The LIGHTS OUT DC / FC
How *Close* Can We Get?

Mike Futch
President
Tompkins Robotics

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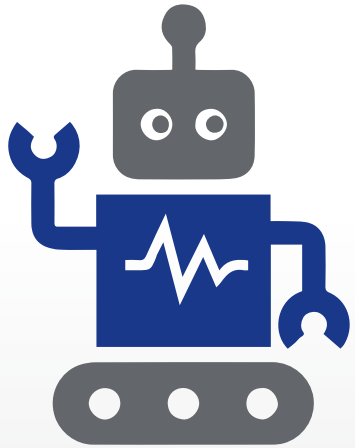
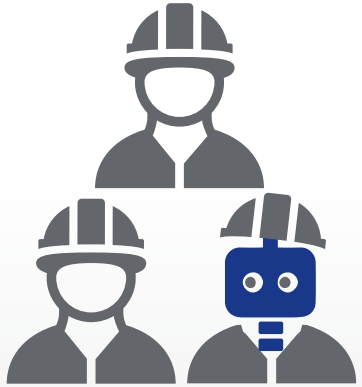
Objectives

CRITICAL CONSTRAINTS EXIST INCLUDING THE **WORKFORCE**



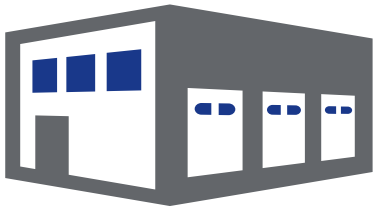
OVERVIEW OF **THE AUTOMATED DISTRIBUTION CENTER**, POWERED BY ADVANCES IN ROBOTIC TECHNOLOGY



