

# Profit Through Innovation

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13<sup>th</sup> World Conference on Investment Casting

The logo for MPI Total Automation, featuring the letters 'MPI' in a stylized, bold font with a small registered trademark symbol, followed by the words 'Total Automation' in a sans-serif font. The logo is set against a dark red, curved background that resembles a stylized wave or a lens.

# Profit Through Innovation

Let's take a look at wax room  
problems

# Profit Through Innovation

The solution:

Innovative Automation

The logo for MPI Total Automation is located at the bottom of the slide. It features a red, horizontally-oriented oval shape with a white border. Inside the oval, the text "MPI Total Automation" is written in a white, sans-serif font. The "MPI" is in a larger, bold font, and "Total Automation" is in a smaller font to its right. The background of the slide is white, and the bottom edge has a dark blue, wavy border.

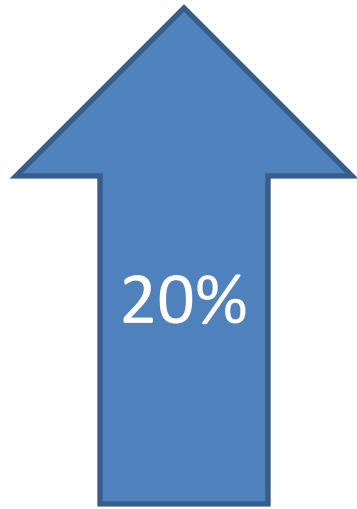
**MPI** Total Automation

# Why Automate?

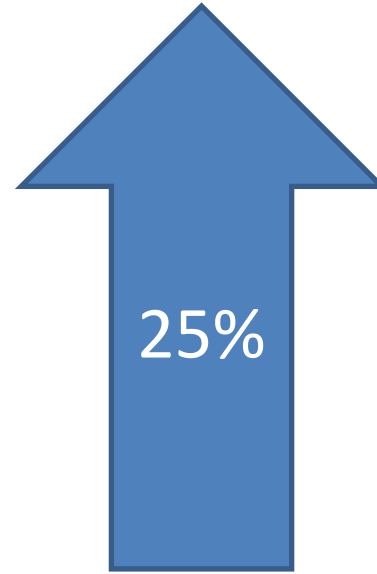
Automation = Repeatability!

- Pattern to Pattern Repeatability
- Assembly to Assembly Repeatability

# Why Automate?



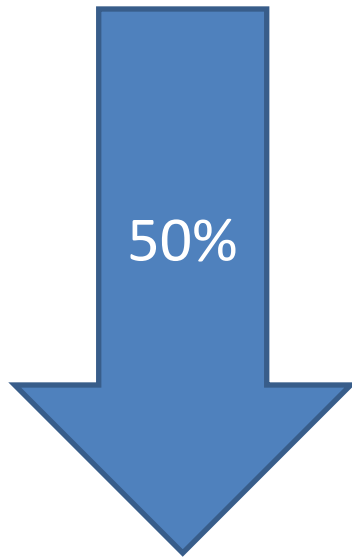
Patterns  
per assembly



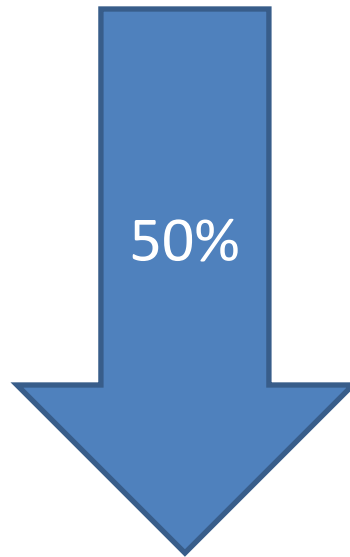
Casting to  
raw materials

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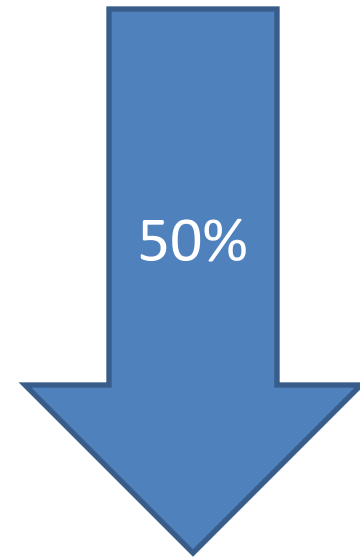
# Why Automate?



