



# Continuous Motion Automation The Factory of the Future

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# Robotics and Automation Today

## 2014 Status

- Hardware configurations similar to 20-30 years ago
- Single head pick and place reached effective limit
- Not much new under the sun
- Need a game changing approach
- Re-examine the problem
- **Products in motion may gain value**

# Principles of Continuous Motion Automation

## Products need to Flow

- View today's factory as a logistics problem
- Factory should be a highway
- Reduce “at rest” time for assembly/processing
- Process product in motion if possible
- Create a logical modular approach
- Implement in phases

White Paper detailing Continuous Motion Automation at  
[www.packflowconcepts.com](http://www.packflowconcepts.com)

# Principles of Continuous Motion Automation

- 1] Keep products in motion
- 2] Remove any return stroke **X**
- 3] Avoid high speed single automation/robotic gripper **X**
- 4] Process a product while in motion wherever possible
- 5] If not continuous motion then use net zero motion
- 6] Keep product linked wherever possible **X**
- 7] Use continuous flexible buffer for timing differences
- 8] Only locate high precision actuation where needed.
- 9] Flow product in a straight line **X**
- 10] Design to simplicity

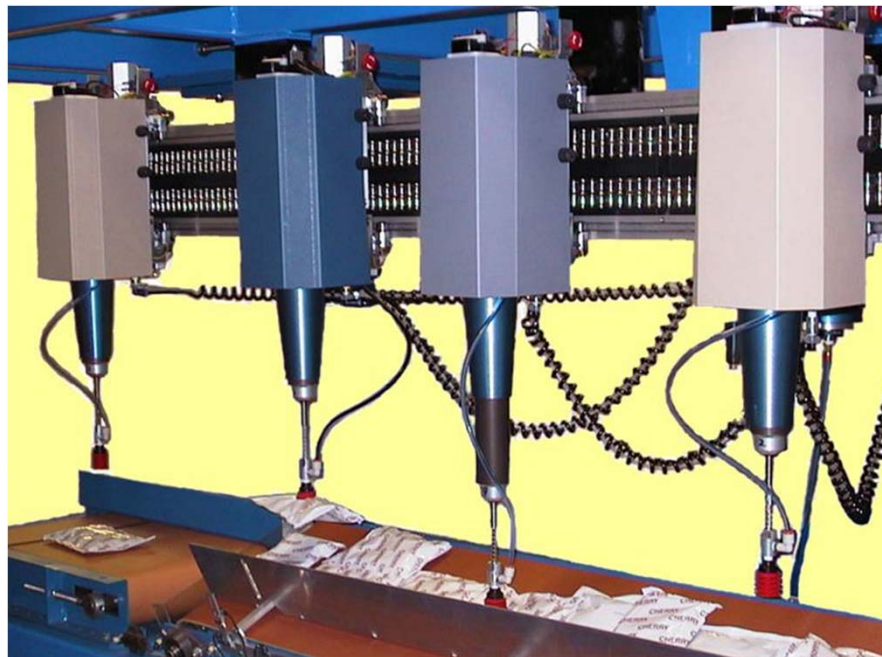
**X Presentation examples**



# Remove the Return Stroke

## Trackbot Product Singulator

- Recirculate robot heads (or Bots)
- Double productivity
- Trackbot prototyped 2000-2002
- Pick only in line
- US Patent 6,688,451

