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Capacity Requirements Planning

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Capacity Requirements Planning

1. Purpose and Role of CRP in Manufacturing Planning

CRP translates the material plan from MRP into detailed capacity requirements for each work center. It verifies whether available capacity can meet the scheduled load and highlights overloads or underloads. CRP ensures that material plans are feasible, aligns production resources with demand, and supports realistic scheduling. For CPIM, understanding CRP's role in connecting MRP outputs to shop-floor execution is critical. CRP helps planners avoid unrealistic schedules, improve resource utilization, and maintain customer delivery performance by ensuring that capacity matches planned production volumes.

2. Work Centers and Capacity Definitions

Work centers are resource groups—machines, labor teams, or production lines—where work is performed. Understanding how work centers are defined and how capacity is measured (hours, shifts, units) is essential. CRP requires accurate data for available hours, efficiencies, utilization, and constraints. Work centers may have alternate machines, parallel operations, or different resource combinations. CPIM stresses the importance of defining work centers clearly so that capacity loads can be calculated correctly. Proper work center definition ensures that planners understand which resources are constrained and how to schedule work realistically.

3. Routings and Their Role in CRP

Routings specify the sequence of operations needed to produce an item and contain critical data such as operation times, work centers, setup time, run time, and queue time.

CRP uses routings to calculate load at each work center. Inaccurate routing data leads to incorrect capacity requirements and inefficient schedules. For CPIM, understanding how routing details affect capacity planning is essential. Routings are the backbone of CRP because they translate production quantities into time requirements. Maintaining accurate and updated routing information ensures reliable capacity calculations and efficient scheduling.

4. Standard Times: Setup, Run, Queue, and Move

Standard times determine how long each operation requires and are used to calculate capacity load. Setup time applies per batch, run time per unit, queue time reflects waiting before processing, and move time accounts for transfers between operations. Understanding these distinctions is crucial for accurate CRP. CPIM emphasizes how variations in standard times affect capacity calculations, lead times, and scheduling decisions. Incorrect times create bottlenecks, unrealistic schedules, and poor capacity utilization. Mastery of standard times ensures accurate load estimation and shop-floor efficiency.

5. Load Profiles and Capacity Analysis

A load profile compares the load on each work center against its available capacity over time. It helps planners visualize overloads, underloads, and periods of balanced load. CPIM requires understanding how to interpret load profiles, identify bottlenecks, and make corrective adjustments. Load profiles guide decisions such as rescheduling, overtime, subcontracting, or altering lot sizes. Effective load profiling ensures the production plan is realistic, achievable, and aligned with capacity constraints.

6. Rated Capacity vs. Demonstrated Capacity
Rated capacity is the theoretical output a work center can produce based on available hours, efficiency, and utilization. Demonstrated capacity reflects what the work center has historically achieved. CPIM requires understanding the differences and when each is appropriate for planning. Demonstrated capacity often provides more realistic scheduling information, accounting for downtime, variability, and workforce performance. Rated capacity is used for long-term planning, while demonstrated capacity supports near-term scheduling. Using the wrong measure can lead to unrealistic or overly conservative capacity plans.

7. Infinite vs. Finite Capacity Planning
Infinite capacity planning assumes unlimited work center capacity and is used in MRP and CRP. Finite capacity planning considers actual resource limits. CPIM emphasizes that CRP generally uses infinite capacity assumptions but planners must reconcile output with real constraints. Understand where each method is appropriate and how finite scheduling tools—like advanced planning systems—complement CRP. Mastery of this concept helps prevent unrealistic schedules and production bottlenecks.

8. Capacity Bills (Bill of Capacity)
A capacity bill shows the amount of capacity needed at each work center to produce one unit of a finished item. It is derived from routing and BOM information. Capacity bills help planners estimate load from the MPS before detailed CRP calculations are done. CPIM requires understanding how capacity bills support aggregate planning, identify bottleneck resources, and guide long-term capacity

decisions. Capacity bills ensure that major resource requirements are recognized early in the planning process.

9. The Role of MRP in CRP

MRP provides planned order releases that serve as input to CRP. CRP examines these orders to determine whether work centers have sufficient capacity to execute them. Understanding how MRP outputs translate into routing-level time requirements is essential for CPIM. If MRP is inaccurate, CRP results will also be unreliable. This concept highlights the interdependence between material and capacity planning and how they must work together for operational success.

