

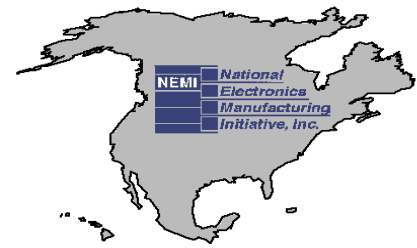
# Automating Optoelectronics Soldering -A NEMI Initiative

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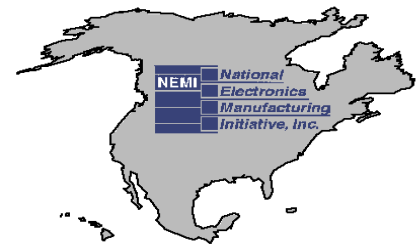
Cookson Electronics





# Agenda

- Project Overview
- Scope of Work
  - Objectives
  - Deliverables
  - Process Issues
- Review Cost of Ownership Model
- Conclusions



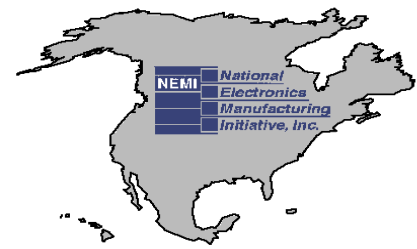
# Overview

## ➤ Objective

- Identify low-cost, high-reliability, high yield, data-driven processes to attach optoelectronic packages to circuit boards

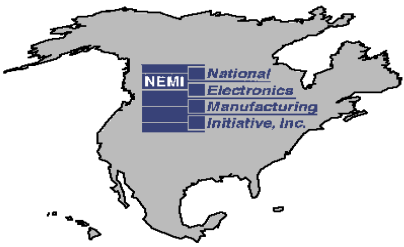
## ➤ Issues

- Manual Soldering
- Low yield
- High Cost
- Lack of Standardization
- Changing package trends