Decrease  
casting defect rate



Decrease  
cycle time



Decrease  
labor required

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# Customer Results

INCREASED  
YIELDS + DECREASED  
SCRAP = INCREASED  
PROFITS



# Who can Automate?

- Small Parts long runs
- Complicated High Value Assemblies
- Companies ready to buy more Equipment



# Automation Experience:

## Successful Automation Projects:

1. Automated Injection of Turbine Blades
2. Automated the Assembly of DS and Single Crystal Turbine Blades
3. Automated Pattern Assembly

# Sharing Facts

## Foundry Success Stories

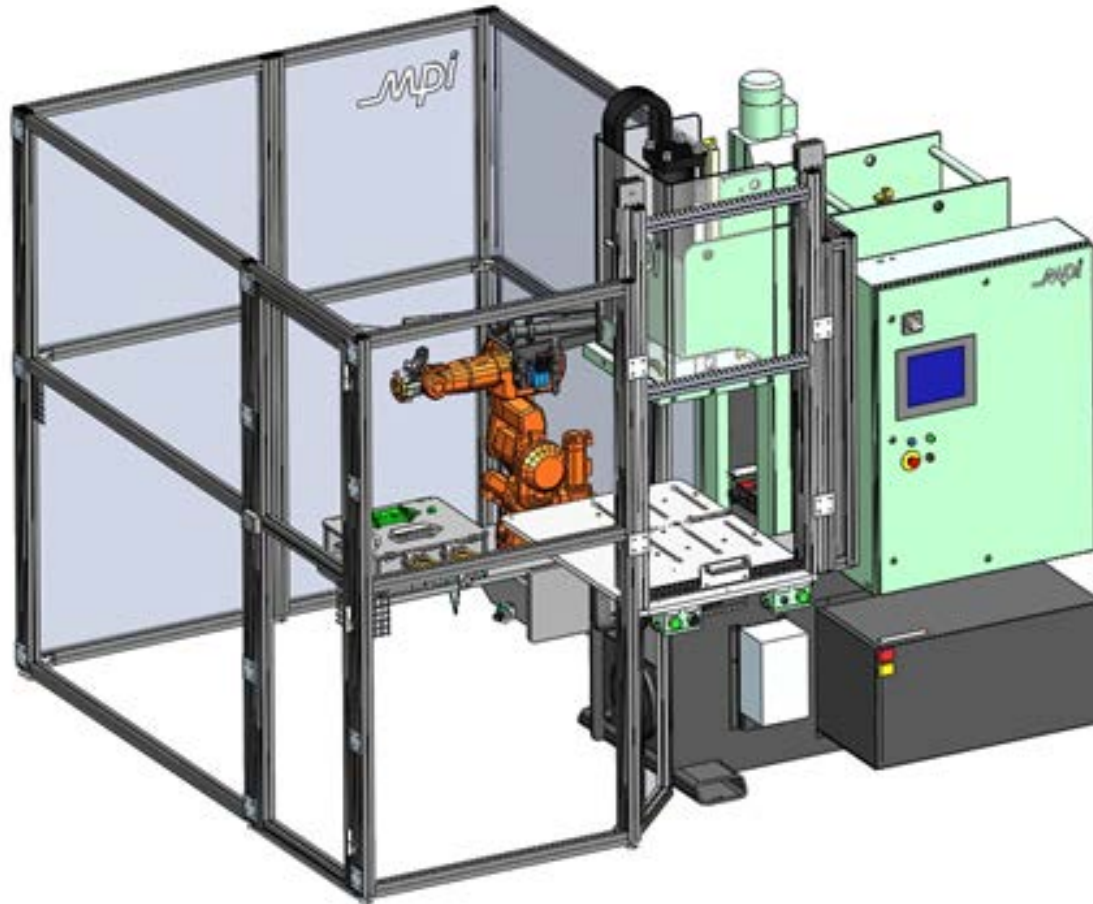
# Example #1

## Automating a Wax Injection Machine

- **PROBLEM:**
  - manual handling of wax pattern; greatest cause for pattern to pattern variation
  - as much as **50% of the metal scrap**
- **SOLUTION:**
  - automating the injection process
- **RESULT:**
  - much of variation *eliminated*

# Example #1

## Automating a Wax Injection Machine



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# Robotic Injection - Automation



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# Customer Results

- Double the number of patterns injected per day
- Pattern yields increased 10 to 20%
  - Reduced pattern distortion
  - Reduced pattern defects
  - Uniform pattern trimming, minimal variation
- Higher casting yields

# Customer Results

INCREASED  
YIELDS + DECREASED  
SCRAP = INCREASED  
PROFITS



## Example #2:

# Automated Assembly of DS and Single Crystal Turbine Blades





## **Example #2:**

# Automated Assembly of DS and Single Crystal Turbine Blades

### **Foundries' Goals:**

Reduce costs and improve profits.

### **Solution:**

Automate the wax assembly

### **Result:**

Eliminate the variability that comes from manual assembly.

