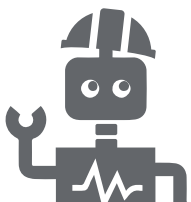


The **LIGHTS OUT DC / FC** How **Close** Can We Get?



POWERED BY **POSSIBILITIES.**



Mike Futch
President
Tompkins Robotics



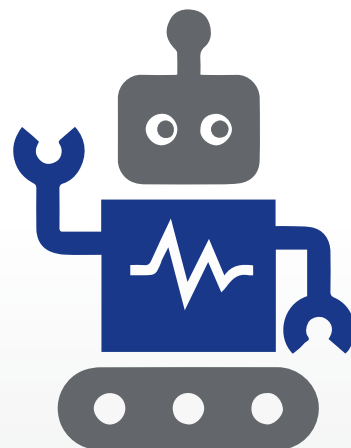
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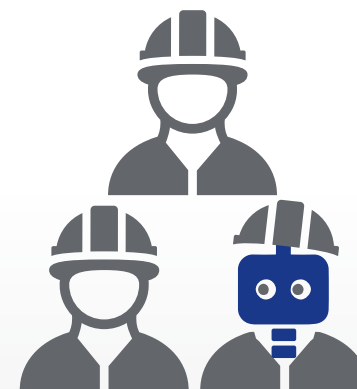
Objectives



CRITICAL CONSTRAINTS
EXIST INCLUDING
THE **WORKFORCE**



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



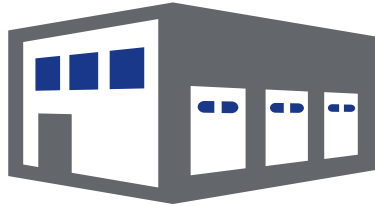
HOW DO **NEW ADVANCES**
IMPACT THE **CRITICAL**
CONSTRAINTS & LABOR?

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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