HOW DO **NEW ADVANCES** IMPACT THE **CRITICAL CONSTRAINTS & LABOR?**

Critical Constraints in Supply Chain

“EACH” FOCUS
IMPACTS
PRODUCTIVITY
AND CAPACITY



FACILITY
CAPACITY AND SPACE
CONSTRAINED

FULFILLMENT AND
STORAGE SYSTEMS
CONSTRAINED AND
INFLEXIBLE

CONSTRAINTS ON
CAPITAL

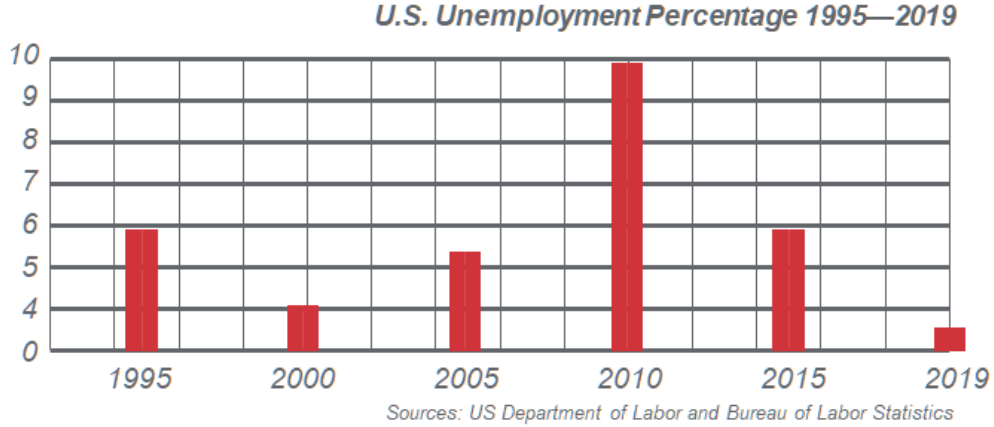
LABOR
IS SCARCE
AND EXPENSIVE

Workforce Constraints

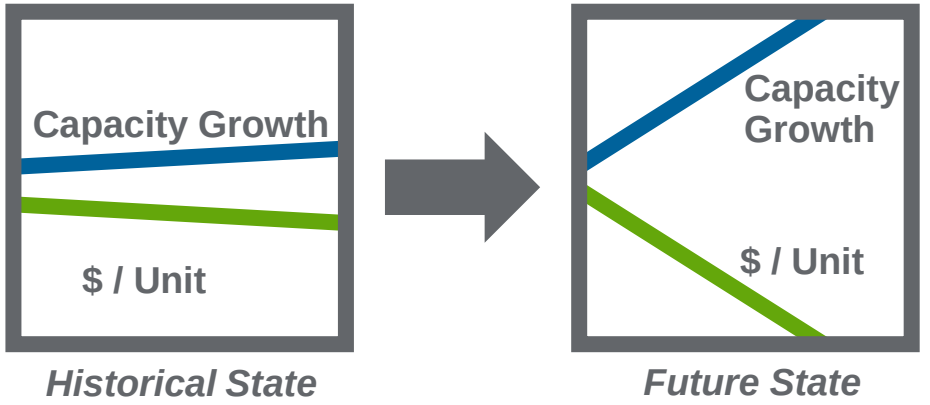
- Unemployment at record lows
- “Each” transition creates greater demand
- Major logistics hubs impacted greater
- Increasing service economy forecasts further constraint
- Traditional solutions capacity and costs unsustainable

