Diploma in Packaging Technology

Package Line Operations

Contact

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Overview

- Line Requirements
- Automation
- Layout
- Efficiency
- Inspection

Line Requirements

- Group exercise
- When deciding on a new packaging line what information is required on
  - Product
  - Packaging
  - Operational requirements
  - Equipment

Product

- Physical format, fragility
- Hazards
- Hygiene requirements
- Variants
- Market information

Packaging Materials

- Materials
- Style, size, tolerances
- Stability, fragility,
- Variants
- Other critical performance indicators

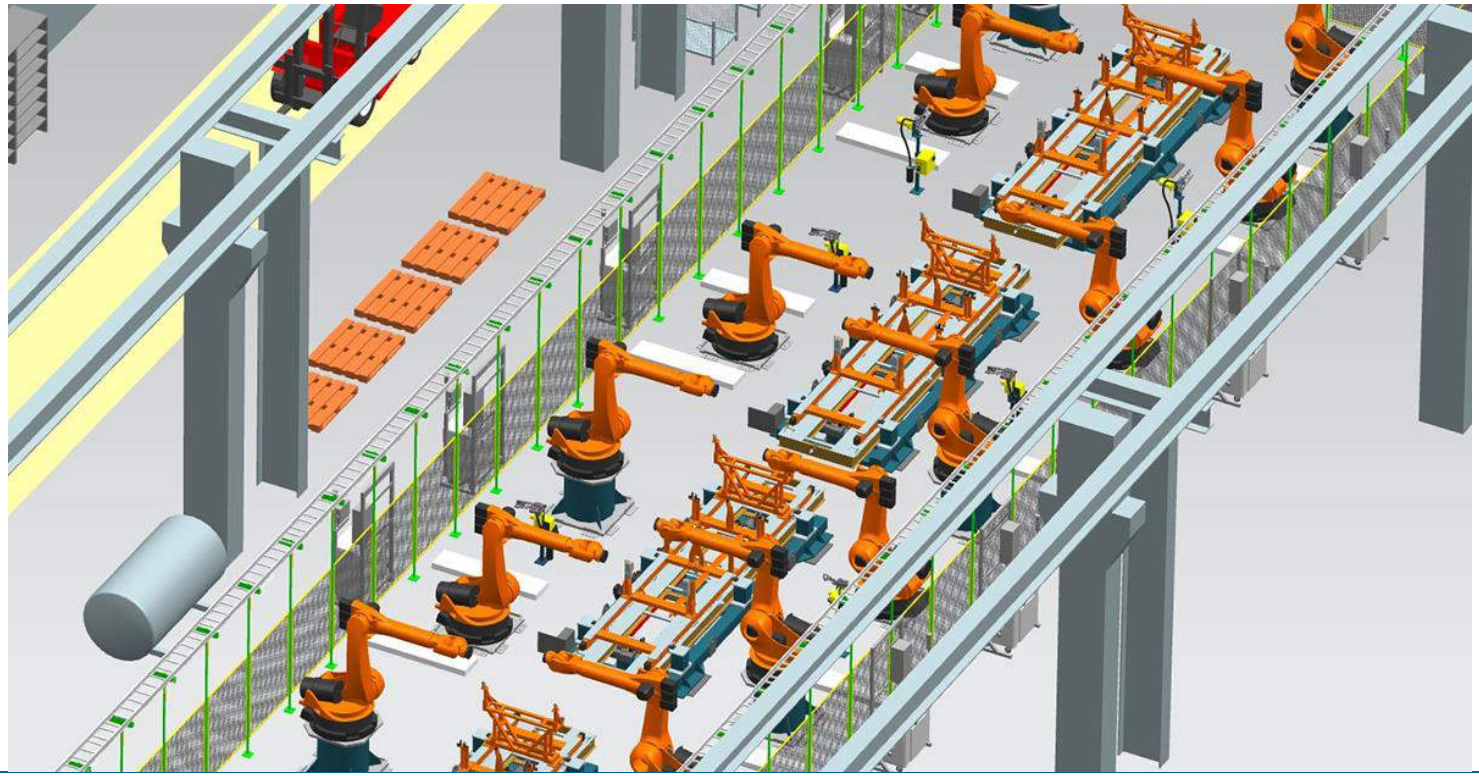
Operational

- Output, speed, automation
- Run lengths
- Space and layout constraints
- Labour requirements, skill and numbers
- Health & Safety
- Time constraints

