

How Can I Quickly Automate Machine Tending?

Use a Collaborative Robot

THANK YOU Questions?

But seriously, folks...

We're going to be talking about CoBots a lot

CoBots are meant to do roughly human-level tasks.

If your applications need superhuman capability (i.e. speed, payloads, etc.), there are solutions.

But... in today's robotics landscape, the quickest way to retrofit your processes generally involves a Collaborative Robot.

So with that out of the way...

HOW TO QUICKLY DEPLOY A MACHINE TENDING SOLUTION

had to give up on a clever subtitle for this

AGENDA

- What is a machine tending solution?
- What are the elements of a machine tending solution?
- **Quick Deployment** – when, why, and how
- Available solutions for quick deployment
- Key takeaways

MACHINE TENDING

What is it?



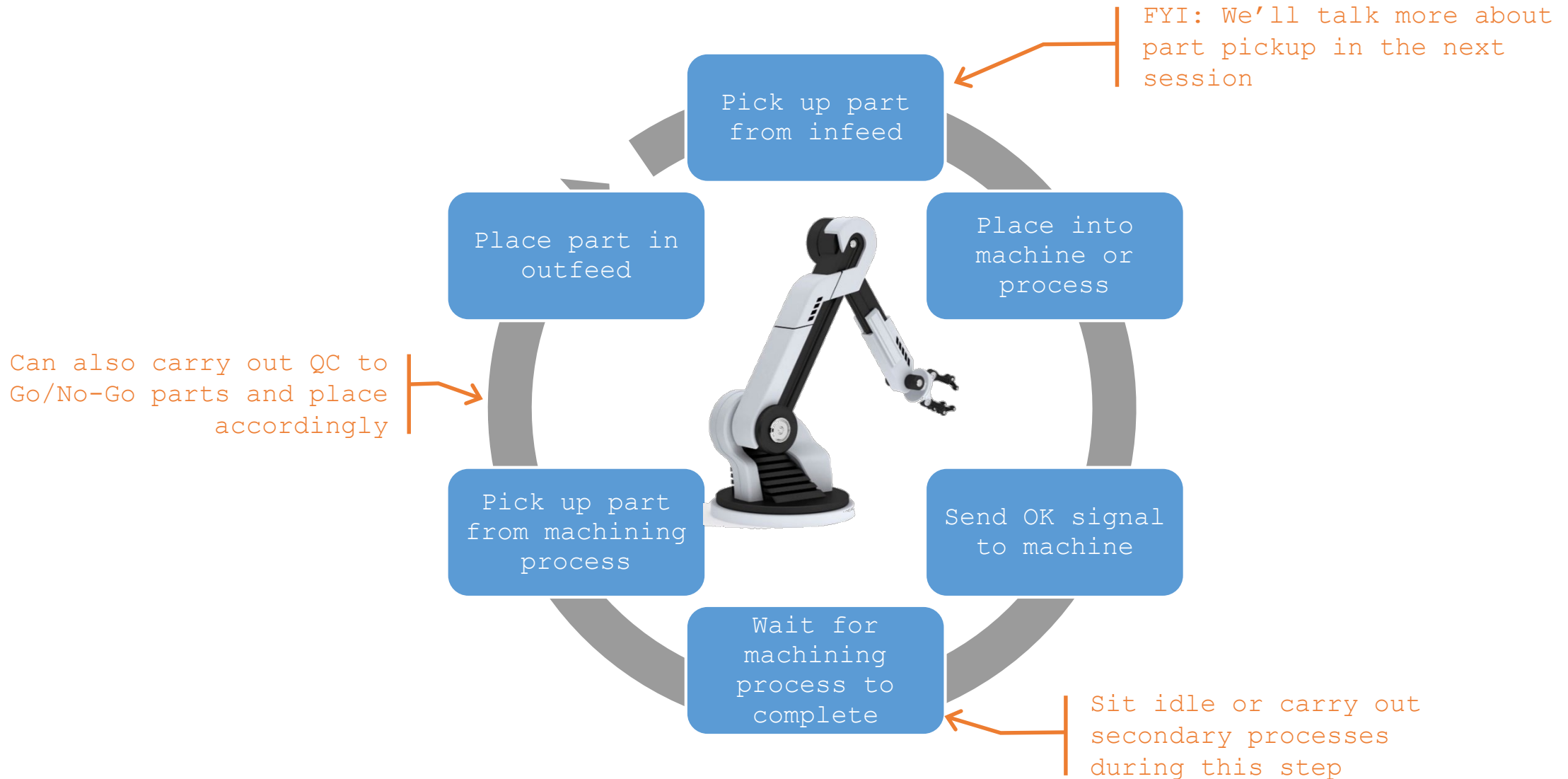
What is Machine Tending?