Something Has To Change

Historical Unemployment



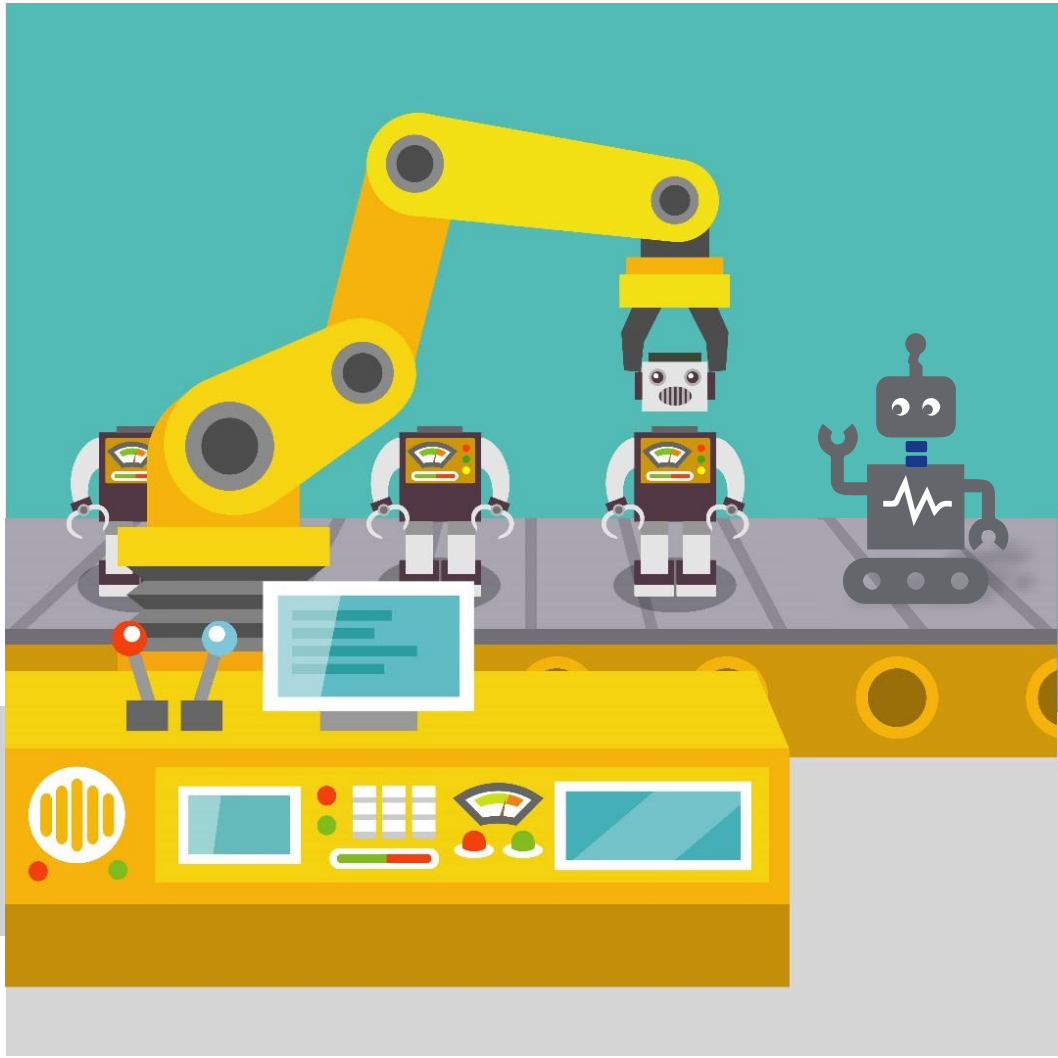
Historical vs Future DC / FC Trends



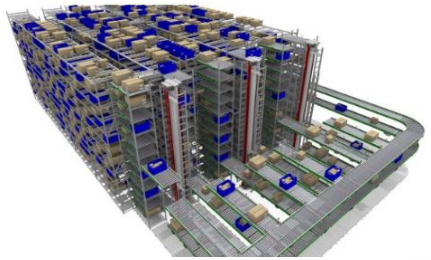
Solution

- Automation is the solution
- Robotics maturity - separation between machine and human disappearing
- Flexible, scalable, portable elements
- Moore's Law and technology price reduction trends now provide real ROI

- **Robotic adoption is not a question of *if*, it is a matter of *when***



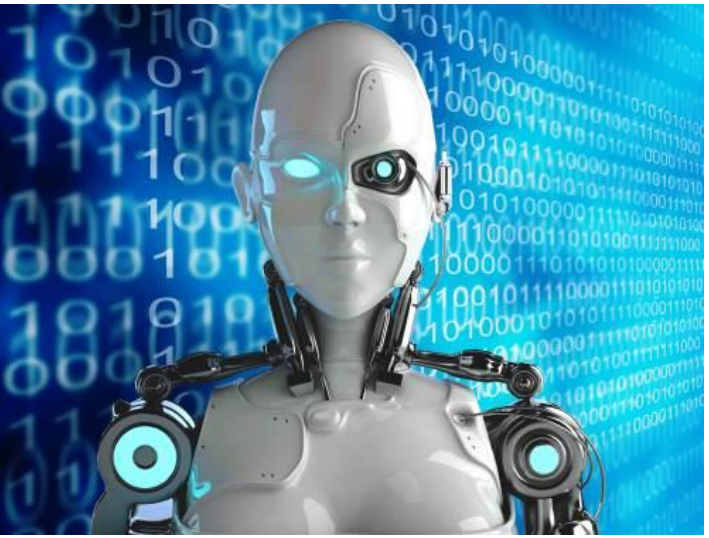
The Automated Distribution/Fulfillment Center



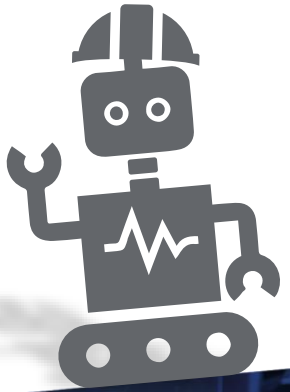
Automated distribution center flows

- Truck Load / Unload
- Movement through Warehouse
- Storage & Retrieval
- Order Fulfillment
- Packaging
- Sorting

Automation and Robotics



- Traditional Automation was conveyor and large fixed assets - Conveyor, ASRS, Human Assisted Tech
- Robotics Automation is a fleet of smaller, autonomous elements
- Higher levels of Intelligence and Control, to include AI
- Performs Human Traits and Tasks
- Easily expanded and less space / capital
- Eliminates the key constraints



How Far Can We Go?
Dock Operations

- Requires pallet and carton handling
- Most difficult task – picture a UPS truck
- Pallets – Automated vehicles and devices
- Cartons – Cameras, robotic arms, grippers, and software can overcome the problem
- Technology in early success, maturity still to arrive
- 50% automation ability today