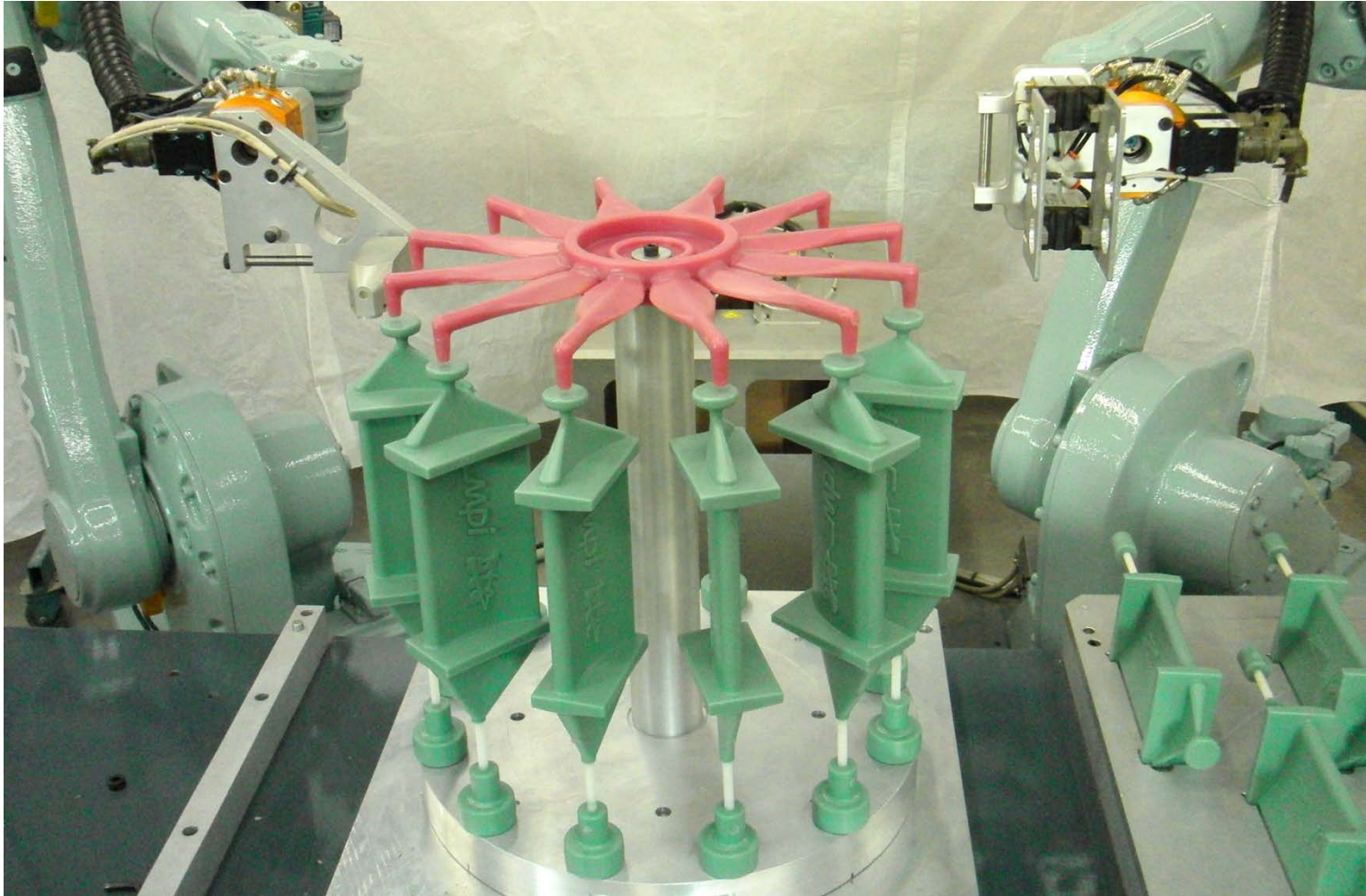
## **Example #2:**

# Automated Assembly of DS and Single Crystal Turbine Blades

### **Steps:**

- Elimination of variation caused by use of extrusions.
- Elimination of variation caused by manual assembly of sub-assembly components.
- Grain selectors are assembled in the injection process.