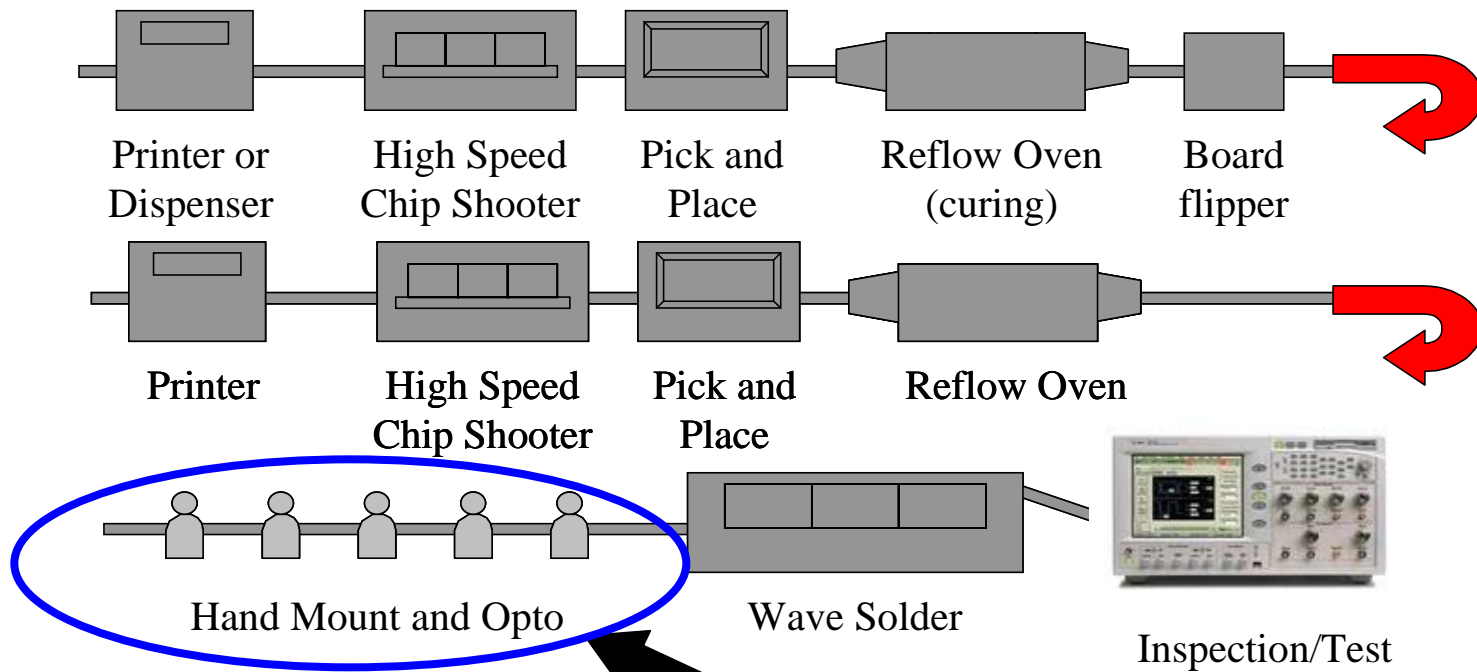


# Scope of Work

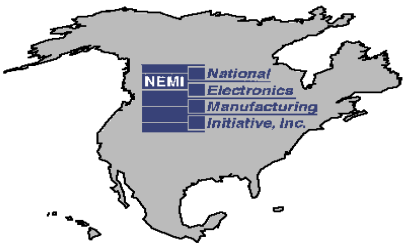
- Develop cost of ownership (COO) model to justify investment in automation equipment
- Identify representative packages & boards
- Define alternative assembly placement and attachment techniques between packages and boards.
- Identify vendors and plan evaluation of processes
- Evaluate performance and reliability, identify improvement opportunities first with dummy then with real packages
- Report results to members