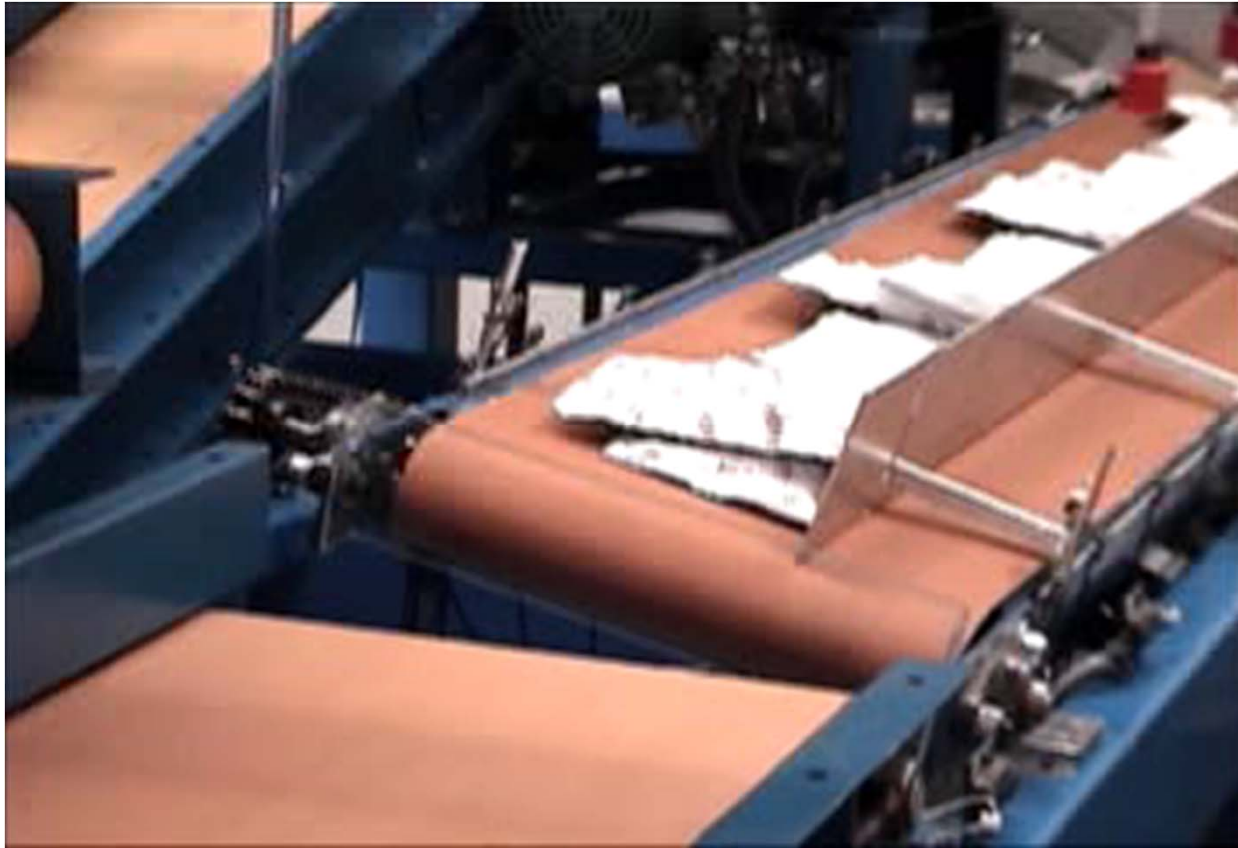


# Trackbot Multi-Head Robot



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# Singulate Filled Stand Up Pouches