Equipment

- Services & Space
- Integration
- Training requirements
- Lead times and installation
- Commissioning & Performance assessment

Automation Impact



Automation Impact

- Speed, quality, consistency, tolerances, adjustments
- Hygiene & safety
- Labour and skill requirements
- Capital cost
- Flexibility
- Integration

Production Layout

- Process layout (job shop)
- Product Layout (production line)
- Hybrid
- Fixed position

Process layout

- Group similar processes together.
  - Cooking, mixing, chopping
  - Printing, die cutting, folding gluing

- Prioritise workload with available equipment / staff
- General machines capable of producing a variety of products
- Layout of economic activity centres important

Product layout

- Lines for individual products / families
- Product flows through production
- Resources arranged about product path
- Specialized
- Straight, U, S,

- Hybrid
  - Elements of Process and Product
  - Group technology
    - Families of products with similar requirements
    - Technology arranged around product requirements
- Fixed Position
  - Product stays in one place
  - All equipment and parts brought to product

Process evaluation

- Issues to consider in process packaging line review.

Process evaluation

- Material handling
- Production rate
- Specialization
- Flexibility
- Capital expenditure
- Work environment
- Work in progress
- Product variety

Economic activity areas arrangement

- Cross contamination
  - Product, people, air, water, waste
- Efficiency
  - Movement of materials, equipment, people
- Storage
  - Raw materials, work in progress, finished goods, equipment, locations

Economic activity areas arrangement

- Space
  - Routine and non routine tasks.
  - Work in progress
  - Circulation
- Hygiene
  - People, equipment, facilities

Filling Lines

- Tend to be production lines (product layout)
- Separate machines linked together
- Balancing speeds
  - Higher speeds feeding into and out from critical plant (often filler)
  - Dynamic speed adjustment or on/off

Packaging Line Efficiency

- How do we measure line efficiency?
- Why do we measure efficiency?
- What factors effect line efficiency?

Efficiency

- Efficiency
  - Ration of Output to Input
  - Operating time to available time
  - Output rate to target

Equipment Speed

- Design speed
  - Theoretical max speed
- Capacity
  - Upper sustainable limits
- Running speed
  - Instantaneous operating rate
- Output rate
  - Output of acceptable product per given time

Equipment Efficiency

- Output required
  - Running speeds
  - Wastage
  - Breaks, product changes
  - Maintenance & breakdown
  - Operating / shift pattern

Output

- Speed & Machine Operation
  - 50 cpm, at 98% efficiency: 49 cpm
  - 70 cpm at 65% efficiency: 46 cpm

Accumulators

- Provide product storage
- Isolate key areas
- Placed after non interruptible operations
  - Ovens
  - Curing
- NOT to be used to compensate for defective machines
- The third generation of the Accutable (youtube.com)

Accumulators

- Space requirements
- Sequences
  - FIFO
  - LOFO

  - https://www.youtube.com/watch?v=y6_tuxycJ2M

Line output

- Unscrambling: 110 pack/min 96% eff
- Filler: 90 pack/min 95% eff
- Labeller: 110 pack/min 97% eff
- Shrink Wrap: 120 pack/min 92% eff

Line output

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- Filler: 90 pack/min 95% eff
  - Accumulator
- Labeller: 110 pack/min 97% eff
- Shrink Wrap: 120 pack/min 92% eff

Line Efficiency

- Labeller stopped
  - Filler can continue to run

Line output

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Line output

- Unscrambling:
  - Accumulator – Output rate
- Filler:
  - Accumulator – Output rate
- Labeller:
  - Accumulator – Output rate
- Shrink Wrap:

Overall Equipment Effectiveness

- Linked to total productive maintenance (TPM)
  - Downtime losses (availability)
  - Speed losses (performance rate)
  - Defect loss (quality rate)

- OEE = Availability x Performance rate x Quality rate

OEE

- Availability (87%)
  - Examples
- Performance (93%)
  - Examples
- Quality (95%)
  - Examples