# Robotic Assembly - Automation



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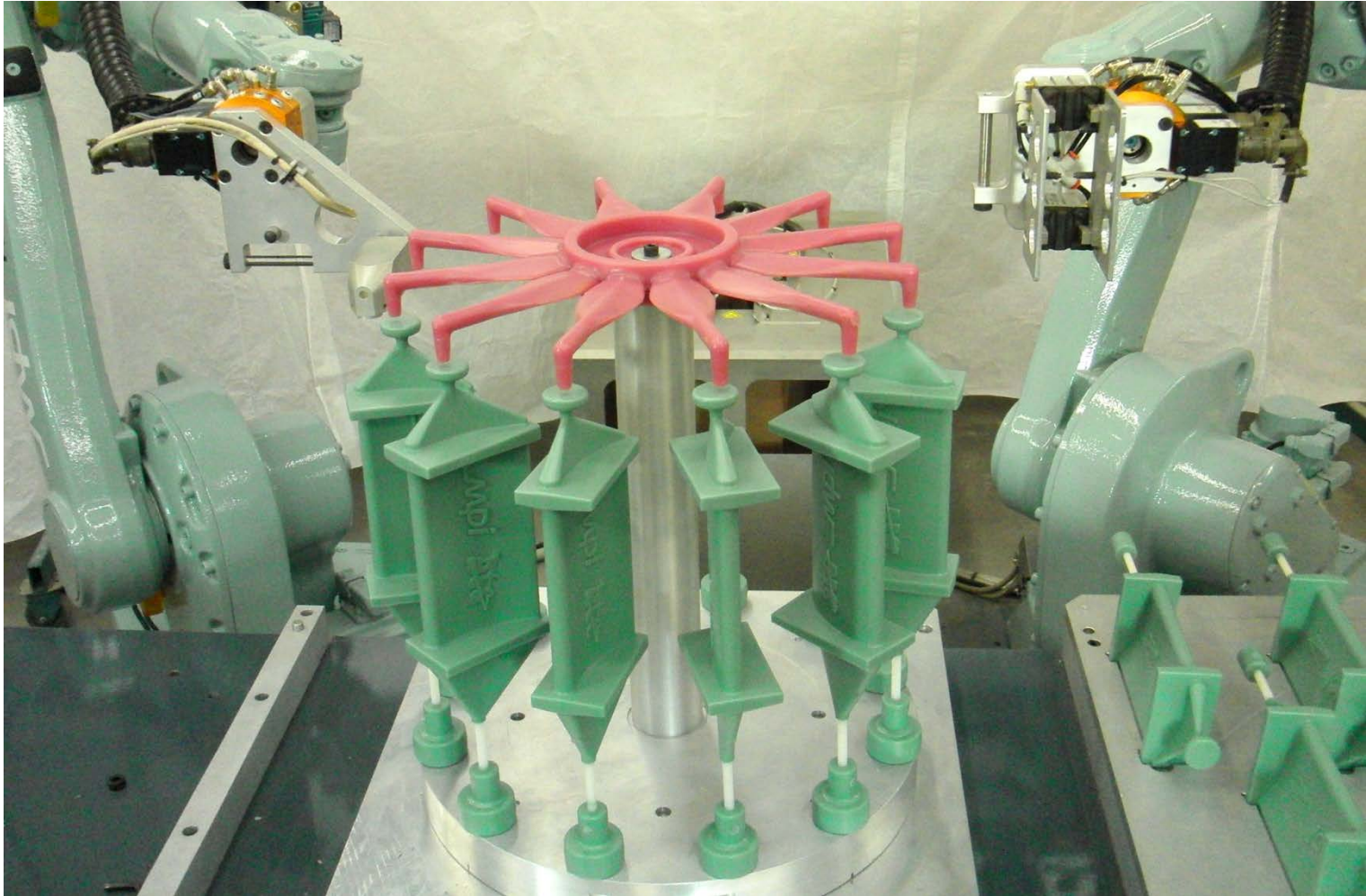
# Robotic Assembly - Automation