- Exactly what it sounds like – robot loading/unloading machine
- A subset of pick and place applications
- Part handling tends to be simple
 - Hard part (typically) comms and handshaking between MTS and machine

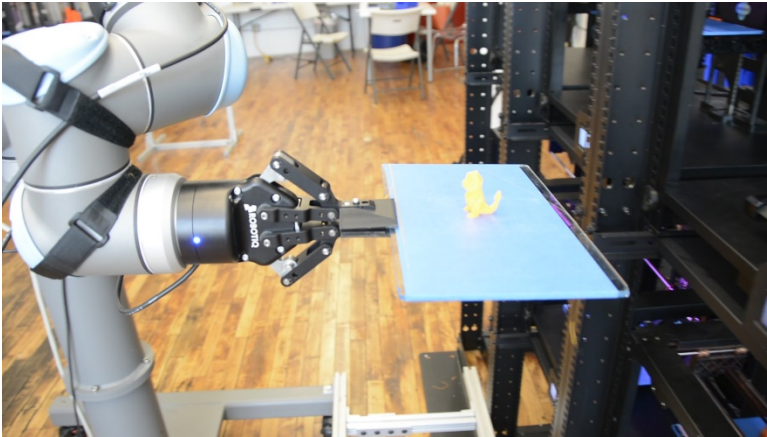
Machine tending is one of the widest and most accessible types of robot applications



