Certified in Planning and Inventory Management

Intermittent/Flow Manufacturing Scheduling, and PAC

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Intermittent/Flow Manufacturing Scheduling, and PAC

1. Differences Between Intermittent and Flow Manufacturing

Intermittent manufacturing handles varied products in small batches, with routing that changes by item. It requires flexible resources, complex scheduling, and high setup frequency. Flow manufacturing produces standardized products in a fixed, repetitive sequence with high volume and low variability. Schedules focus on rate-based output instead of discrete orders. Understanding these differences is essential because scheduling, capacity planning, and PAC techniques vary significantly by environment. CPIM candidates must recognize which practices apply to job shops, batch operations, assembly lines, and continuous flows, enabling more accurate planning and execution.

2. Characteristics of Intermittent Manufacturing

Intermittent systems manage diverse product mixes, variable routing, and unpredictable workloads. Orders often differ in quantity, process steps, and lead-time requirements. These environments require detailed scheduling, strong priority rules, and effective dispatching to manage frequent changeovers. Queue times are typically higher due to job variability and resource contention. PAC must closely monitor progress, adjust sequences, and ensure accurate reporting. Mastering intermittent manufacturing is crucial for CPIM because it forms the foundation of many job shops, custom manufacturing setups, and engineer-to-order environments where flexibility and visibility drive performance.

3. Characteristics of Flow Manufacturing

Flow manufacturing emphasizes high-volume, repetitive production with minimized variation and standardized routing. Line balancing, takt time, and rate-based scheduling are critical tools for managing flow environments. Work-in-process is tightly controlled, and schedules release work at a consistent pace. PAC focuses on maintaining line stability, minimizing downtime, and enforcing standard processes. Flow systems support lean initiatives by reducing waste and improving predictability. Understanding flow manufacturing helps CPIM candidates apply appropriate scheduling methods, assess throughput, and maintain continuous movement of materials across manufacturing lines.

4. Production Line Design and Workstation Layout

In flow environments, designing the production line is critical to achieving consistent throughput. Workstations must be arranged in the order of operations with balanced workloads to minimize idle time and bottlenecks. Cellular layouts, U-shaped lines, and cross-trained labor enable flexible flow. Intermittent systems require adaptable, process-oriented layouts. Layout decisions directly affect queue times, move times, labor productivity, and scheduling accuracy. CPIM exam takers must understand how layout affects PAC decisions, capacity utilization, variability, and flow continuity.

5. Takt Time and Line Balancing

Takt time defines the pace of production required to meet customer demand. Line balancing aligns workstation tasks so each operates within takt time, ensuring smooth flow without bottlenecks. In flow manufacturing, PAC uses takt time to set production rates, manage labor, and stabilize flow. Line imbalance leads to idle time, WIP accumulation, and reduced output. In intermittent systems, balancing is more difficult due to variable routing but still important for minimizing delays. Mastery of takt time and line balancing ensures efficient scheduling and predictable throughput.

6. Rate-Based Scheduling (RBS)

Rate-based scheduling is used in flow environments where production is planned as a rate rather than discrete order quantities. RBS aligns production with demand by establishing a consistent output pace, often using takt time or paced lines. It reduces reliance on detailed order-level schedules and supports lean flow by minimizing WIP and stabilizing production. PAC monitors actual output against the planned rate, adjusting for disruptions. Understanding RBS is essential for CPIM because it contrasts sharply with intermittent scheduling and is fundamental in repetitive and continuous manufacturing.

7. Finite vs. Infinite Loading in Scheduling

Infinite loading assumes capacity is unlimited, scheduling work without regard for real constraints—a method common in MRP planning. Finite loading considers actual resource limits, making schedules realistic and executable. Intermittent systems benefit from finite loading to control queue times and avoid bottlenecks. Flow environments use rate-based capacity matching rather than discrete loading. PAC uses loading techniques to release work, manage WIP, and maintain schedule adherence. Understanding both approaches is key for selecting the right scheduling strategy.

8. PAC Requirements in Intermittent Manufacturing
PAC in intermittent systems must manage job-level priorities, complex routings, and variability in processing times. It involves dispatching, sequencing rules, monitoring progress, and frequent corrective action. Real-time feedback is essential due to constant routing and order-level differences. PAC must also maintain accurate data for lead-time calculations and capacity planning. Good control minimizes delays, improves delivery performance, and reduces WIP. This concept is foundational for CPIM because many traditional manufacturing environments fall into this category.

9. PAC Requirements in Flow Manufacturing
PAC in flow systems focuses on maintaining continuous movement, minimizing downtime, and ensuring adherence to the planned production rate. It monitors station-level performance, balances workloads, and responds quickly to flow disruptions. Standardization and stability are more critical than detailed order-level tracking. Tools such as andon systems, visual controls, and heijunka boards support PAC. CPIM candidates must understand how PAC responsibilities shift in flow systems—from order execution to line management and throughput protection.