Line Speeds

- Straight Machines
  - Indexing to position, single or multi head
  - Up to 150cpm
- Rotary Machines
  - High speed, large number of heads, compact
  - Up to 2000cmp

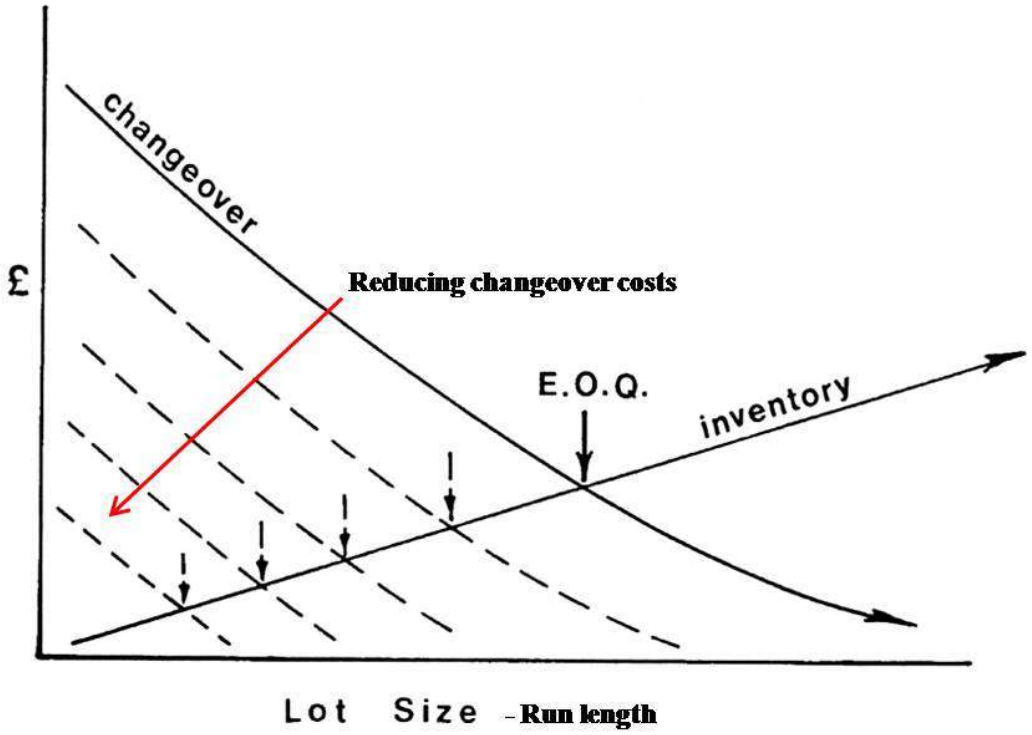
Line speed

- Container shape
- Shingling
  - Cylindrical / oval / square
- Stability
  - Base, weight, points of contact
- Optimum speed?

Changeovers

- From last saleable product to first saleable
- Time reduction
  - Preparation. Parts, tools operators, duplicates
  - Changeover. No tools,
  - Set up. Adjustment
  - Trial. Run up to production speed

Changeovers



https://www.youtube.com/watch?v=aHSUp7msCIE

Availability

- Planned preventative maintenance
  - Time or work based
  - Condition based
  - Opportunity based
- Breakdown maintenance
  - Availability of parts
  - Damage to products

Quality

- Cannot be inspected in
- Determine appropriate checks
- Monitor process
- Feedback to operators
- Self inspection

Inspection

- Inspection frequency
  - Product category
  - Level of risk
  - Established inspection systems
  - Inspection cost
  - Due diligence

Inspection

- Weights
- Contamination – Foreign body
- Leakage
- Correct product / pack
- Coding & traceability

Other Quality Checks

Online v's Offline Inspection

- Online
  - 100 % inspection
  - Automated possible
  - Reliability
  - Capital
  - Line speed
  - Operator training
- Offline
  - Statistical based
  - Destructive testing
  - Cost
  - Training requiement

Inspection Feedback

- Statistical Process Control (SPC)
  - Process capability
  - Reduction of variation
  - Not related to product tolerances
- Requires action

Overall Equipment Effectiveness

- Availability
- Performance
- Quality

- OEE = Availability x Performance rate x Quality rate