Typical Robot Machine Tending Process

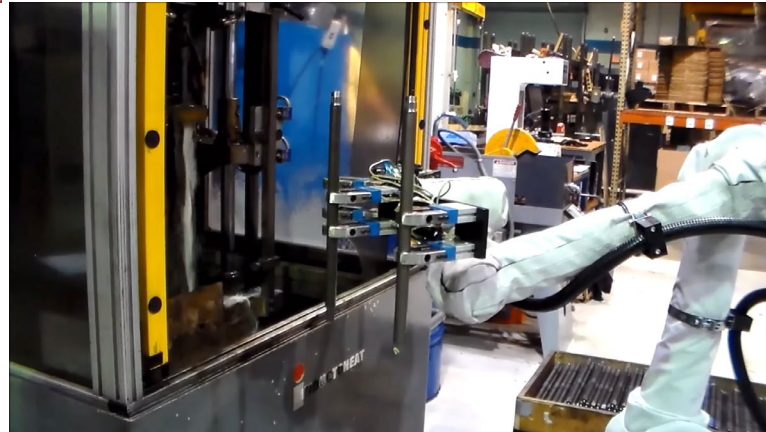


Examples



Voodoo Manufacturing
Tending of 3D Printers

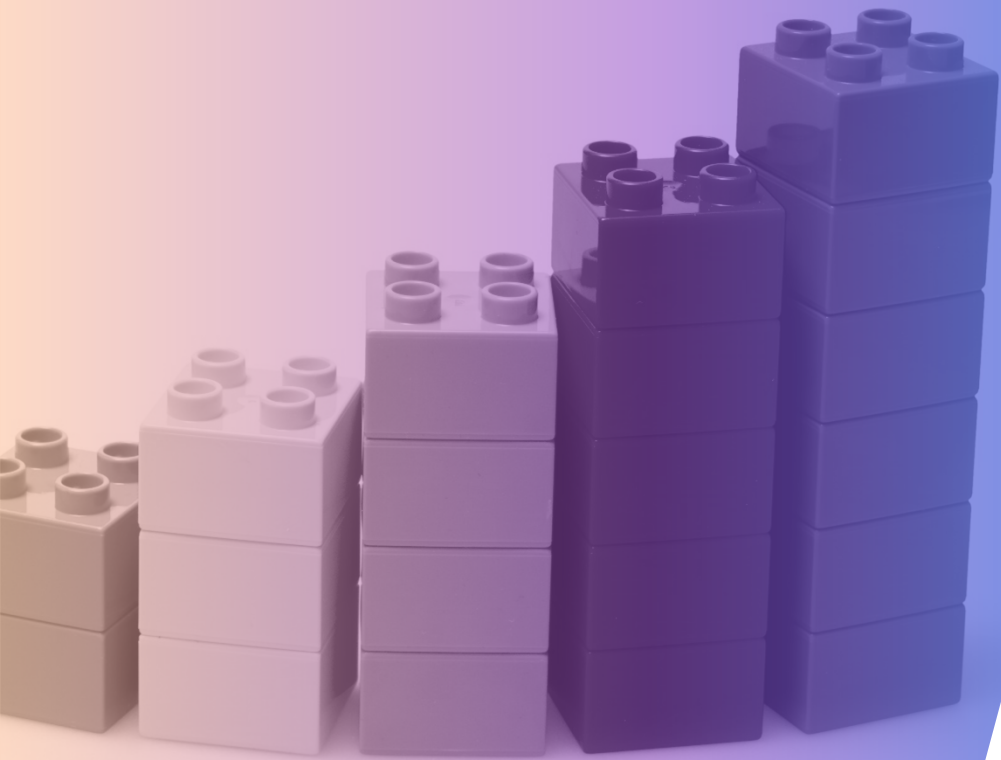
Panther Global Technologies
Hardening Steel Shafts



WALT Machine Inc.
Machining Camera Housings

Why Bother Automating It?

- Finding good people is hard
- Any employee eventually gets sick, injured, takes breaks, etc.
- A robot tending a machine
 - Provides a buffer against employee turnover
 - Removes people from dull, dirty, dangerous work
 - Never takes breaks
 - Does the exact same thing, every single time



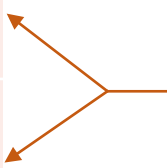
Machine Tending Elements

What should you think about?

Hardware/Infrastructure Elements

Robot	<ul style="list-style-type: none"> • Payload (including EOAT) • Cycle time • Reach and pose • # of Axes required 	Safety	<ul style="list-style-type: none"> • Risk Assessment required for CoBot Apps • Light Curtains • Area scanners • Pressure mats
Gripper	<ul style="list-style-type: none"> • Single/dual head • Mechanical grip? Electrical? Pneumatic? • Vacuum cup • Actuation 	Footprint/ Layout	<ul style="list-style-type: none"> • Robot work envelope • Location for robot • Location for infeed/outfeed
Air/Electrical Supply	<ul style="list-style-type: none"> • Voltage • PSI requirement • Quality of compressed air 	Part Presentation	<ul style="list-style-type: none"> • Unfinished parts entering system • Finished Parts leaving system • Jigs/Fixtures • Conveyor • Nested Trays • 2D Vision / 3D Vision / Bin Picking
Controls/PLC	<ul style="list-style-type: none"> • Communication protocol • Handshaking 		

Process Elements

Cycle Time	<ul style="list-style-type: none"> Average time it takes to produce one unit <p>$\text{Total Production Time} / \text{Units Produced}$</p>	 <p>These two are often used interchangeably, and are the first element to consider</p>
Takt Time	<ul style="list-style-type: none"> Time available to produce one unit <p>$\text{Available Time} / \text{Units Required}$</p>	
Throughput	<ul style="list-style-type: none"> Total units produced / Maximum rate of production Often constrained by capacity 	<p>Often a goal to increase throughput by adding capacity with a robot</p>
Setup Time	<ul style="list-style-type: none"> The time taken to prepare a station or cell for production 	
Changeover Time	<ul style="list-style-type: none"> Part of setup Converting machine from running one product/process to another Almost never adds value 	<p>Minimizing this increases ROI of automation and quickens payback</p>
Throughput Yield	<ul style="list-style-type: none"> Capability of a process to produce good product 	<p>Robots typically increase yield, as they perform extremely consistently</p>