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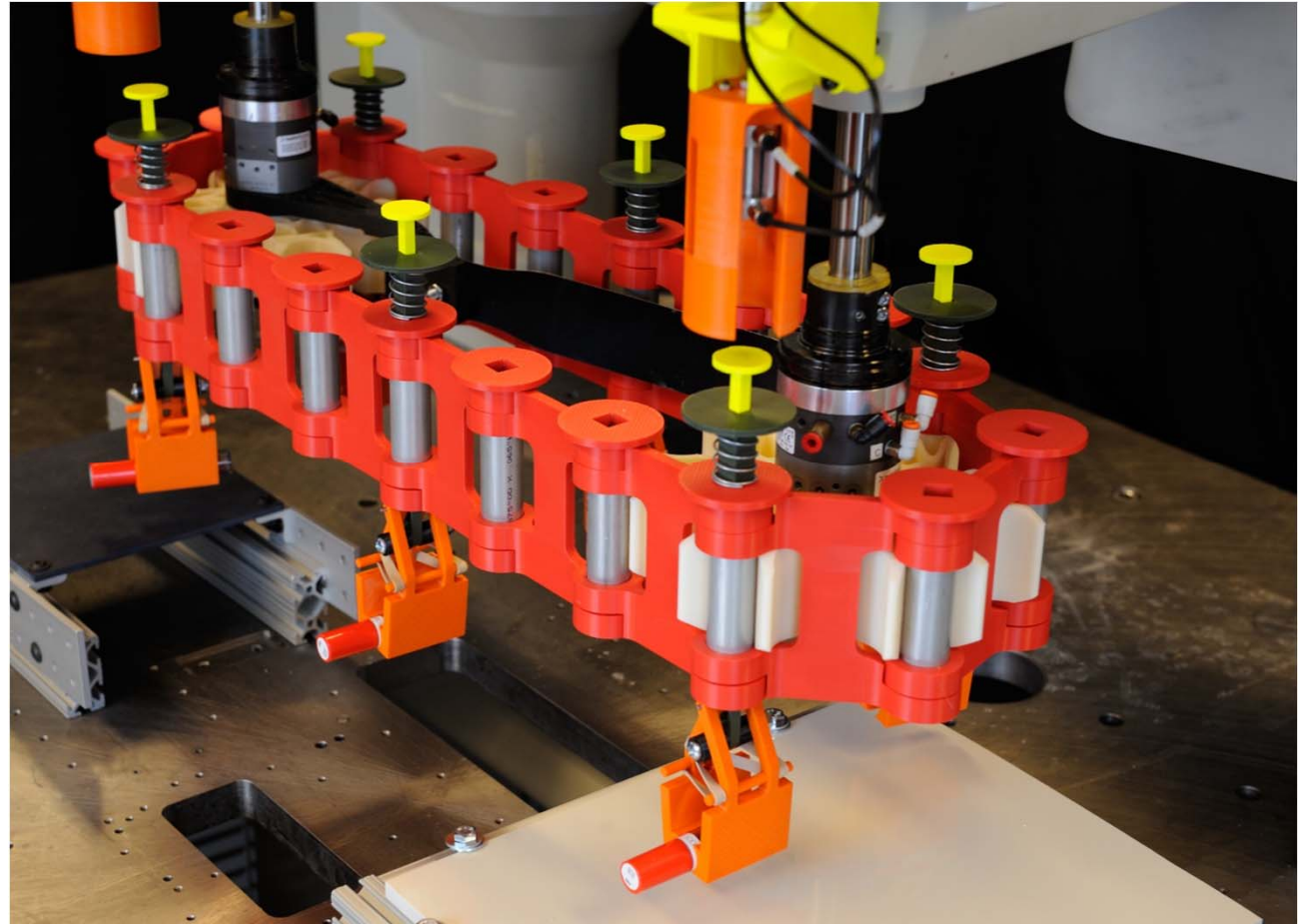
# Avoid High Speed Single Head Gripper

## The Compact FlowBot

- A Multi-Head chain driven robot
- Moderate speed but high product throughput
- Distance traveled does not impact throughput rate
- Modular Design – Add more heads
- *Markets – Food/CPG Packaging, Pharma*
- **Heads on chain can buffer pick/place timing issues**

