

Garment Production Management

Week 10

Production Planning and Control

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Recap-previous week

- Demand management and forecasting concepts
- Importance of forecasting
- Forecasting methods
- Measuring forecasting accuracy
- Collaborative forecasting and planning in the fashion supply chain
- Practical cases of forecasting and demand management in garment industry

Lecture Learning Outcomes

- Understand planning and control concepts
- Identify capacity planning concepts
- Identify aggregate planning strategies
- Analyze capacity planning decisions
- Apply production planning concepts in garment industry

Session outline

- Production planning and control
- Capacity decisions
- Functions and objectives of PPC
- Production planning activities
- Aggregate planning strategies
- Production planning in garment industry

Production planning and control

Production planning

- Production Planning answers the what, how, and when questions
- Done before production actual production
- Systematic management function that coordinates flow of
 - materials, labor, equipment, and information across the entire business process
- It aims to produce products at the:
 - Right quantity
 - Right quality
 - Right time
 - Right (lowest possible) cost

Production planning and control

Production planning

- Flow of materials, labor, equipment, and information
- From order receipt to finished product shipment
- Bridges the gap between design/merchandising and shop floor execution
- Design/merchandising is about what customers want
- Shop floor execution is about what operators actually produce

Production planning and control

Production planning

- What to produce?
 - Type of products, styles, quantity, color, size etc.
- How to produce?
 - Operation breakdown, machine and manpower assignment
- How long will it take?
 - Standard allowed minute(SAM) calculation, total manpower time, set targets

Production planning and control

Production planning

- What resources are needed?
 - Raw materials, accessories, packing materials
- When to perform each task?
 - Back calculation of time from shipment data back to order receive date
- Who will do it?
 - Allocation of operators to workstations based on skill level

Production planning and control

Out puts of Production planning

- Production order / work order
- Cutting plan: marker length, number of plies
- Operation bulletin: sequence of sewing operations
- Line balancing chart: operator allocation
- Material requirement plan: fabric and trim requisitions
- Production schedule: daily targets for each production line (e.g. sewing line)

Production planning and control

Production Control:

- Real-time execution and corrective phase
- Ensures the plan is followed and adapts to deviations
- It monitor, adjust, correct the production
- Done during production

Production planning and control

- Capacity determines upper limit on the rate of output
- Measuring capacity is difficult in certain cases
- A capacity measure that does not fluctuate is preferred (dollar amounts are often a poor measure of capacity)
- Measuring capacity based on units of output can be misleading
 - E.g. for more than one products
- Measure of capacity must be tailored to the situation

Production planning and control

Definitions of capacity:

- Design capacity: The maximum output rate or service capacity an operation, process, or facility is designed for.
- Effective capacity: Design capacity minus allowances (personal time, and maintenance)
- Actual output cannot exceed effective capacity
 - Machine breakdowns
 - Absenteeism
 - Shortages of materials
 - Quality problems,
 - Factors out of control of the operations managers

Production planning and control

Capacity planning

Key questions:

- What kind of capacity is needed?
- How much is needed to match demand?
- When is it needed?

Key inputs for capacity planning

- Forecasts about **how much** capacity is needed?
- When that capacity is needed?

Production planning and control

Capacity planning

- How much will it cost?
- How will it be funded?
- What is the expected return?
- **What are the potential benefits and risks?**
 - Degree of uncertainty in demand forecasting
 - Rate of change in demand and costs, profits, and the time to adjust capacity changes
 - Sustainability issues that need to be addressed?
 - Should capacity be changed **all at once**, or **through several small changes**?
 - Can the supply chain handle the necessary changes?

Production planning and control

Capacity decision

- Strategic issue
- Enable organization **to meet future demands** for products and services
- Affect operating costs
- Determinant of **initial cost** (the greater the capacity, the greater its cost)
- Often involve **long-term commitment of resources**
 - Once implemented, difficult or impossible to modify
 - Requires major cost to modify

Production planning and control

Capacity decision

- **Excess capacity** can be a barrier to others, affect delivery time
- Appropriate capacity makes **management easier**
- Very important in **globalization** era
- Often involve **substantial financial and other resources**
 - necessary to plan in advance