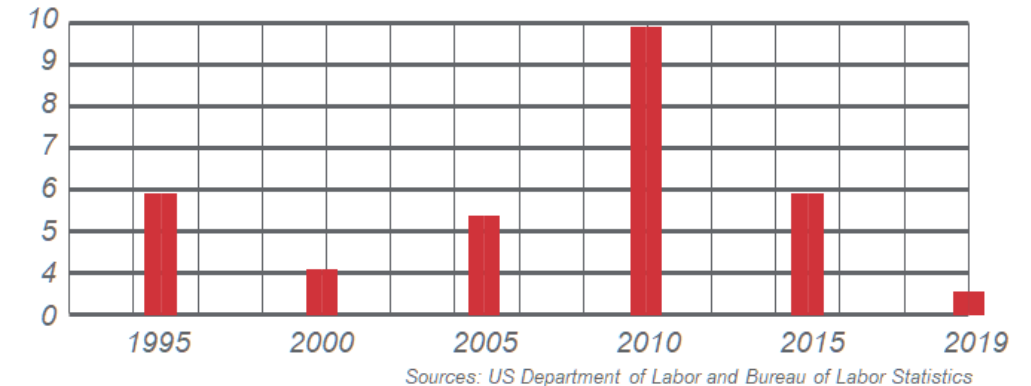
Workforce Constraints

- ▶ 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

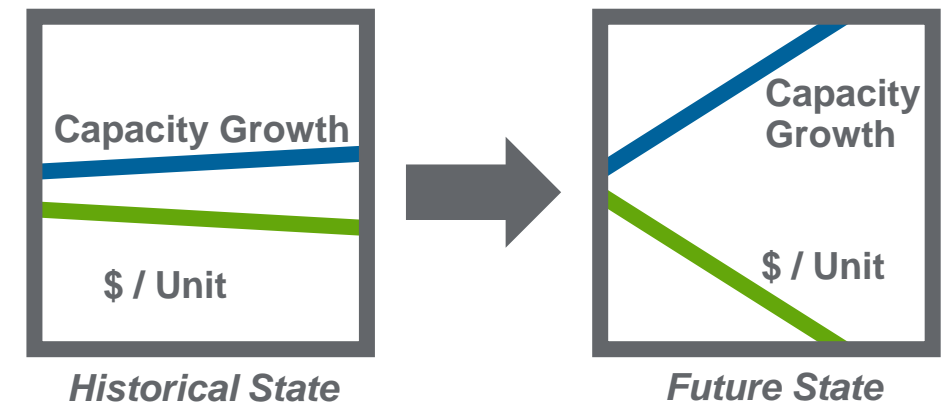
Something Has To Change

Historical Unemployment

U.S. Unemployment Percentage 1995—2019

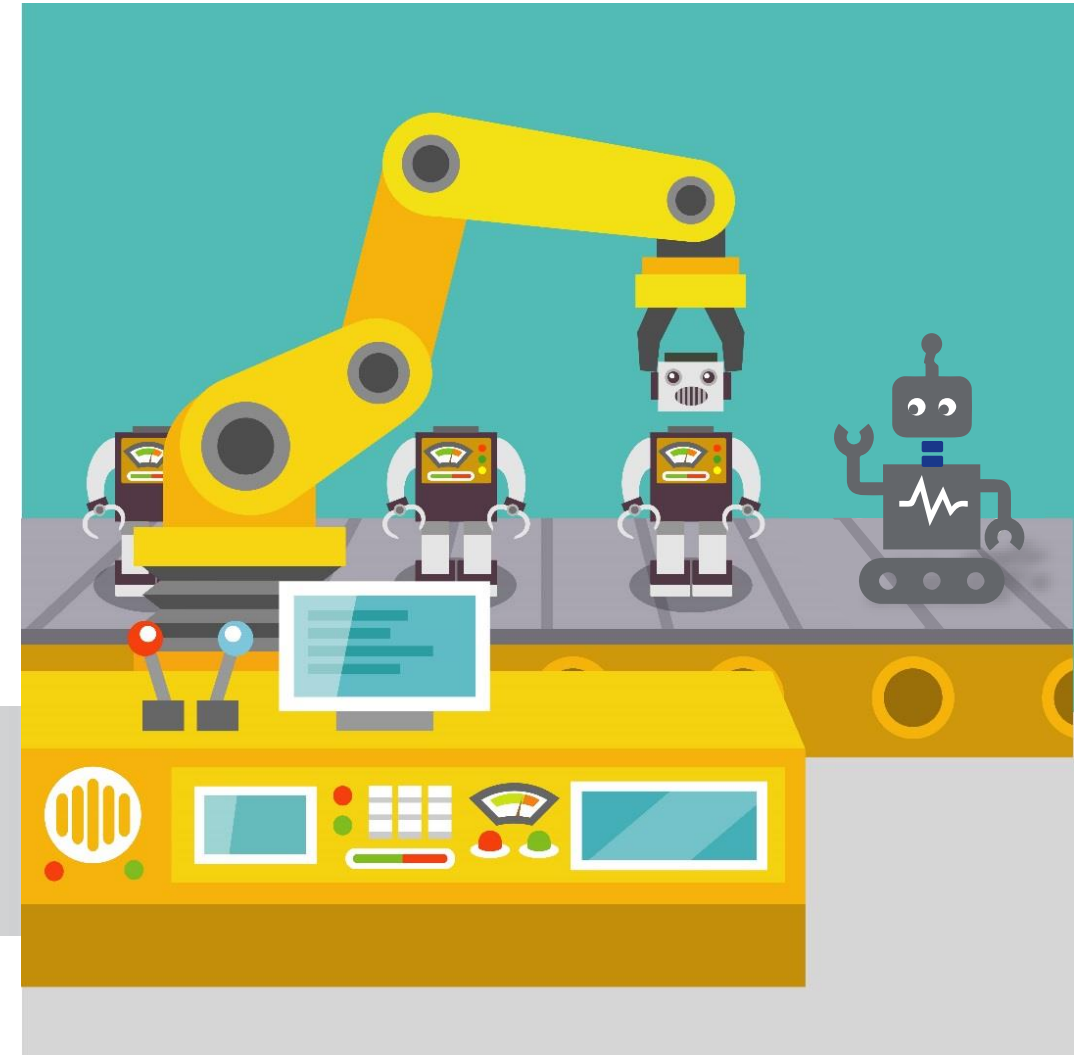


Historical vs Future DC / FC Trends

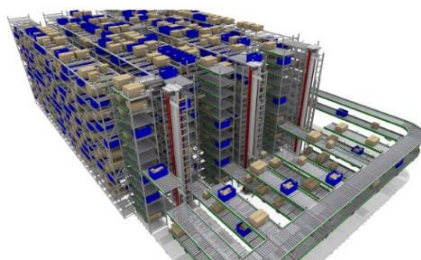


Solution

- ▶ 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

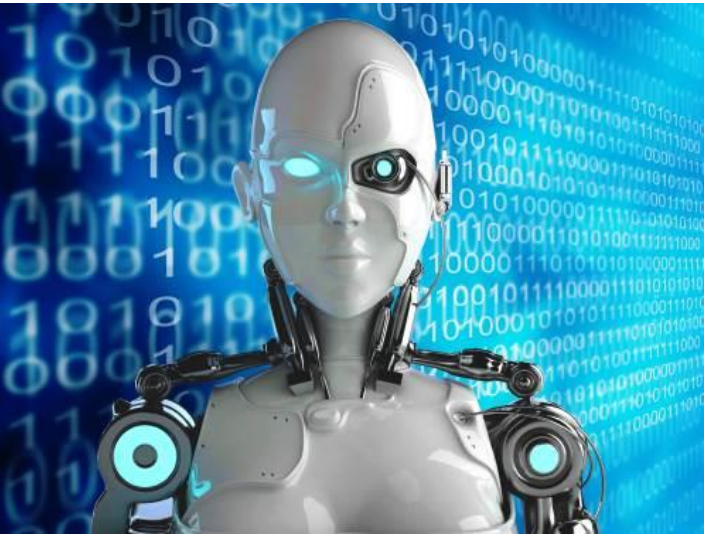


Automated distribution center flows

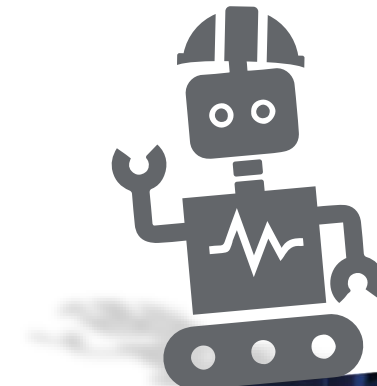
- ▶ Truck Load / Unload