# Compact FlowBot Pick and Place Device

Prototyping  
Assisted by the  
RPI CATS Center

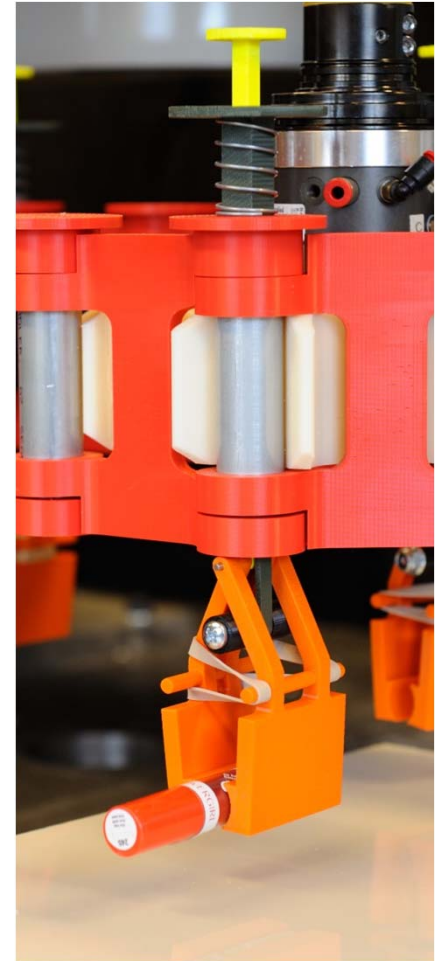
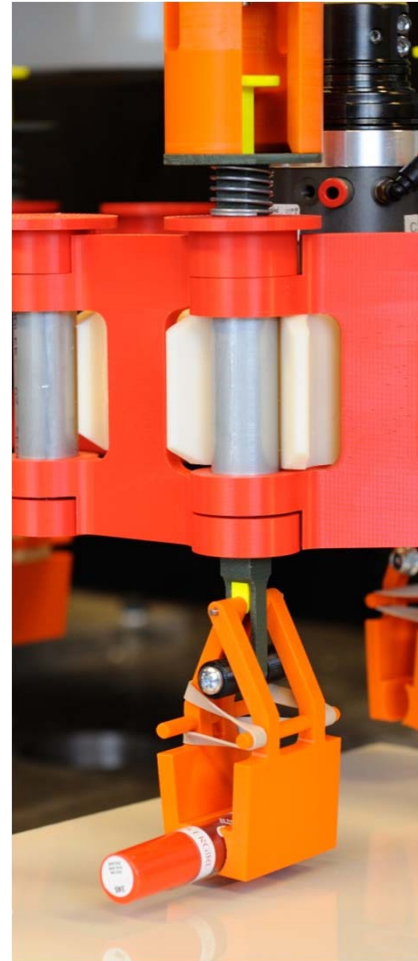
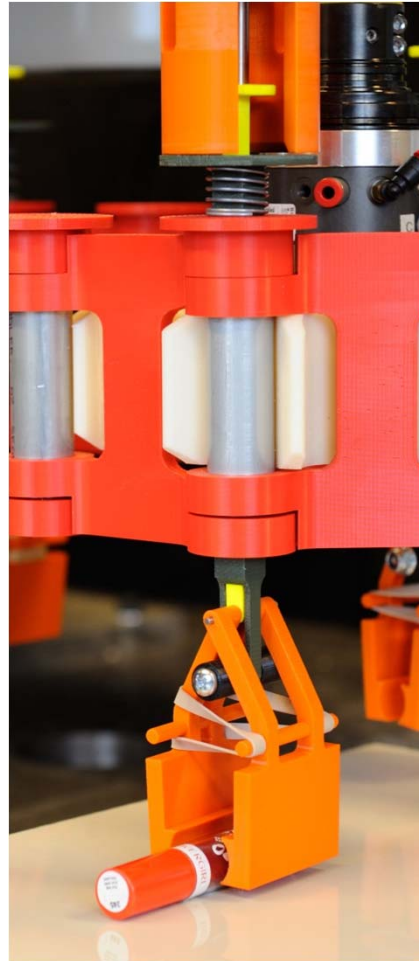
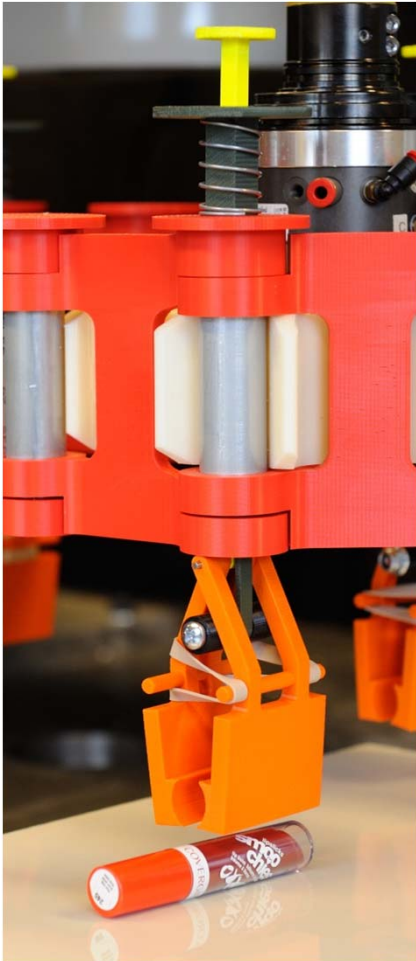