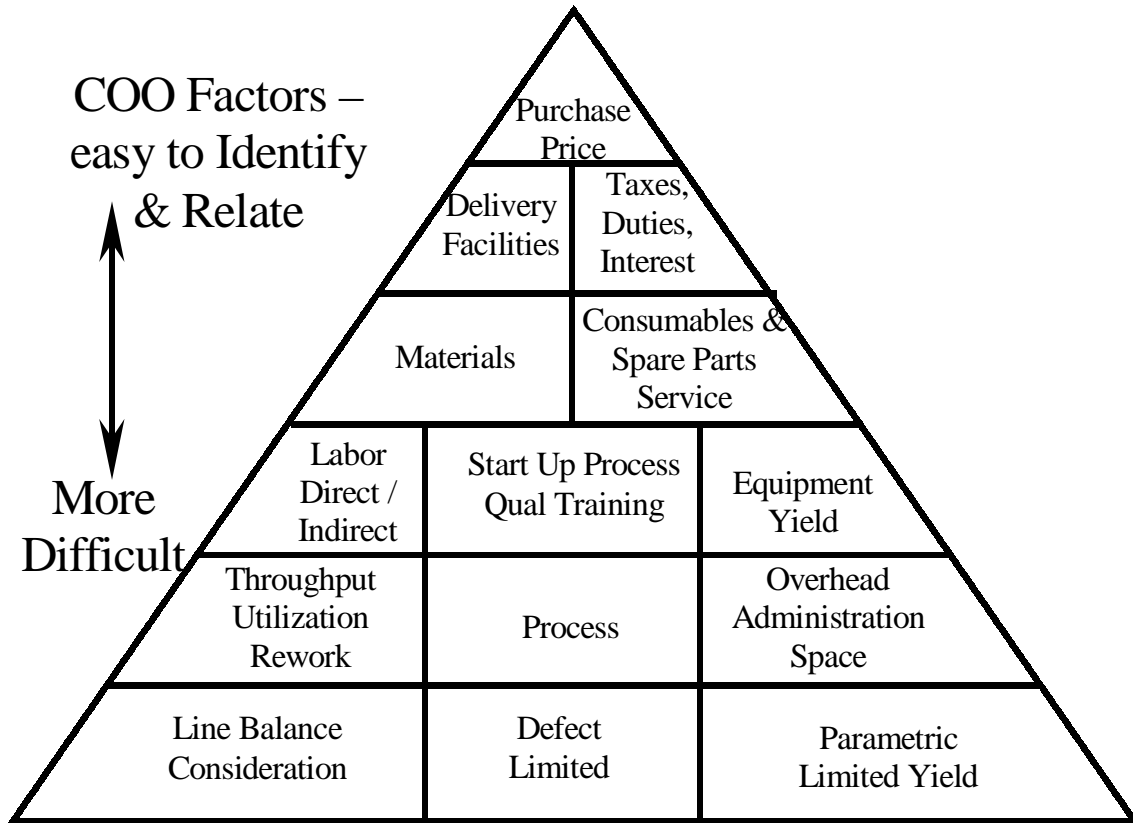
# Typical OE Assembly Line

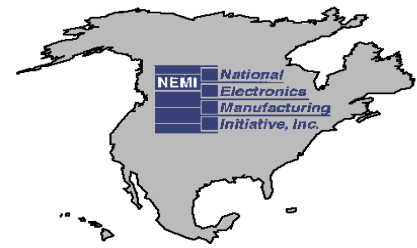


# Opportunity for Automation



# Elements of Cost





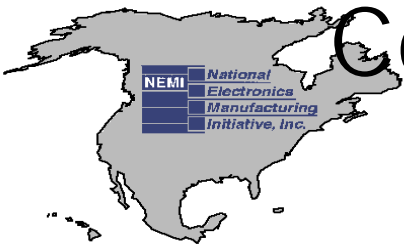
# Cost of Ownership Model

## A few assumptions -

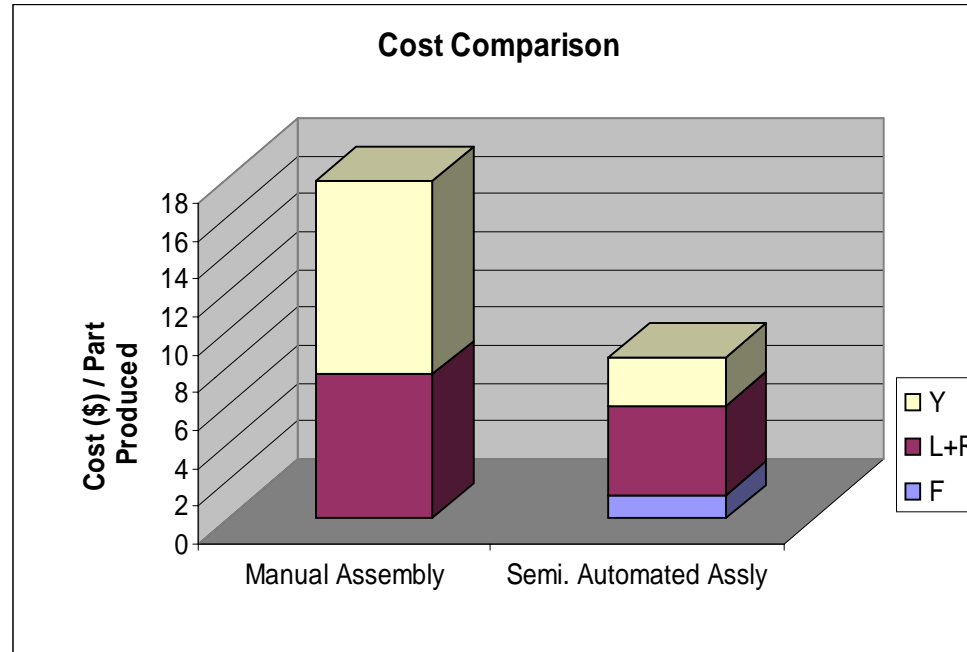
<b>Cost of Component being manufactured (\$)</b>	<b>1500</b>
<b>Equipment Cost (\$)</b>	<b>150000</b>
<b>Operator Labor Cost (\$/hr)</b>	<b>25</b>
<b>Process Engineering Cost (\$/hr)</b>	<b>100</b>
<b>Operational time (hrs/year) @ 2 shifts/day, 6 days/week</b>	<b>4992</b>
<b>Yield</b>	<b>60%-Manual, 91%-SemiAuto</b>
<b>Cycle Time (parts/hr)</b>	<b>4-Manual, 8-SemiAuto</b>
<b>Total Cost of Consumables per year</b>	<b>32500</b>
<b>Useful life &amp; Depreciable Life of Equipment (yrs)</b>	<b>5</b>
<b>Employee Productivity</b>	<b>0.977</b>
<b>Equipment Utilization</b>	<b>0.88</b>