Financial Elements

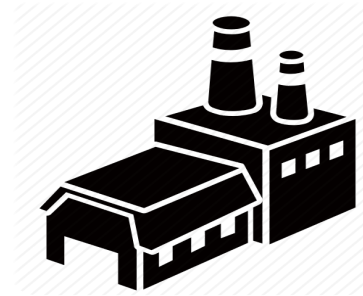
Labor Rate / Burn Rate	<ul style="list-style-type: none">How much does each hour of production cost?
Upfront Cost	<ul style="list-style-type: none">Exactly what it sounds like
Deployment Time	<ul style="list-style-type: none">How long until the solution is up and running?Pure cost. Delays payback period and reduces ROI.
Return on Investment (ROI)	<ul style="list-style-type: none">Effectiveness of an investment $\text{Simple ROI} = \frac{\text{Gains} - \text{Cost}}{\text{Cost}}$ <ul style="list-style-type: none">Human machine tender salary often the main “gain” pursued
Payback Period	<ul style="list-style-type: none">How long does it take to break even on the investment?

Gains from automation many times go way beyond salary savings. Humans often not even replaced, just repurposed.

Often used interchangeably with ROI.

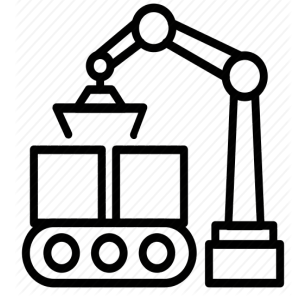
Facility vs. Process

- Each level has different key factors
- Arriving at the “best” solution requires knowing the constraints at each level



Facility Level

- Safety
- Footprint/Layout
- Air/Electrical Supply
- Changeover Time
 - Setup Time
- Upfront Cost
- Labor Rate
- ROI/Payback



Process Level

- Robot
- Part Presentation
- Controls/PLC
 - EOAT
- Cycle Time
- Yield
- Throughput
- Deployment Time

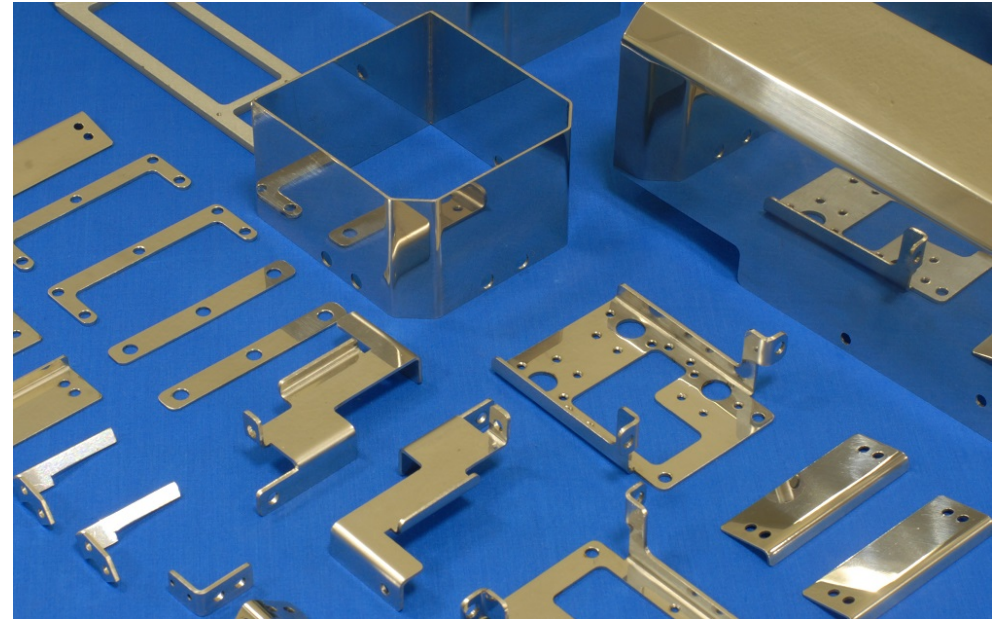
The background of the slide is a photograph of stadium seating, viewed from an elevated angle. The seats are arranged in curved rows, and the image is overlaid with a blue-to-purple gradient that transitions into the white background on the right side of the slide.

Quick Deployment

Challenges and Considerations

When and Why?