Patent Pending

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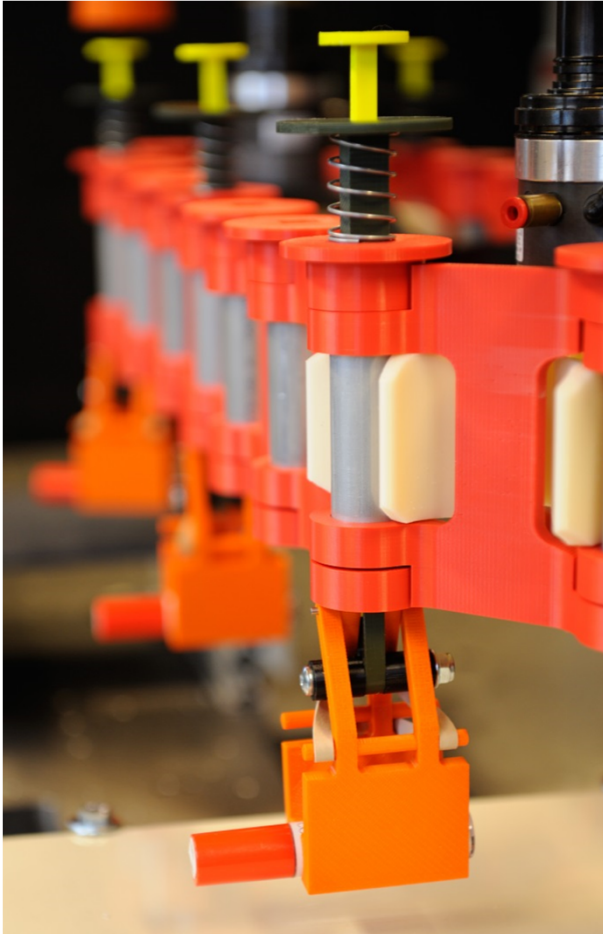
# Modular Design – Chain Gripper Spacing



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# Designed & RP Prototyped in 5 weeks



Rensselaer

#A3NETWORK



Patent Pending



**Designed & RP Prototyped in 5 weeks**

Compact FlowBot  
Prototype 2.0  
Patent Pending  
Pack Flow Concepts LLC



**Rensselaer**

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Patent Pending

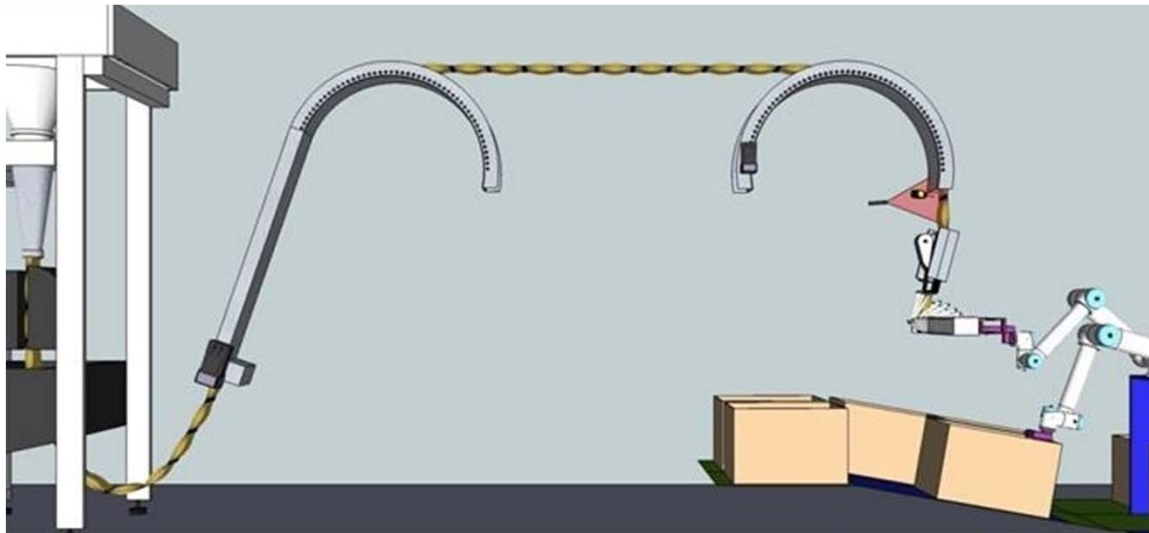


# Keep Products Linked

## Packaging Line Example

- Why make bags of snacks from roll stock and cut them?
- Keep bags together and cut before case packing
- Stream of bags ARE the accumulator
- *Markets – Snacks, Cookies, Packaged Parts*
- **Product location always known – no Vision system**