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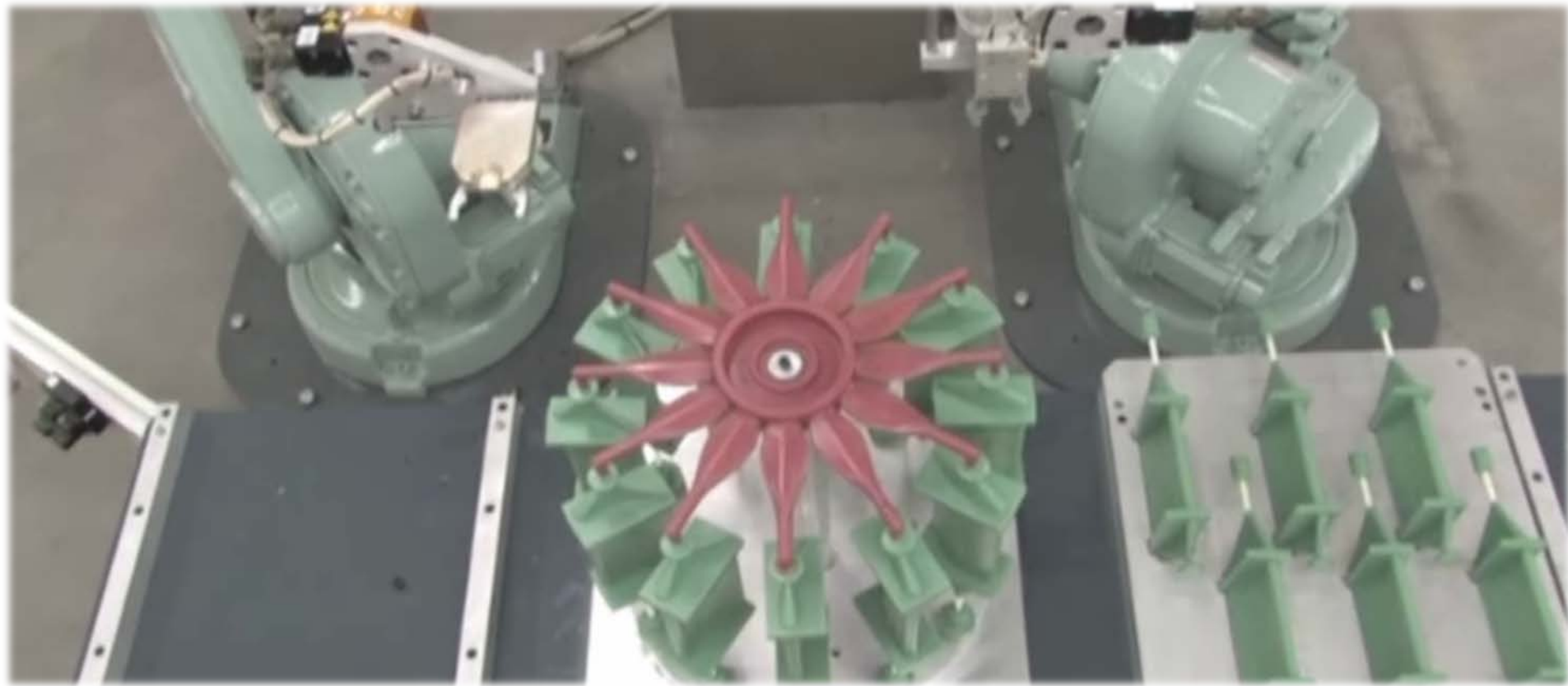


# Robotic Assembly - Automation



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# Robotic Assembly - Automation



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## **Example #2:**

### Automated Assembly of DS and Single Crystal Turbine Blades

#### **Results:**

- Extremely uniform and repeatable assemblies
  - Increased strength of the wax assembly
  - Repeatability in Process
- A more uniform shell coverage due to accurate spacing
- Improved thermal gradient of the final shell
- Improved metallurgical properties
- Higher casting yields
- Decreased cycle times
- Reduced labor

# Customer Results

INCREASED  
YIELDS + DECREASED  
SCRAP = INCREASED  
PROFITS





# Example #3 - Avalon Precision Casting Outsourced Automated Pattern and Assembly

a v a l o n  
Precision Casting Company



.....Where the future is taking shape.

***mpi*** Total Automation

# **Example #3 - Avalon Precision Casting**

## **Outsourced Automated Pattern and Assembly**

Avalon is a job shop foundry specializing in commercial and aerospace hardware components.

I want to thank Avalon for allowing us share their name, and specifics.