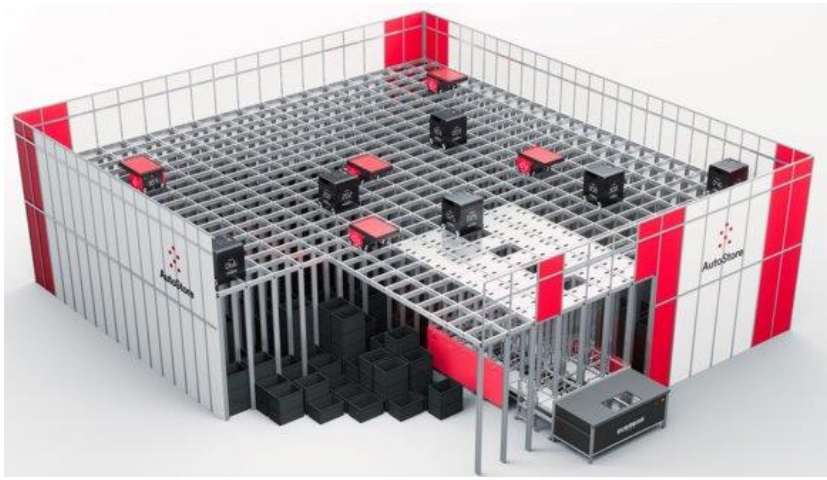
How Far Can We Go?

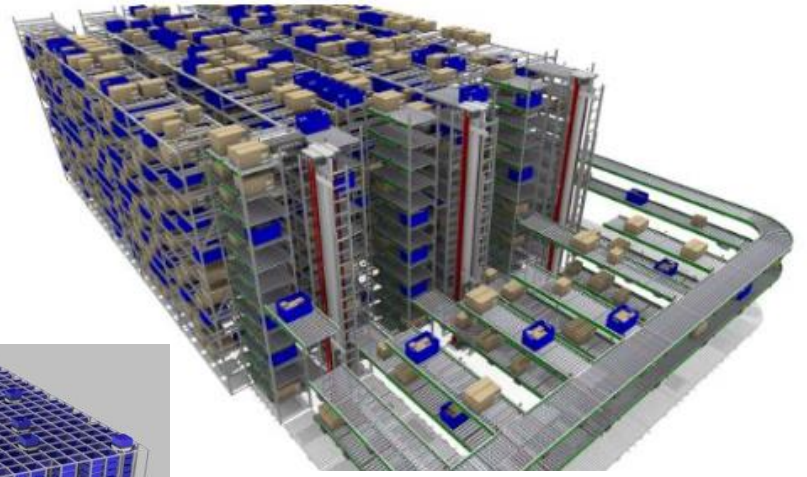
General Material Movement

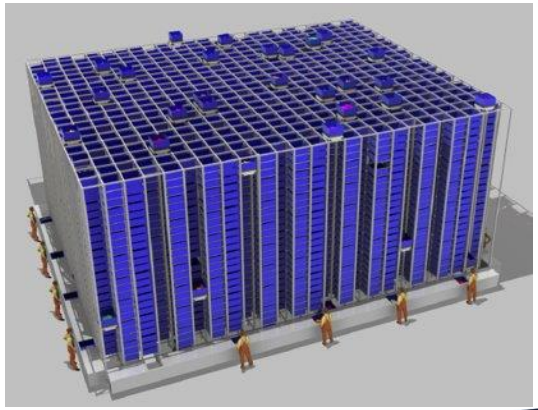
- Traditional required manned vehicles, tracked conveyor, fixed path AGV
- Today's robotic vehicles are free ranging, faster, intelligent
- Handles all load sizes, replicates human decisions
- Collaborative and human interactive
- Technology more mature – wide adoption planned
- 85% automation ability today

How Far Can We Go?
Storage and Retrieval

- Traditional is manual or use of large fixed mobile equipment such as ASRS
- Shuttle systems in operation extensively over past 10 years
- New breed of more agile, flexible robotic solutions with dense storage ability
- High SKU counts and high capacity
- Can have human or machine interface
- Technology more mature – wide adoption underway
- 80% automation ability today

