Morgan Lens Assembly – Partial Automation

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Index of Performance
$400-800 savings in production costs per lot
13-23% reduction in waste
12 hour reduction in setup time per lot
20% reduction in rejection rate

Current State
- Assembly
  - Current method: ‘Homemade’ finger cots
  - Goals:
    - Reduces operator fatigue
    - Increases handling efficiency
  - Solution: more ergonomic and efficient assembly method
- Handling Trays
  - Current method: Assembled lenses stored in plastic bin then manually placed in sealer
  - Goals: reduces double handling, inspection steps, and time
  - Solution: use cart and handling trays to put assembled lenses in packaging, make transfer between processes quicker, and for storage
  - Implementation: use at assembly table and sealer for organization and quick placement into sealer 6 at a time

Process Improvement Design
- Assembly
  - Current method: operators memorize rejection criteria
  - Goals: reduces inconsistency and subjectivity
  - Solution: Checklist of criteria for a defective component based on the standard operating procedure
  - Implementation: place checklist on assembly table for easy access
- Rejection Criteria Checklist
  - Current method: defect assessment with naked eye
  - Goals: reduces inconsistency, subjectivity, and costs
  - Solution: using a camera system to magnify and compare defects to a calibrated scale
  - Implementation: use at assembly table only to verify suspected defects
  - Preliminary test: confusion matrix
    - 20% of rejects are not actually rejects
  - Result shows operator’s over-critical assessment

- Handling Trays
  - Current method: manual check for presence of device with naked eye
  - Goals: eliminates shipping empty packages
  - Solution: using a scale to confirm existence of a device inside a package
  - Implementation: use checkweigher to automatically reject empty packages

Result/Impact
- Production
  - Assembly
    - Promising initial tests but more long-term testing needed
  - Handling Trays
    - Reduction in over-handling of assembled lenses
    - Reduction in necessary inspection steps caused by additional handling
    - 12 hour reduction in setup time per lot
  - Stamping
    - Reduction in subjectivity of stamp location
    - Decrease in rejected units by 3%
    - Savings of $1 per unit or $200-400 per lot

- Inspection
  - Rejection Criteria Checklist
    - Increase in inspection consistency
    - Increase in effectiveness of training
  - Camera
    - Increase in consistency without sacrificing speed
    - Reduction in subjectivity within quality inspection
    - Reduction in rejection rate by 20%
    - Increase in effectiveness of training
  - Scale Check
    - Implementing a mistake proofing device (poka-yoke)
    - Facilitation of empty package
    - Prevent loss of goodwill

Further Research
- Assembly
  - Explore new designs & materials
- Handling trays
  - Critical VIP calculation & simulation to determine optimal batch size
  - Investigate use of permanent ink on plastic for more cost-effective mistake facilitation
- Checklist
  - Digitize checklist to reduce clutter & focus on 5S
- Camera
  - Automated quality inspection prior to assembly
- Scale check
  - Fully-automated detection method