# Example #3 - Avalon Precision Casting

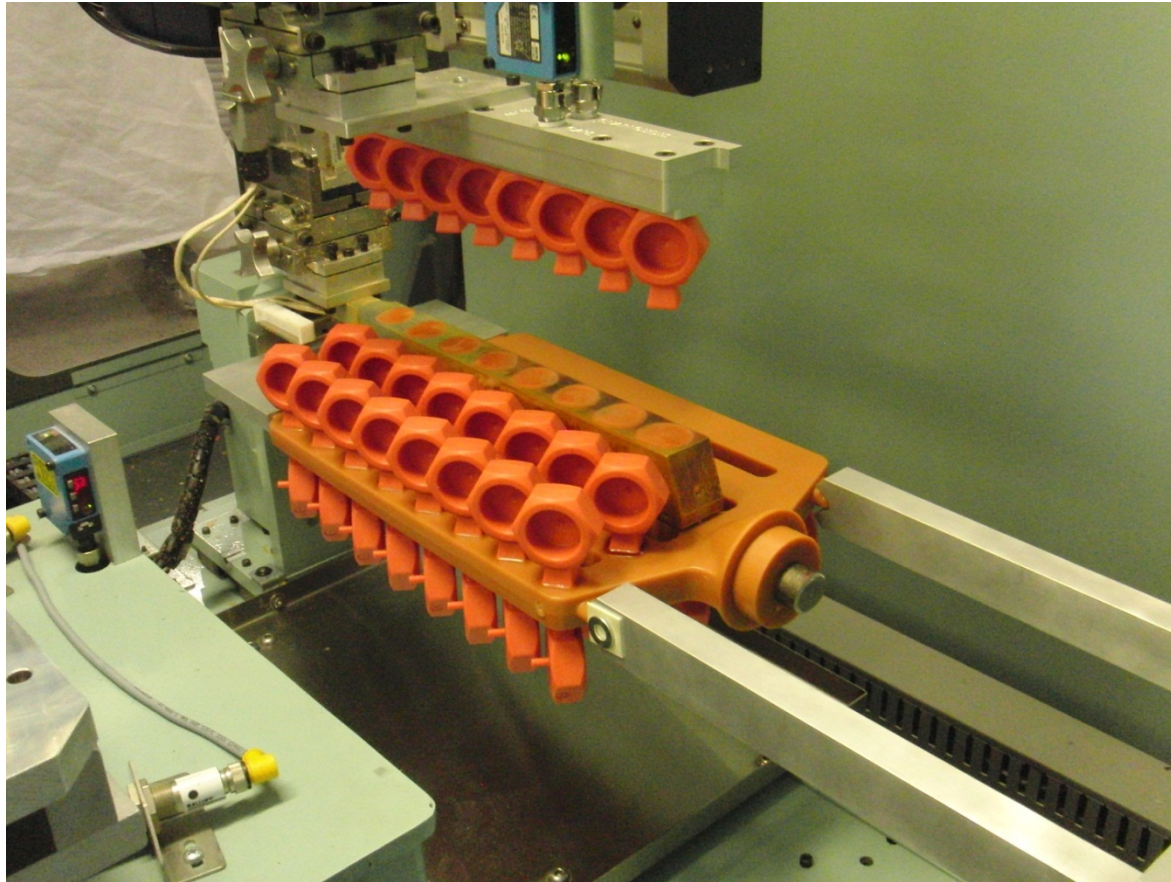
## Outsourced Automated Pattern and Assembly



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## Example #3 - Avalon Precision Casting

### Outsourced Automated Pattern and Assembly



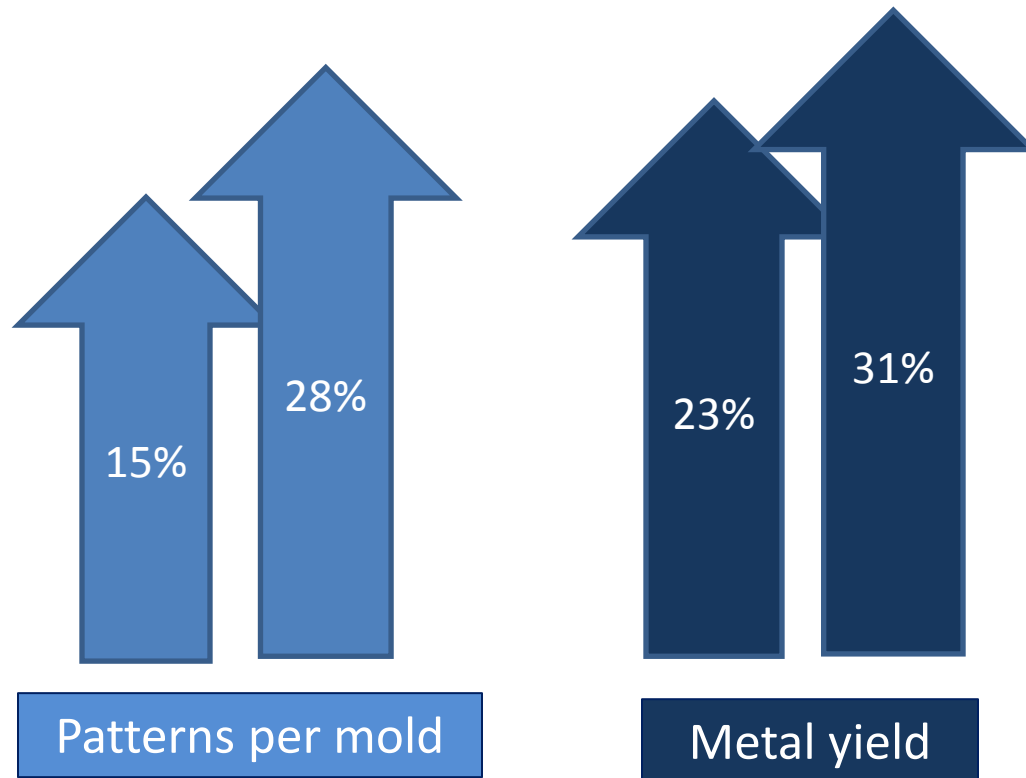


# Outsourced Automated Pattern and Assembly



# Outsourced Automated Pattern and Assembly

Results:

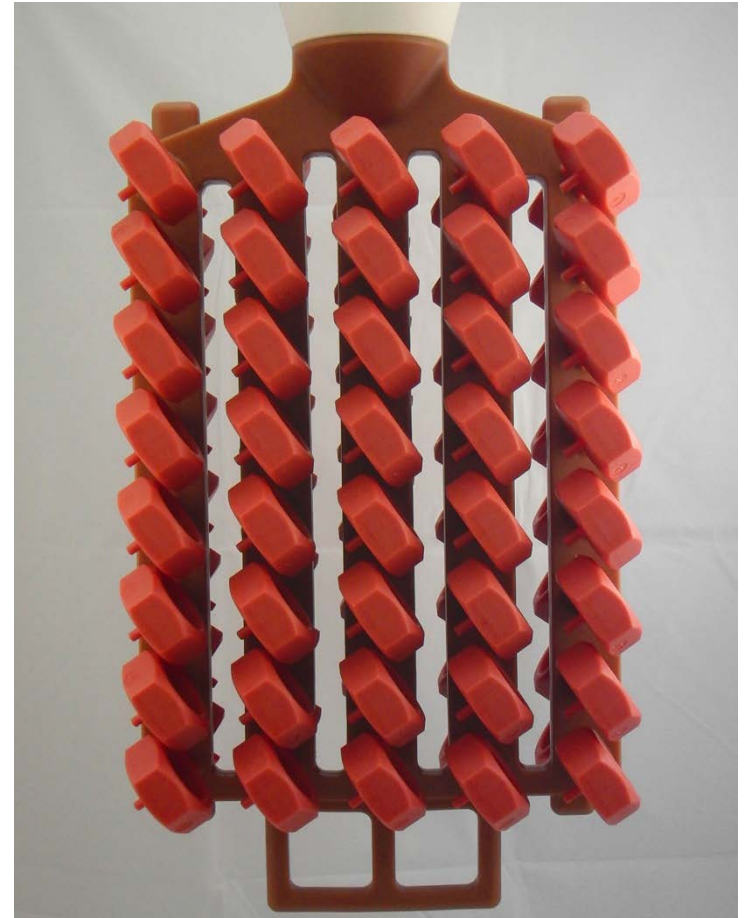


# Outsourced Automated Pattern and Assembly

Unexpected benefit:

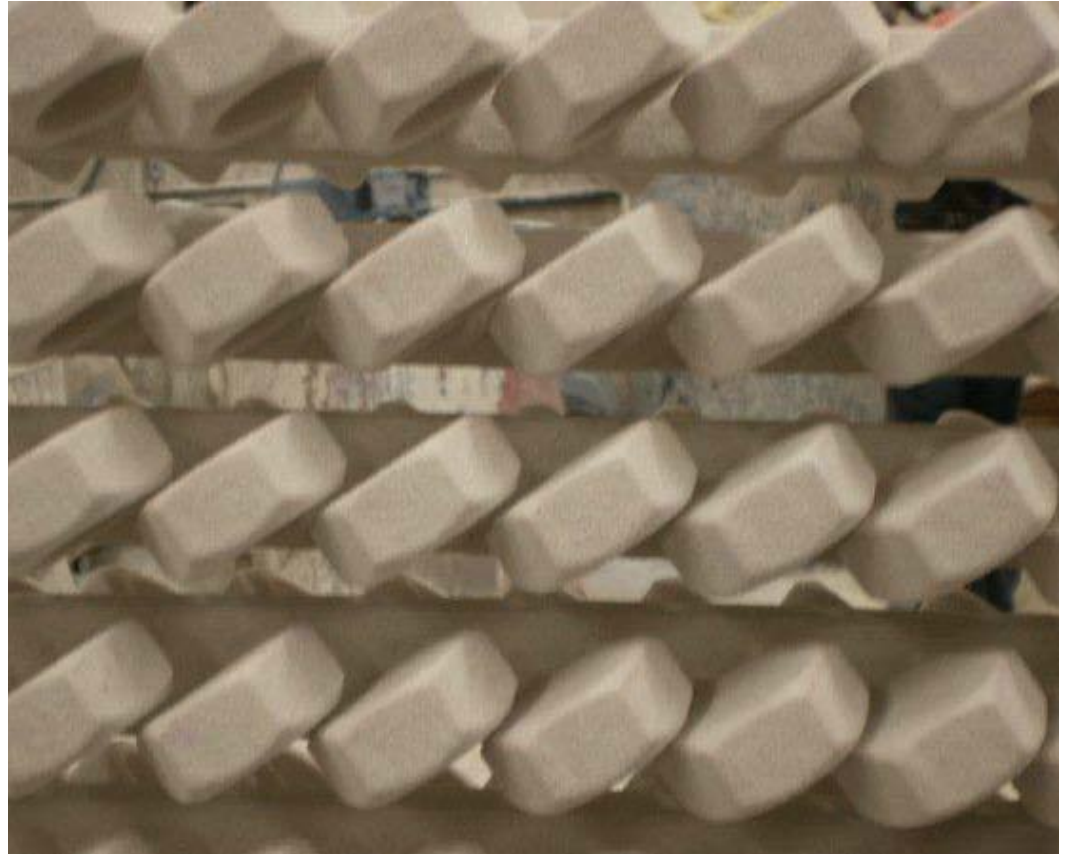
*“What **was** the **one finger rule**  
**now** is the **one finger nail rule.**”*

