delivered using critical resources. Poor alignment between S&OP and MPS causes instability and capacity conflicts. Understanding this integration ensures that strategic plans are feasible and that tactical plans support long-term objectives. It also enhances collaboration between sales, operations, and supply chain teams.

19. Exception Messages and Alerts in MPS

Advanced planning systems generate exception messages when the MPS violates capacity limits, falls short of demand, or creates scheduling conflicts. Understanding these alerts helps planners quickly intervene and resolve issues. RCCP provides the underlying logic for many of these exceptions. Mastery ensures faster decision-making, better responsiveness, and improved schedule reliability. It also helps prioritize which alerts require immediate action.

20. Continuous Improvement in Capacity Planning

Capacity planning must adapt as product mix, technology, reliability, and workforce conditions evolve. Understanding continuous improvement concepts—such as updating demonstrated capacity, refining BOR data, reducing variability, or improving forecasting—ensures RCCP and MPS remain accurate. Organizations that continuously refine their planning processes achieve better on-time delivery, lower cost, and fewer production surprises. Continuous improvement keeps the capacity planning system aligned with operational realities.

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XEFHYZ88

Certifications@Fhyzics.net

+91-900-304-9000

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