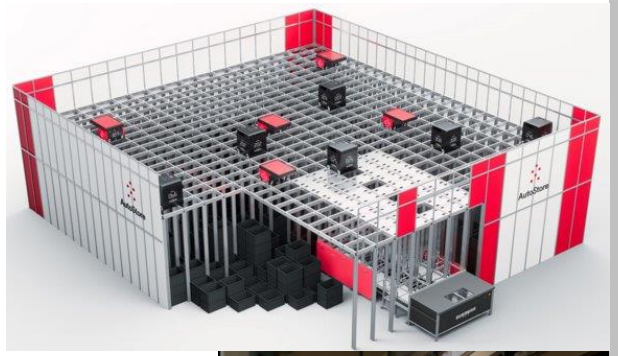
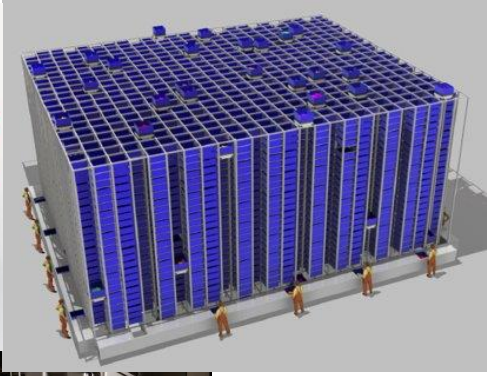






How Far Can We Go?
Order Fulfillment

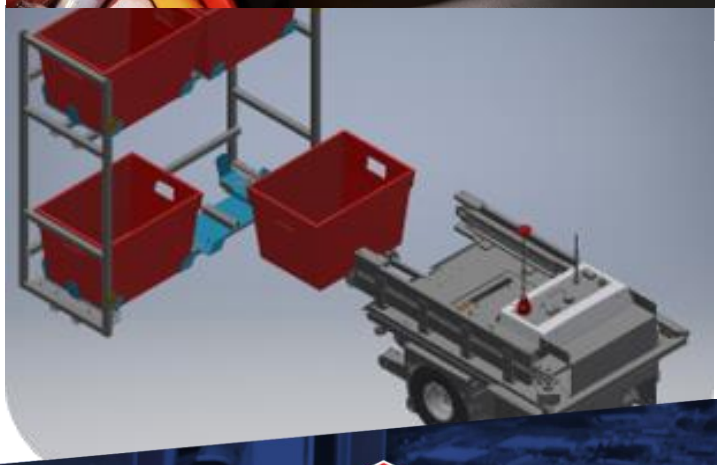
- Traditional is manual with technology assist or large, fixed asset, sorter systems
- These systems are still widespread and effective in some cases
- Variety of new robotic solutions at multiple points in the process flow
- Goods-to-Person / Robot options bring storage containers to order consolidation
- Human or Robotic Pick to order at consolidation
- Robotic Pick systems that go to pick locations and consolidate into an order container
  – Human & Robotic Pick


How Far Can We Go?

Order Fulfillment

- Pick & Place Robots - from storage containers to orders
- Robotic Sorters - items and packages to consolidation
- Robotic Systems to remove, replace and transport order containers
- Combinations of Robotic technologies – Goods-to-Person, Pick & Place, Sortation, Order Movement
- Technology ranges from mature to evolving and adoption varies widely
- 75% to 95% automation ability today in various channels / industries