- ▶ Movement through Warehouse
- ▶ Storage & Retrieval
- ▶ Order Fulfillment
- ▶ Packaging
- ▶ Sorting

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Automation and Robotics



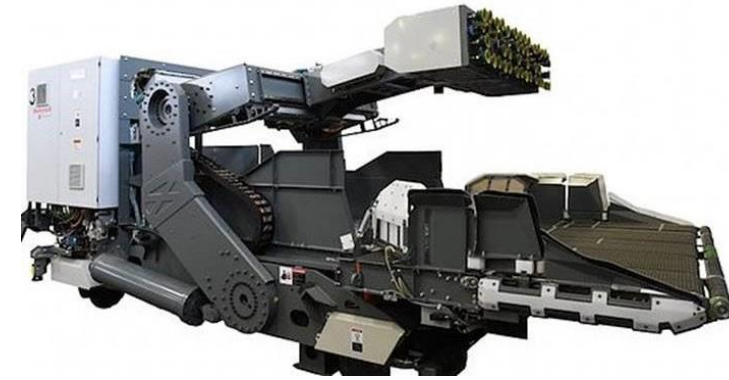
- ▶ Traditional Automation was conveyor and large fixed assets - Conveyor, ASRS, Human Assisted Tech
- ▶ Robotics Automation is a fleet of smaller, autonomous elements
- ▶ Higher levels of Intelligence and Control, to include AI
- ▶ Performs Human Traits and Tasks
- ▶ Easily expanded and less space /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