# Keep Products Linked – Snack Bags



Patent  
Pending

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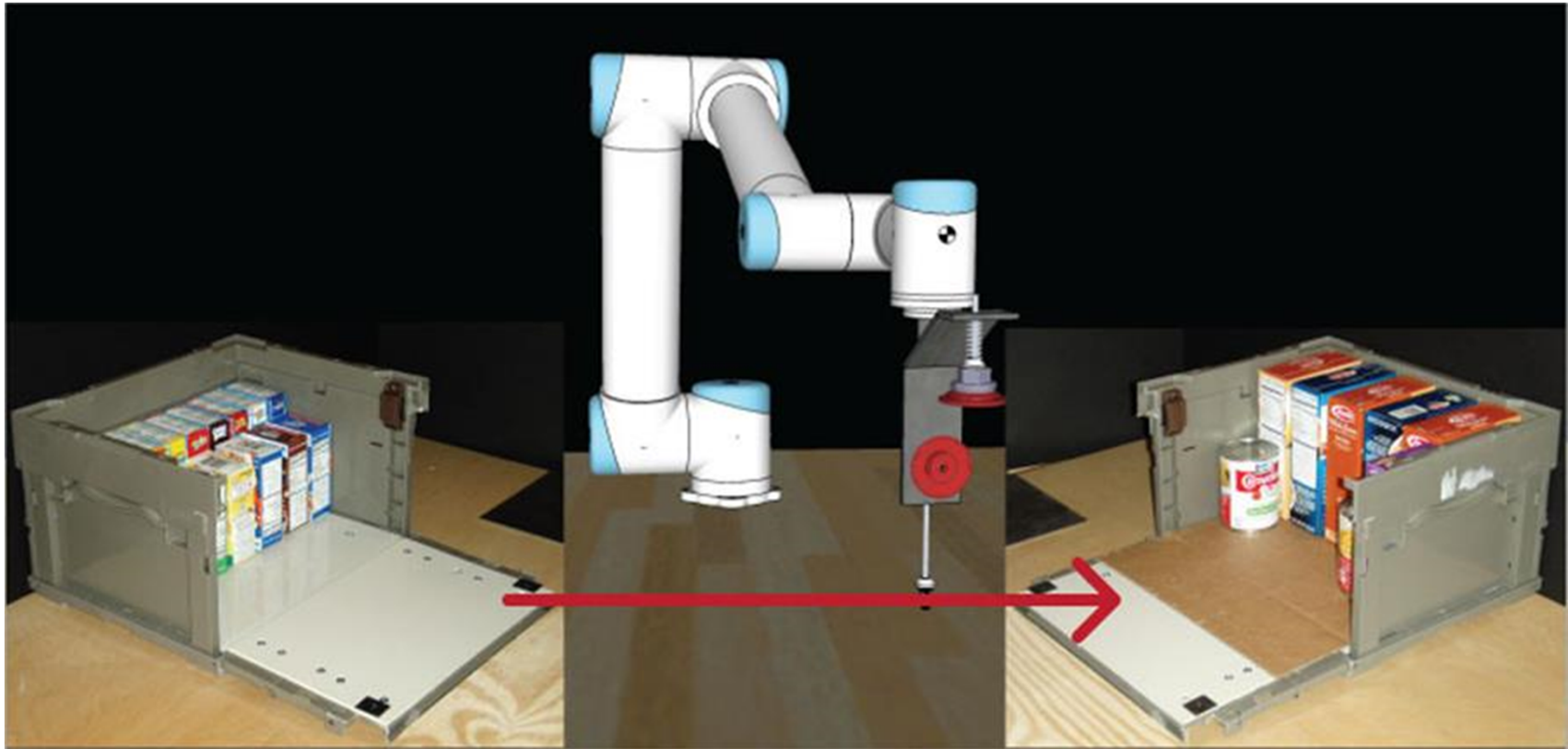