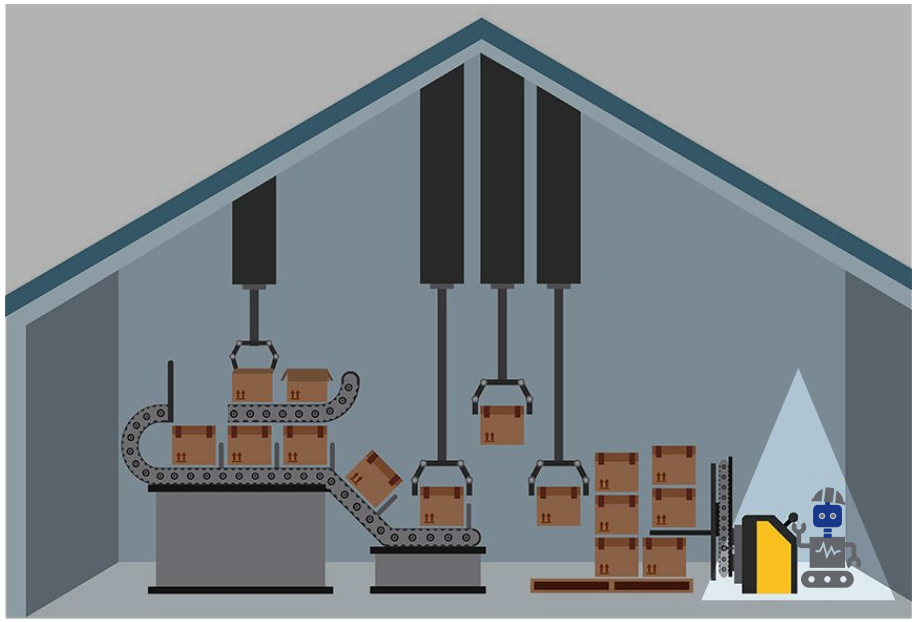
How Far Can We Go?

Packaging

- Traditional is manual and static box or bag automation
- New designs can vary packaging based on cube / order characteristics
- Auto packaging range includes box, bag, mailers and other varied ship containers
- Speed and intelligence has advanced
- Technology maturity and adoption is wide on basic models and growing for advanced models
- 60% to 90% automation ability today in various channels / industries

How Far Can We Go?
Limitations

Is “Lights Out” Realistic?



No, there are still limits

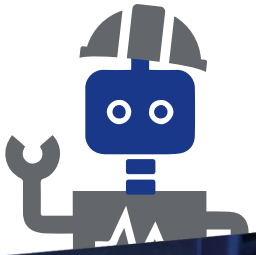
- Difficult products for automation & robotics
- Difficult tasks such as gift wrap
- Technology gaps exist for some processes
- ROI unattainable for some tasks / volumes
- Maintenance, IT and machine operators required
- Management, decision making & support

We Still Require a Skilled Workforce

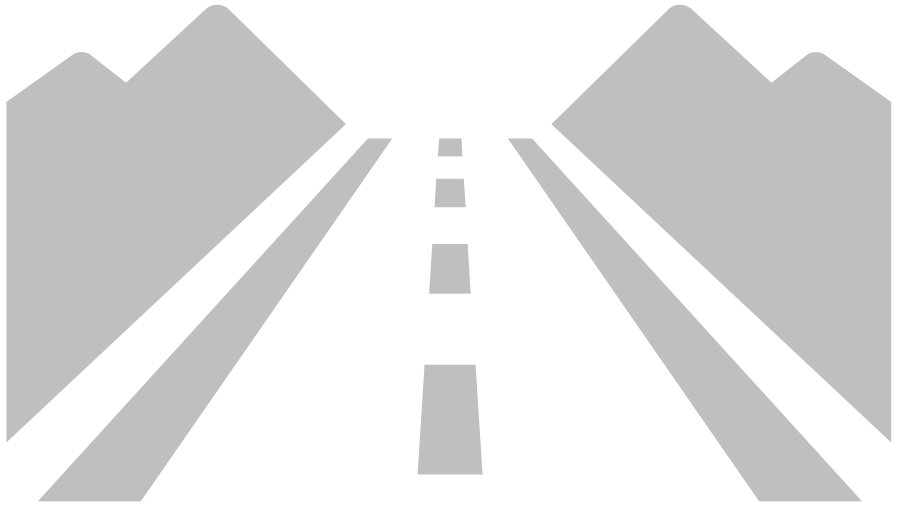
- Automation & robotic technology can perform most manual tasks
- The use of Automation & Robotics:
  - Eliminates or mitigates the key constraints presented
  - Better leverages staff and removes labor shortfall
  - Improves capacity, accuracy, space utilization, effectiveness
  - Maximizes the effectiveness of capital
  - Improves customer experience in the “each” Supply Chain
- However, these solutions are not completely autonomous – “Lights Out” is not a reality
- In most operations, 60% - 85% of all manual tasks can be automated