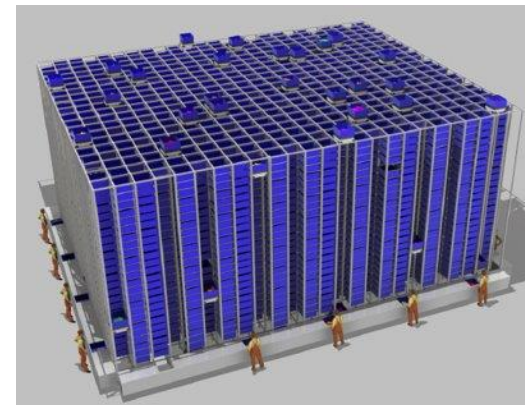
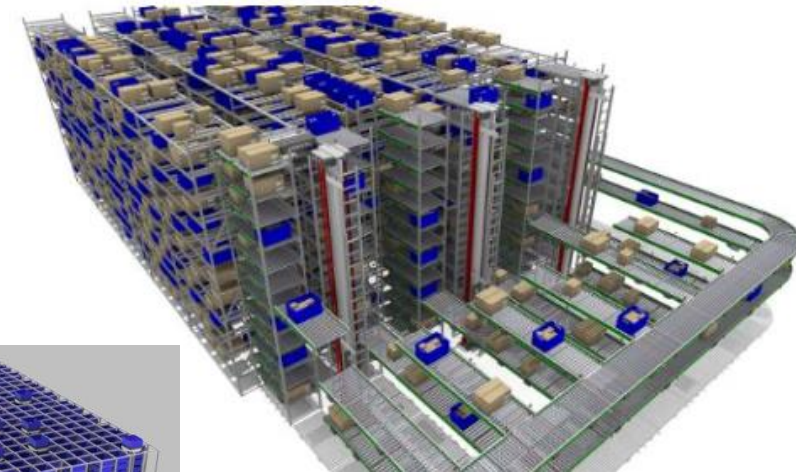
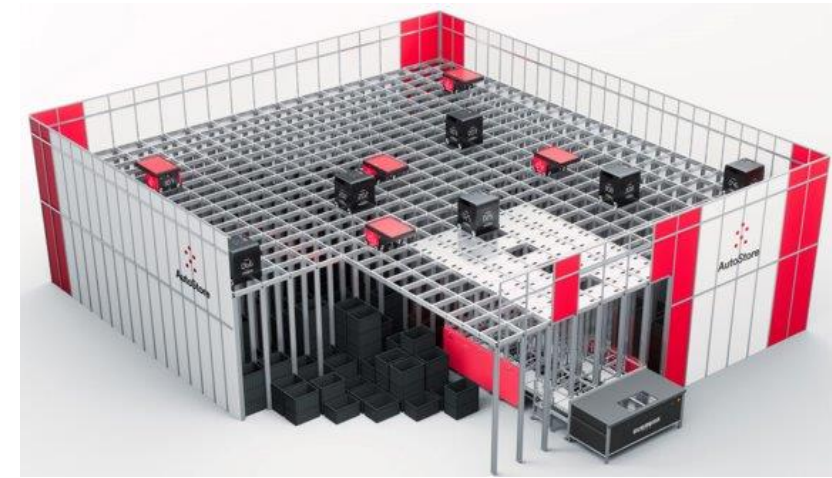
- ▶ Traditional required manned vehicles, tracked conveyor, fixed path AGV
- ▶ Today's robotic vehicles are free ranging, faster, intelligent
- ▶ Handles all load sizes, replicates human decisions
- ▶ Collaborative and human interactive
- ▶ Technology more mature – wide adoption planned
- ▶ 85% automation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



How Far Can We Go?