### Note:

The above values are some of the assumptions used for calculations.



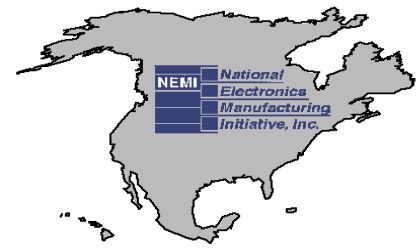
# Comparison Between Manual & Semi-Automated Process



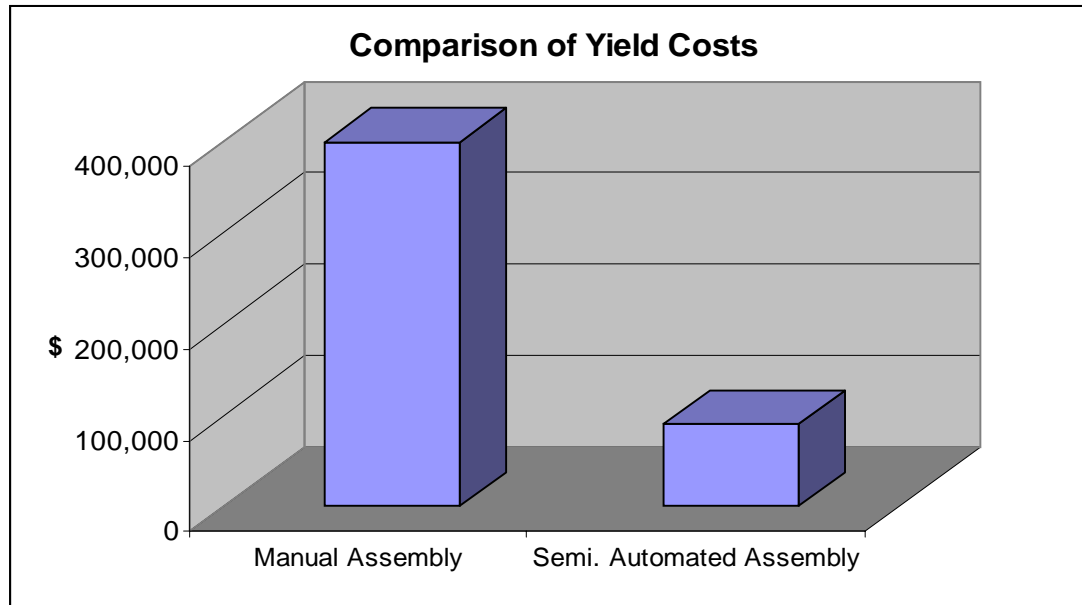
## COO

For Manual Assembly - \$17.846 (F-\$0.04, L+R-\$7.57, Y-\$10.23)

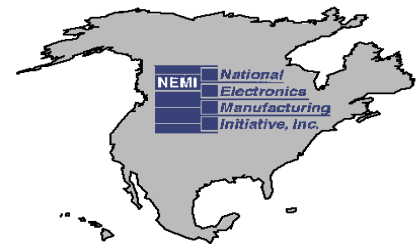
For Semi-Automatic Process - \$8.523 (F-\$1.24, L+R-\$4.74, Y-\$2.55)