Key Takeaways

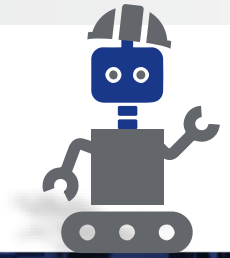
- There are a wide variety of functional automation options available to eliminate DC / FC constraints
- Robotic automation is key to any solution
- Space, labor, and capital constraints can be minimized or eliminated through robotic automation
- The potential of effective automation is approaching high levels in most situations
- We are not approaching “Lights Out” – there are too many required human tasks – *for now*



Key Takeaways for Your Path Forward



- Recognize the challenges due to supply chain constraints
- Develop a plan to automate using robotic technologies
  - Understand the range of business requirements you may need to address
  - Understand the range of robotics and automation available
  - Learn how integration of technologies cover a range of distribution center functions
  - Recognize the true possibilities and limitations - Don’t get swept up in hype or unrequired advanced technology
- Apply robotic automation in the most effective manner to address your constraints



For more information:

mfutch@tompkinsrobotics.com
https://www.tompkinsrobotics.com/

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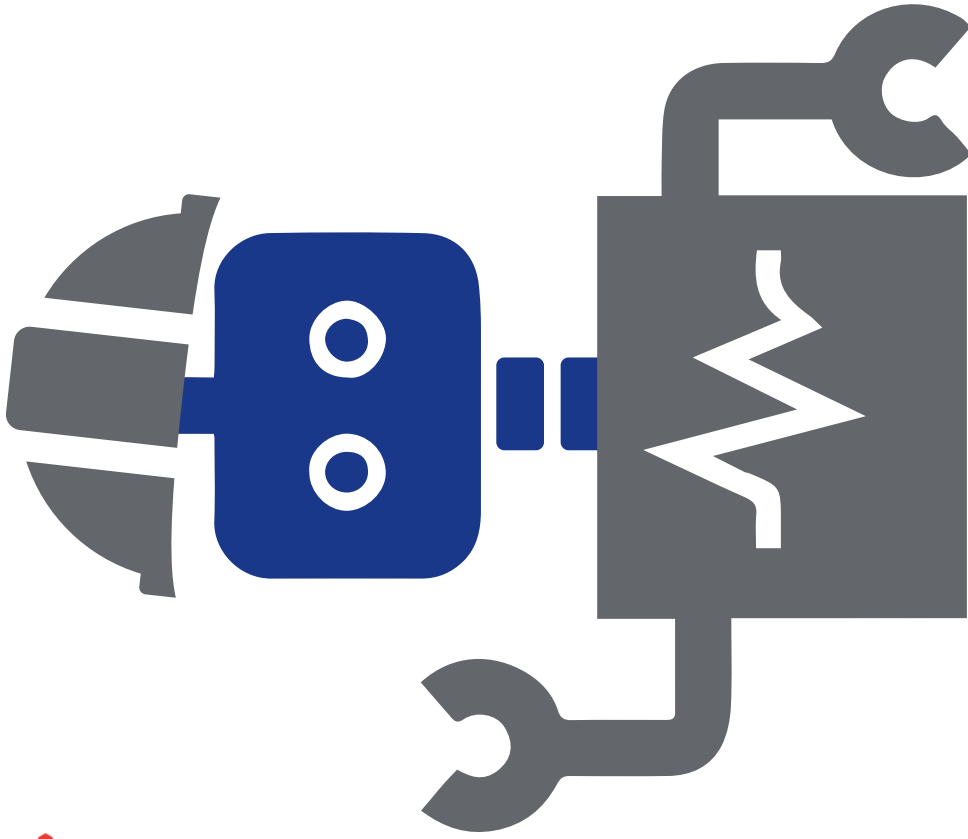

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