10. Bottleneck Identification and Management

Bottlenecks are work centers where required load exceeds available capacity. Identifying bottlenecks is essential for realistic scheduling. CRP helps detect bottlenecks early so planners can apply solutions such as increasing shifts, outsourcing work, adjusting schedules, or redesigning processes. CPIM stresses understanding bottleneck behavior because bottlenecks determine overall throughput. Effective bottleneck management ensures smoother flow, reduced work-in-process, and better customer service.

11. Capacity Adjustments and Leveling Strategies

When overloads occur, planners use capacity adjustments such as overtime, adding shifts, moving work to alternate work centers, subcontracting, or modifying routings. Capacity leveling attempts to smooth load across periods to reduce peaks and valleys. CPIM requires understanding the

cost, feasibility, and implications of each leveling technique. Effective capacity adjustments create stable schedules and reduce work center congestion.

12. Shop Floor Control and CRP Integration

CRP provides planned capacity requirements, but shop floor control tracks actual performance. Integration between the two ensures that variances are identified and corrected. CPIM emphasizes understanding how real-time shop floor data—labor hours, scrap, downtime—feeds back into CRP accuracy. This link ensures that future schedules are based on reliable information and that capacity planning reflects real-world conditions.

13. Queue Management and Flow Control

Queue times significantly affect lead times and capacity requirements. Poor queue management leads to congestion, WIP buildup, long lead times, and reduced throughput. CPIM requires understanding how queuing theory, priority dispatch rules, and workload balancing affect CRP outcomes. Effective queue management improves flow, reduces variability, and stabilizes production schedules.

14. Capacity Planning Horizons

Capacity planning occurs at multiple levels—long-range (resource planning), medium-term (RCCP), and short-term (CRP). Understanding how these levels integrate is essential for CPIM. CRP operates at the short-term execution level, ensuring that scheduled orders are feasible. Mastery includes understanding planning horizons, their data requirements, and how each level influences the others.

15. Rough-Cut Capacity Planning (RCCP) Differences
RCCP validates capacity feasibility at the MPS level using simplified data such as capacity bills or key resource profiles. Unlike CRP, RCCP does not use detailed routings or operation-level load. CPIM requires knowing when RCCP is appropriate and how it contributes to preventing unrealistic MPS plans. Distinguishing RCCP from CRP is essential for understanding the capacity planning hierarchy.

16. Input/Output Control in CRP
Input/output control compares planned input (scheduled work) with actual output from work centers. It helps assess how well work centers are performing relative to load. CPIM requires understanding how input/output reports detect imbalances, delays, or inefficiencies. This feedback loop improves capacity planning accuracy and helps planners adjust work schedules proactively.

17. Finite Scheduling Techniques
Although CRP uses infinite capacity planning, advanced techniques—like forward scheduling, backward scheduling, and finite capacity planning systems—help refine schedules to align with real constraints. CPIM emphasizes understanding these methods and when they are needed to enhance CRP. Finite scheduling supports manufacturing environments with tight resource constraints or complex routings.

18. CRP Data Accuracy Requirements
CRP requires accurate data from inventory, routings, BOMs, work center calendars, efficiencies, and utilization factors. Inaccurate data leads to poor load calculations, bottleneck

misidentification, and unreliable schedules. CPIM stresses the importance of clean master data, audits, and continuous improvement processes. High data accuracy ensures that CRP results reflect operational reality.

19. Using CRP Output Reports

CRP generates reports such as work center load reports, capacity exception messages, overload/underload summaries, and capacity requirement charts. Planners must interpret these outputs and take corrective actions. CPIM requires understanding how to prioritize issues based on severity, timing, and impact on customer orders. Effective use of CRP outputs improves decision-making and operational stability.

20. Aligning CRP with Continuous Improvement (Lean, TOC)

CRP effectiveness improves when integrated with Lean principles and Theory of Constraints (TOC). Lean reduces waste and variability, improving flow and capacity reliability, while TOC focuses on optimizing bottleneck resources. CPIM emphasizes understanding how CRP complements these methodologies. Integrating continuous improvement with CRP ensures sustainable capacity planning, reduces firefighting, and improves throughput.

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www.Fhyzics.net

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XEFHYZ88

Certifications@Fhyzics.net

+91-900-304-9000

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