Storage and Retrieval

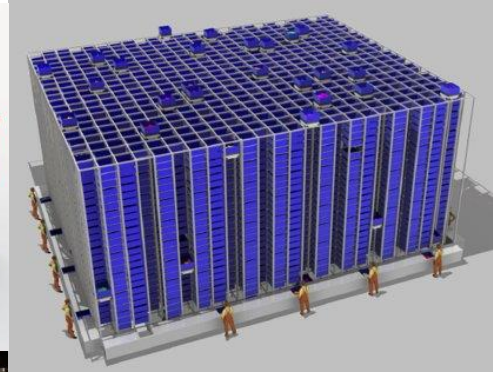
- ▶ Traditional is manual or use of large fixed mobile equipment such as ASRS
- ▶ Shuttle systems in operation extensively over past 10 years
- ▶ New breed of more agile, flexible robotic solutions with dense storage ability
- ▶ High SKU counts and high capacity
- ▶ Can have human or machine interface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



How Far Can We Go?

Order Fulfillment

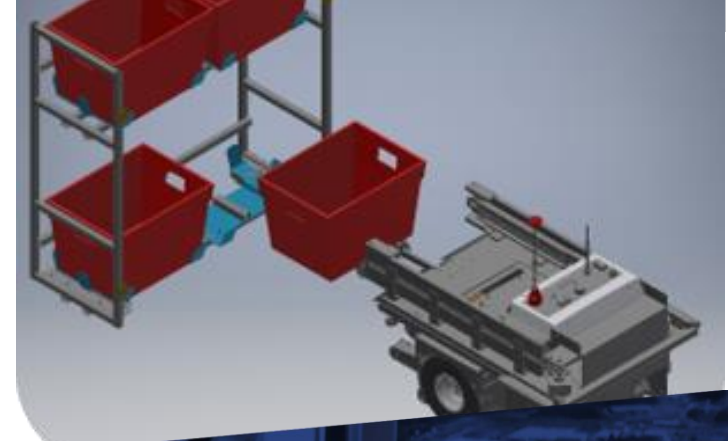
- ▶ Traditional is manual with technology assist or large, fixed asset, sorter systems
- ▶ These systems are still widespread and effective in some cases
- ▶ Variety of new robotic solutions at multiple points in the process flow
- ▶ Goods-to-Person / Robot options bring storage containers to order consolidation
- ▶ 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

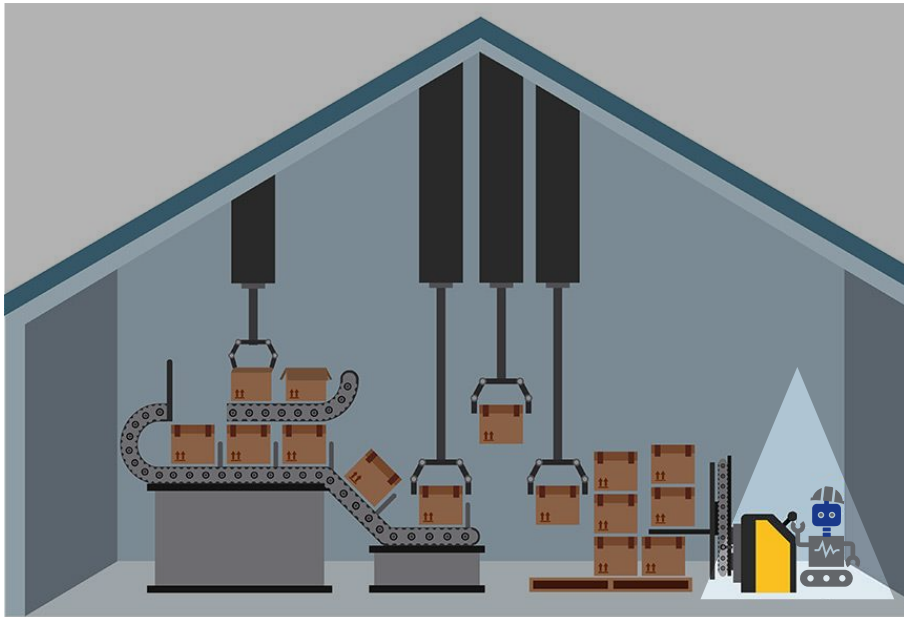
- ▶ Traditional is manual and static box or bag automation
- ▶ New designs can vary packaging based on cube / order characteristics
- ▶ Auto packaging range includes box, bag, mailers and other varied ship containers
- ▶ Speed and intelligence has advanced
- ▶ Technology maturity and adoption is wide 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