Production planning and control

Steps in capacity planning

- Estimate future capacity requirements
- **Evaluate existing capacity** in resources and identify gaps
- **Identify alternatives** for meeting requirements
- Conduct **financial analyses** of each alternative
- Assess key qualitative issues for each alternative
- Select best alternative for long term success
- Implement the **selected alternative**
- Monitor results

Production planning and control

Determinants of effective capacity planning

- Facilities: Size and provision for expansion
- Products or services: Similar items vs successive items changes
- Processes
- Human considerations
- Operational factors
- Supply chain factors
- External forces or factors

Production planning and control

Capacity formulation strategy

- **Leading capacity strategy:** builds capacity in anticipation of future demand increase
- **Following capacity strategy:** builds capacity when demand exceeds current capacity
- **Tracking capacity strategy:** similar to a following strategy
 - It adds capacity in relatively small increments to keep pace with increasing demand

Production planning and control

Aggregate Planning Strategies

- Approaches used to balance production capacity with fluctuating demand
- The planning period is in a medium-term horizon (typically 3–18 months)
- Help organizations **minimize costs**, optimize resource utilization, and **maintain customer service levels**
- Key types of strategies **are level strategy, chase strategy, and mixed(hybrid) strategy**

Production planning and control

Level Strategy

- Maintaining a constant production rate and workforce level
- Not affected by demand fluctuations
- When demand is low, excess production builds inventory
- When demand is high, inventory is drawn down

Key features:

- Stable workforce (no hiring/layoffs)
- Consistent production output
- Inventory serves as a buffer
- Requires accurate demand forecasting

Production planning and control

Application context

- High costs of hiring/firing workers
- Skilled labor is scarce or expensive to train
- For non-perishability is not a concern (inventory can be stored)
- **Stable production processes** are critical

Cost components

- Regular production cost (fixed rate)
- Inventory holding cost (\$/unit/month)
- Potential backorder or stockout costs

Production planning and control

Chase Strategy

- **Adjust production rates and workforce levels** to precisely match demand fluctuations
- Production occurs only when demand exists, minimizing or eliminating finished goods inventory

Key Features

- Workforce size changes with demand
- Minimal inventory holding costs
- High flexibility required
- Frequent hiring and layoffs

Production planning and control

Application context

- Low hiring/firing costs
- High inventory holding costs (or perishable products)
- Labor market provides flexible workforce access
- Storage space is limited or expensive

Cost components:

- Regular production cost (varies by time)
- Hiring cost (\$/worker hired)
- Layoff/termination cost (\$/worker laid off)
- Overtime cost (when demand exceeds regular capacity)

Production planning and control

Mixed (Hybrid) Strategy

- Combining elements of both level and chase strategies
- Often incorporate overtime, subcontracting, part-time workers, or inventory adjustments to achieve optimal cost balance

Key features

- Stable base workforce (level component)
- Flexible adjustments via overtime/undertime (chase component)
- Inventory as additional buffer
- Subcontracting for demand peaks

Production planning and control

Application context

- Both hiring and inventory costs are significant
- Demand has moderate variability
- Subcontracting options are available
- A balanced approach is preferred over extremes

Cost Components:

- Regular production (base level)
- Overtime premium
- Inventory holding
- Subcontracting costs
- Part-time or temporary labor

Production planning and control

Capacity formulation strategy

Assumptions and predictions in capacity planning includes:

- Long-term demand patterns
- Technological changes
- Behaviour of its competitors

The assumptions and predictions typically involve:

- Growth rate and variability of demand
- Costs of building and operating facilities of various sizes
- Rate and direction of technological innovation
- Likely behaviour of competitors
- Availability of capital and other inputs

Production planning and control

Core functions or activities of PPC

- **Planning Functions (Pre-Production)**

- **Routing:** Determine the sequence of operations (E.g. operation breakdown in sewing)
- **Scheduling:** assign start and end time to each operation
- **Loading:** assigning task to specific workstation
- **Material requirement planning(MRP):** calculate exact material requirement and availability

Production planning and control

Core functions or activities of PPC

- **Control Functions (During Production)**

- **Dispatching:** release materials, work orders, and instructions to the shop floor to start production
- **Progress monitoring:** tracking actual production against the plan
- **Inspection & Quality Control:** checking products against specifications, feeding quality data back to planning