10. Dispatching Rules and Sequencing Strategies
Dispatching rules determine the order jobs should be processed when competing for resources. Common rules include FCFS, SPT, EDD, and CR. These rules help manage variability in intermittent environments, reduce queue lengths, and improve due-date performance. In flow

systems, dispatching is often unnecessary because work follows a fixed sequence. Understanding sequencing strategies helps CPIM candidates evaluate trade-offs in WIP, lead time, and schedule adherence, especially in environments with high variability or mixed-model production.

11. Queue Management and Queue Time Reduction

Intermittent manufacturing often suffers from long queues due to routing variability, conflicting priorities, and unpredictable cycle times. Controlling queues reduces lead time and improves responsiveness. Techniques include controlling order release, workload balancing, sequencing optimization, and bottleneck management. In flow systems, queues are minimized through pull systems and takt-time alignment. PAC must monitor queues continuously to identify delays and adjust sequences. Understanding queue behavior is essential for managing throughput and reducing variability.

12. Work-in-Process (WIP) Control in Different Environments

WIP control is critical because excessive WIP increases lead time, congestion, and cost. Intermittent systems use dispatching, input/output control, and release timing to limit WIP. Flow systems use Kanban, CONWIP, and rate-based scheduling to regulate WIP. PAC must ensure WIP does not exceed the system's capacity to maintain predictable flow. Understanding WIP regulation helps CPIM candidates analyze how planning decisions impact queue times, throughput, and overall efficiency.

13. Bottleneck Identification and Throughput Maximization

Bottlenecks restrict system output and define the maximum achievable throughput. Identifying bottlenecks in intermittent systems requires tracking queue patterns, utilization, and WIP buildup. In flow systems, bottlenecks often occur at slowest stations or areas with frequent downtime. PAC must protect bottlenecks through prioritization, buffer placement, and quick-response measures. The Theory of Constraints provides structured methods for improving flow around constraints. Understanding bottlenecks is essential for improving performance across both environments.

14. Drum-Buffer-Rope and TOC in Scheduling

Drum-Buffer-Rope (DBR) is a scheduling method from the Theory of Constraints that synchronizes production based on the bottleneck's pace. The drum sets the schedule, buffers protect against variability, and the rope controls release to prevent overload. DBR improves throughput and reduces WIP in both intermittent and flow systems. PAC uses DBR to maintain smooth flow, protect constraint resources, and manage release timing. Mastery of DBR is critical for CPIM candidates studying advanced flow management techniques.

15. Kanban and Pull Systems

Kanban systems use visual signals to regulate material replenishment based on consumption rather than forecasts. They are widely used in flow environments and mixed-model lines to control WIP, stabilize flow, and reduce lead time. PAC uses Kanban to trigger production, manage line balancing, and ensure material availability. Intermittent systems can also use Kanban in repetitive subassemblies. Understanding how pull systems differ from push scheduling is essential for CPIM exam success.

16. Heijunka (Level Loading)
Heijunka levels production volume and product mix to reduce variability and stabilize flow. It prevents batching, minimizes inventory, and supports efficient scheduling in flow environments. Level loading enables consistent workloads across workstations and suppliers. PAC relies on heijunka to maintain predictable flow and reduce disruptions caused by fluctuating demand. Understanding heijunka is essential for blending lean principles with scheduling and PAC practices.

17. Production Planning vs. Execution in Different Environments
Intermittent systems require detailed order-level planning and frequent schedule revisions. Flow systems focus more on maintaining rates, stability, and minimal variability. PAC acts as the execution bridge, translating plans into real-time actions. Successful management requires understanding how planning tools (MRP, RBS, Kanban) interact with execution practices (dispatching, andon, DBR). CPIM candidates should understand the fundamental differences in execution strategies by manufacturing type.

18. Setup Time Reduction and SMED
Setup time significantly impacts scheduling flexibility, batch size, and throughput—especially in intermittent systems. SMED (Single-Minute Exchange of Dies) reduces setup time

drastically, enabling smaller batches and faster changeovers. In flow environments, SMED ensures mixed-model production runs smoothly without reducing line efficiency. PAC relies on setup reduction to improve scheduling performance, reduce WIP, and enhance responsiveness. Understanding SMED is vital for improving flow and reducing downtime.

19. Feedback Loops Between PAC and Planning Systems
PAC provides actual performance data—cycle times, queue lengths, downtime, scrap—to planning systems like MRP and capacity planning. This feedback ensures future schedules reflect reality. In both intermittent and flow environments, reliable feedback enhances schedule accuracy, WIP control, and resource utilization. CPIM students must understand the importance of continuous feedback in maintaining synchronized planning and execution.

20. Performance Measurement in Intermittent and Flow Systems
Different environments require different KPIs. Intermittent systems emphasize queue time, priority adherence, setup performance, and job completion time. Flow systems focus on throughput, line efficiency, takt adherence, and WIP levels. PAC tracks these metrics to ensure ongoing control and improvement. Understanding performance measurement helps align scheduling and PAC with organizational goals, making it essential for CPIM exam preparation.

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