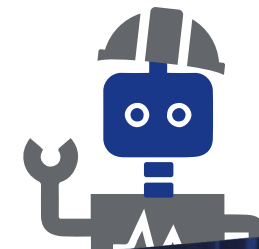
We Still Require a Skilled Workforce



- ▶ 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

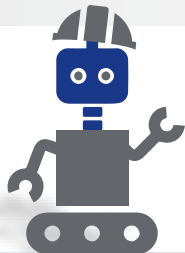
- ▶ There are a wide variety of functional automation options available to eliminate DC / FC constraints
- ▶ Robotic automation is key to any solution
- ▶ Space, labor, and capital constraints can be minimized or eliminated through robotic automation
- ▶ The potential of effective automation is approaching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



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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



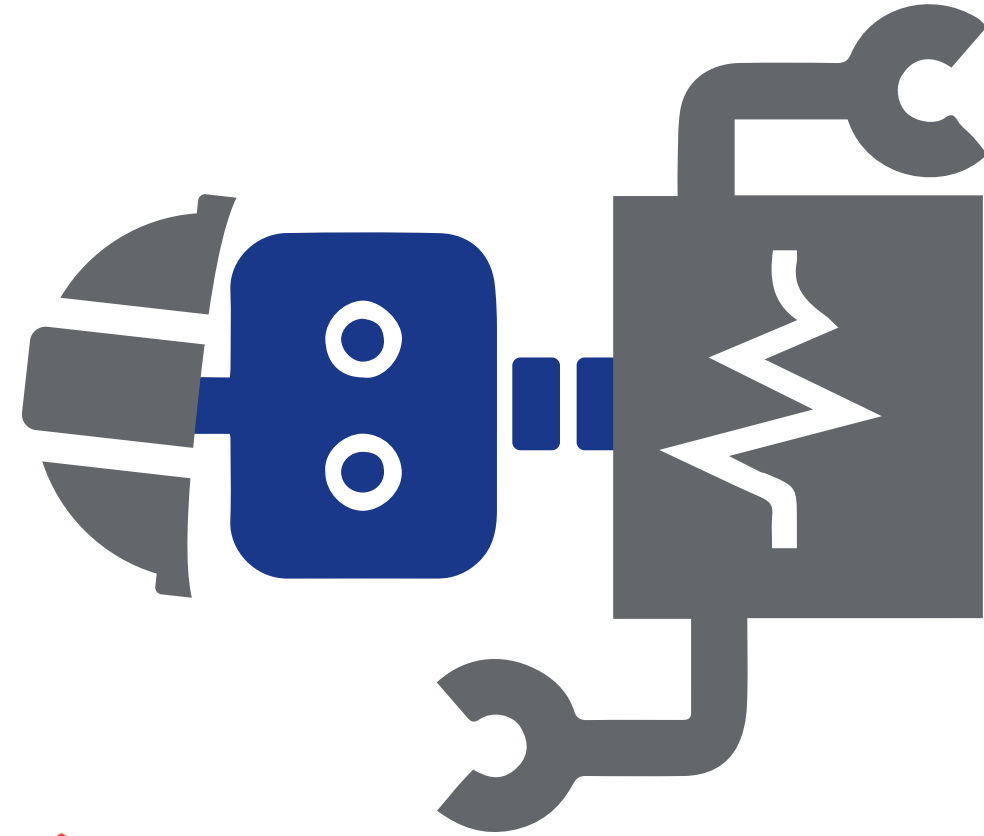
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<https://www.tompkinsrobotics.com/>

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