Production planning and control

Core functions or activities of PPC

- **Feedback Functions (Continuous Improvement)**
 - **Recording & Reporting:** Documenting actual performance
 - **Corrective action:** adjust plans, resources or methods based on recorded deviations
 - **Update standard:** revise planning parameters (SAM, lead time, wastage rates) based on actual performance

Production planning and control

Operational benefits

- Reduces total production lead time (from order receipt to shipment)
 - Eliminate waiting time between processes
- Minimizes work-in-process (WIP) inventory
 - preventing excess partially finished garments from accumulating between workstations
- Prevents stockouts of raw materials
 - Ensure fabric, thread, and trims are available when needed
- Improves on-time delivery performance
 - Meet customer promised dates consistently
 - Reduce late penalties and lost customers
- Identifies and reduces bottlenecks
 - Focus slowest operation (e.g., buttonhole machine) that limits line output

Production planning and control

Cost and efficiency benefits

- **Reduces idle time for operators and machines**
 - Keep resources productive instead of waiting for work or materials
- **Lowers overtime costs**
 - Ensure realistic scheduling that prevents last-minute production rushes
- **Minimizes fabric waste**
 - Accurate marker planning and material requirement calculation
- **Reduces finished goods inventory**
 - Produce only what is needed when it is needed (pull system)
- **Lowers expediting and air freight costs**
 - Avoid expensive last-minute shipping

Production planning and control

Quality and Labor Benefits

- **Improves quality consistency:** Allow time for **in-process inspections**
- **Reduces rework and defect rates:** Through controlled processes and standardized work methods
- **Increases operator productivity:** Balance workload evenly across all workstations
- **Enables better workforce utilization:** Assign the right skilled operator to each operation
- **Provides clear daily targets:** Assign visible and achievable goals to operators and supervisors

Production planning and control

Management and Decision-Making Benefits

- **Provides real-time visibility:** Know exact status of each production status at any moment
- **Enables accurate delivery promises:** Realistic deadline based on actual capacity
- **Supports what-if scenario analysis:** Test the impact of absenteeism, or machine breakdowns
- **Creates a feedback loop for continuous improvement:** Comparing planned vs. actual to update standards
- **Improves coordination between departments:** Cutting, sewing, finishing, and packing

Production planning and control

Customer and Market Benefits

- **Increases customer satisfaction:** through reliable, predictable delivery dates
- **Enables shorter order lead times:** give the factory a competitive advantage
- **Allows flexible response to changes:** quick orders, quantity adjustments, or style modifications can be evaluated quickly
- **Supports small-batch, high-variety production:** making lean and quick-response manufacturing feasible
- **Builds buyer confidence:** demonstrate **professional planning systems** during factory audits

Production planning and control

Challenges

- Raw material uncertainty (late fabric arrival, quality defects)
- High labour variability (turnover, absenteeism and skill gap)
- Machine and equipment constraints
- Demand and order variability
- Quality and rework
- Information and coordination gap

Production planning and control

Production planning in the garment industry:

- Raw material availability
- Fabric variability
- Short fashion cycles
- Seasonal demand variations
- Multiple sizes and colours
- Bottleneck operations
- High labour turnover

Summary

- Production planning is a key activity in the successful delivery of production orders for buyers
- Uncertainties in garment industry make planning difficult but very important function
- Capacity should be planned in advance before we plan production
- Production planning is before production starts
- Production control is during production process
- Forecasted demand is the base for accurate capacity planning
- Production planning is a key function in a garment industry

References

1. Mesquita, T., & Araújo, P. D. (2025). Optimization of production planning and control in a clothing industry through lean manufacturing. *Brazilian Journal of Production Engineering*, 11(1), 1–15. <https://doi.org/10.47456/bjpe.v11i1.46903>
2. Tsai, W. H. (2018). Green production planning and control for the textile industry by using mathematical programming and Industry 4.0 techniques. *Energies*, 11(8), 2072. <https://doi.org/10.3390/en11082072>
3. Choi, T. M. (2011). Editorial: Challenges in apparel production planning and control. *Production Planning & Control*, 22(3), 209. <https://doi.org/10.1080/09537287.2010.498572>
4. Geršak, J. (2022). *Design of clothing manufacturing processes: A systematic approach to developing, planning, and control* (2nd ed.). Woodhead Publishing/Elsevier.
5. Purushothama, B. (2021). *Handbook of managing apparel production and quality*. Woodhead Publishing India.



Thank You !

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