Mel Kman



# Outsourced Automated Pattern and Assembly

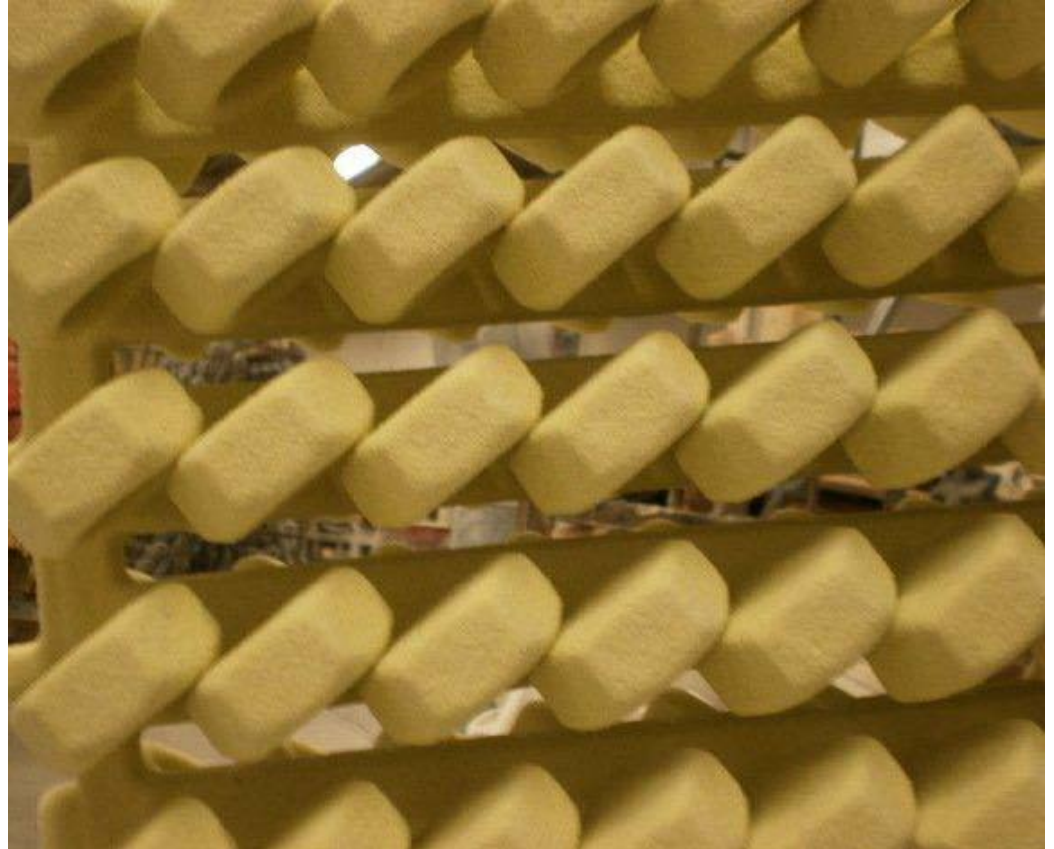
## 1st Coat





# Outsourced Automated Pattern and Assembly

## 2nd Coat



# Outsourced Automated Pattern and Assembly

## 3rd Coat





# Outsourced Automated Pattern and Assembly

## 4th Coat



# Outsourced Automated Pattern and Assembly 5th Coat





# Outsourced Automated Pattern and Assembly

## 5th Coat with Seal Coat



# Customer Results

INCREASED  
YIELDS + DECREASED  
SCRAP = INCREASED  
PROFITS



# How can you approach Automation in your wax room?

- Be selective
- Foundry Friendly Assembly
- Partner with a proven innovator in Wax Room Automation

# Conclusion

Automation = Repeatability!

- Pattern to Pattern Repeatability
- Assembly to Assembly Repeatability

Results:

- Decreased Casting Defects
  - Higher Casting Yields
- Reduced Operating Expense
  - Improved Safety
- Increased Customer Satisfaction



Automating Your Wax Room

**Significantly Greater Profits**

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# Questions?