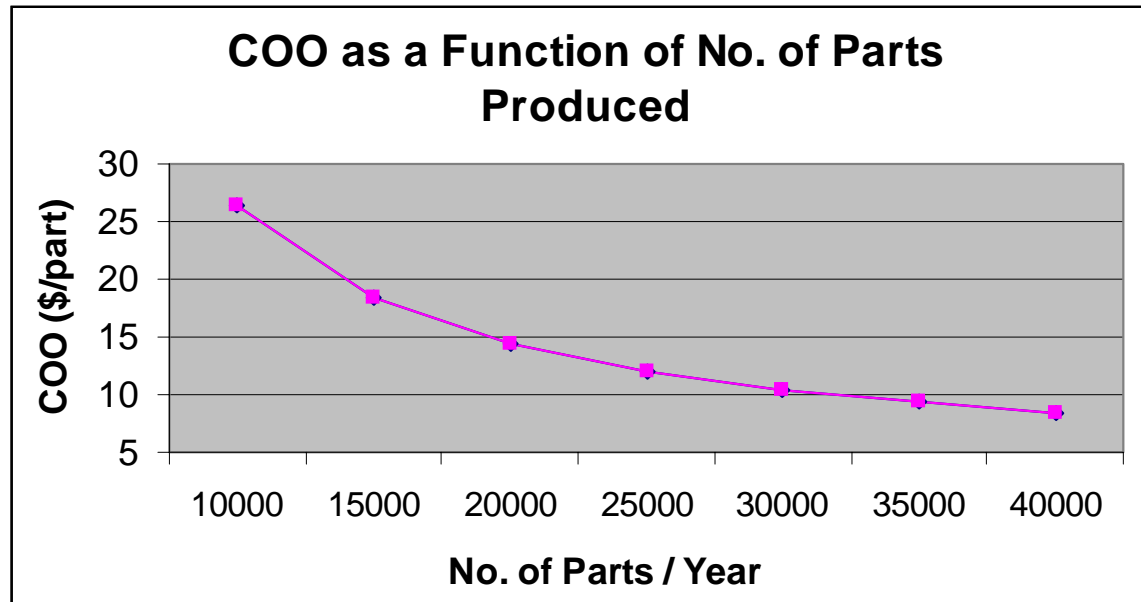
# Cost of Ownership Model (Comparison of Yield Costs)



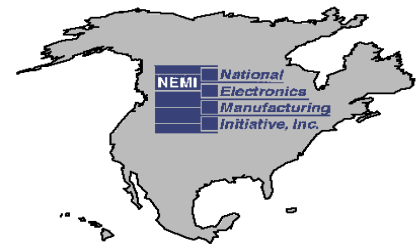
Yield Costs - \$398,344 (Manual Assembly)  
- \$ 89,627 (Semi-Automated)



# Cost as a Function of Parts Produced

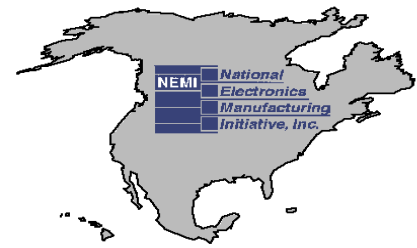


Cost of Ownership per part decreases as the number of parts produced increases



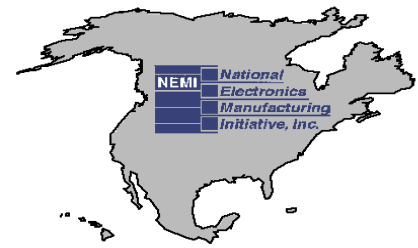
# Automation - Constraints

- Changing component trends
  - Pluggable components
  - SMT compatible
- Downturn in OE sectors
  - Lack of volume
  - Reluctance to spend in capital equipment
- Lack of standardization, standards



# Conclusions

- COO is a valuable tool to justify capital investment
  - Yield costs are more significant than labor costs
  - COO is dependent on the volume of parts produced
  - It helps determine the least number of parts required to justify automation
  - Benefits of moving manufacturing operations to a different geographic location
- Semi-automated processes seem to be more near term realistic solution than fully automated solutions
  - Automated solutions offer better repeatability and significant improvements in yield and reduction in cycle time



# Questions