- Most important in **high mix environments**
 - Especially when volumes are not high
 - E.g. job shops, contract manufacturing
- Automation tied to a single machine/product can be difficult to justify (depending on volume and changeover required)



If automation is **redeployable** to different products or processes, suddenly it **starts to make sense**

How?

- Get your operators involved
 - Your operators are intimately familiar with the details of the process
 - Knowing your process is critical
- Redeployable Automation
 - Collaborative Robot + Adaptive Gripper + Mobile Base = Extremely Flexible
- Focus on ease of use
 - No expertise required = your own operators may be able to do it
 - Reduces deployment time and cost

A woman with blonde hair and safety glasses is working on a robotic arm in a factory setting. She is wearing a dark t-shirt and white gloves, and is smiling as she adjusts a component on the arm. The background shows industrial machinery and a blue-tinted overlay on the right side of the image.

Solutions for Rapid (Re)Deployment

S h a m e l e s s P l u g S e c t i o n

CrossRobotics UR Platform

UR Collaborative Robot

3, 5, or 10 kg payloads available
No guarding for most applications
Easy to program



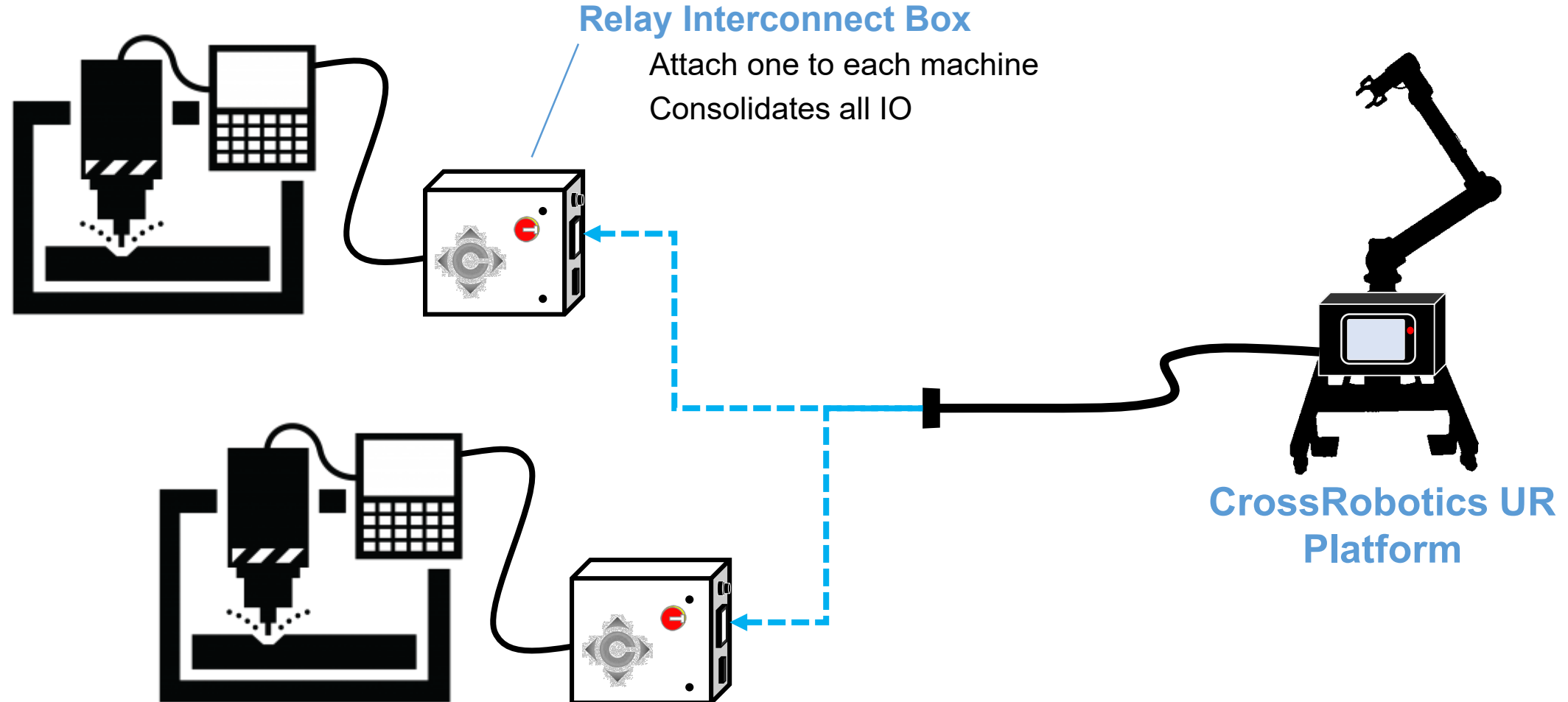
Adaptive Gripper

85mm or 140mm stroke
Force/Position/Speed Adjustable
Easy to program

Mobile Pedestal

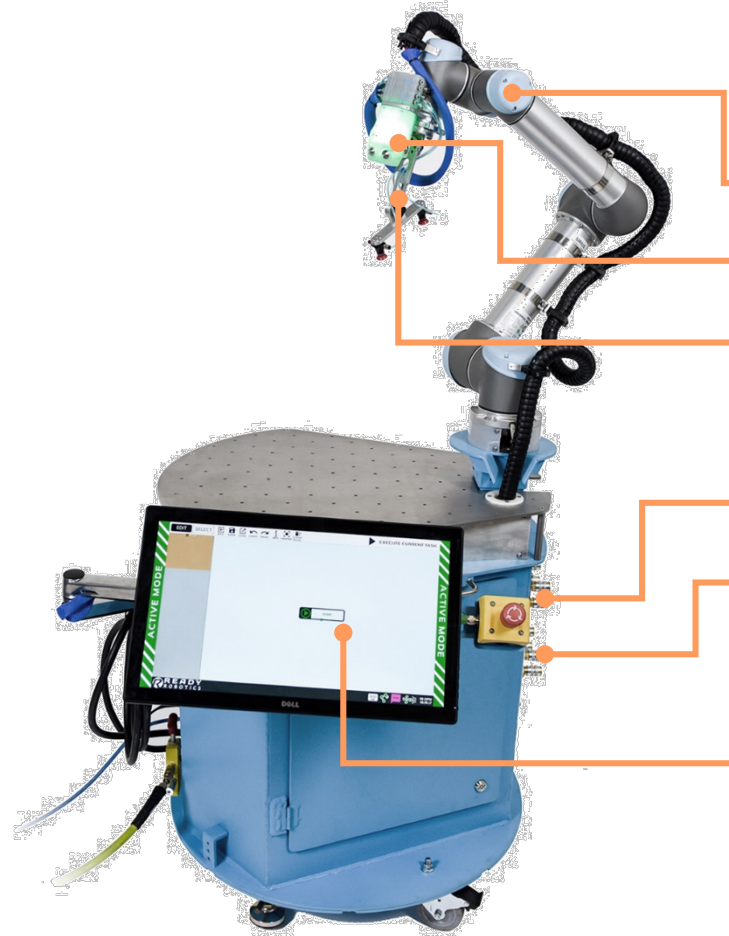
Can easily be moved between locations
Fixed or adjustable height options
Adjustable feet and lag brackets
Precision Locating Options

CrossRobotics Relay Interconnect Box





TaskMate



- Designed to **eliminate or minimize many contributors to changeover time**
 - *Collaborate Robot*: UR3, UR5, or UR10
 - *TeachMate*: Programming controls and electrical/air on end of arm
 - *Toolless Quick Change Interface*
- *R-Align*: Waypoint recalibration in <5 min
- *PLC Box* makes 24V Digital IO modular
- *Integrated pneumatics*
- *Forge*: Custom programming interface for ease of use
- Can be deployed up to 24x faster than industrial robots for simple machining tending tasks

A photograph of a white styrofoam container, likely for food delivery, with a cardboard box partially visible next to it. The image is overlaid with a blue-to-white gradient that separates it from the text area on the right.

Key Takeaways

Take it to go

Key Takeaways

- **Collaborative Robots** are very well suited to retrofitting a machine tending process
- **Minimize Changeover** Time
- Get your **operators** involved
- **Know your process** as detailed as possible
- Focus on **flexible and redeployable automation**

THANK YOU



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