# Flow Products in a Straight Line

## Avoid Unproductive Motions

- Don't always go "Up, Over and Down"
- For Robotic Order Picking redefine the Totes
- Folding Side Wall increases access
- Flow products from Supply to Shipper
- Roller Thumb lets robot move heavier products
- *Markets – Order Picking, 3PL, End of Aisle Packaging*
- **Increased Picking and Vision access**

# Robotic Order Picking – Flow the Product



Folding Side Wall Totes

Patent Pending

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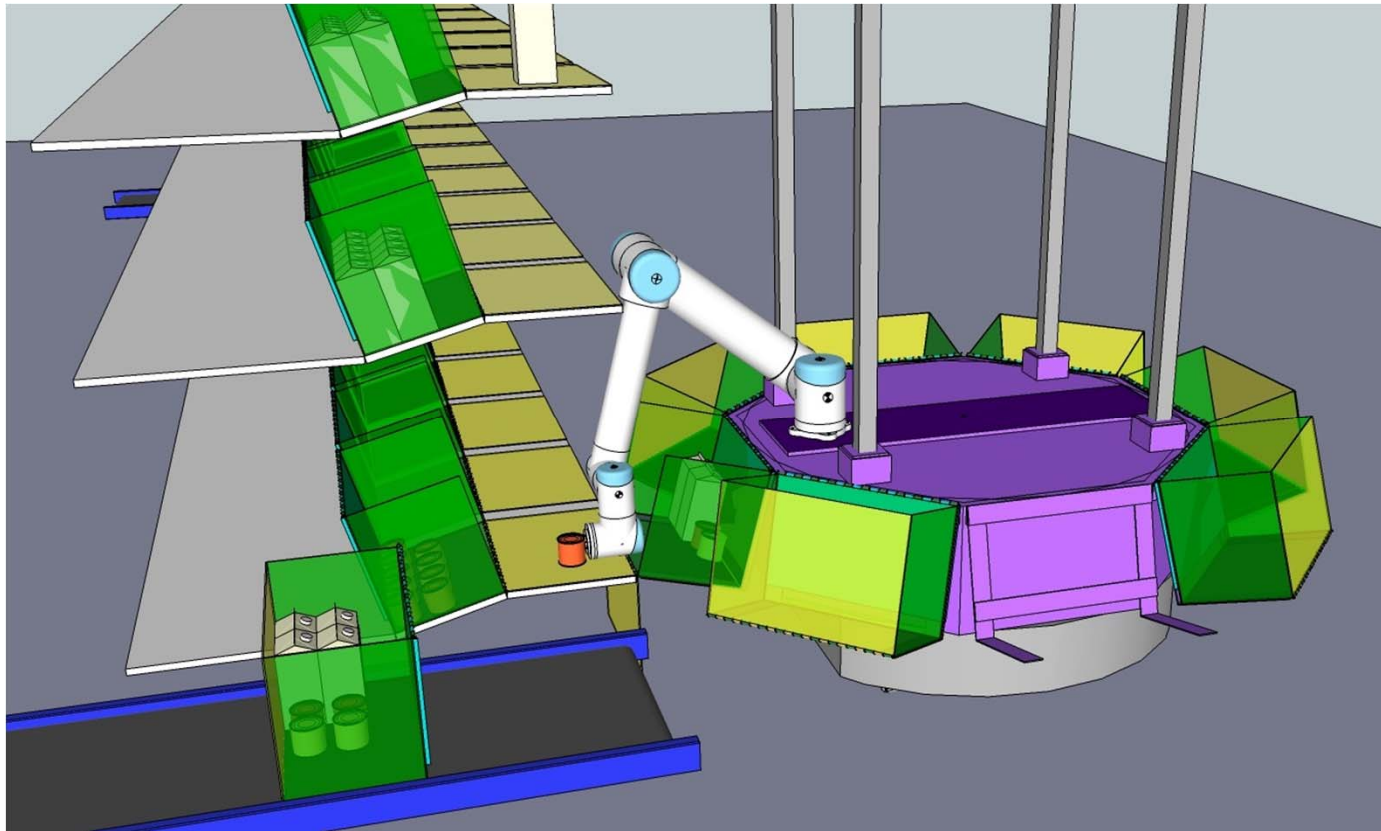


# Robotic Order Picking – UR-5 Robot Demo



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# Robotic Order Picking - Using AGV

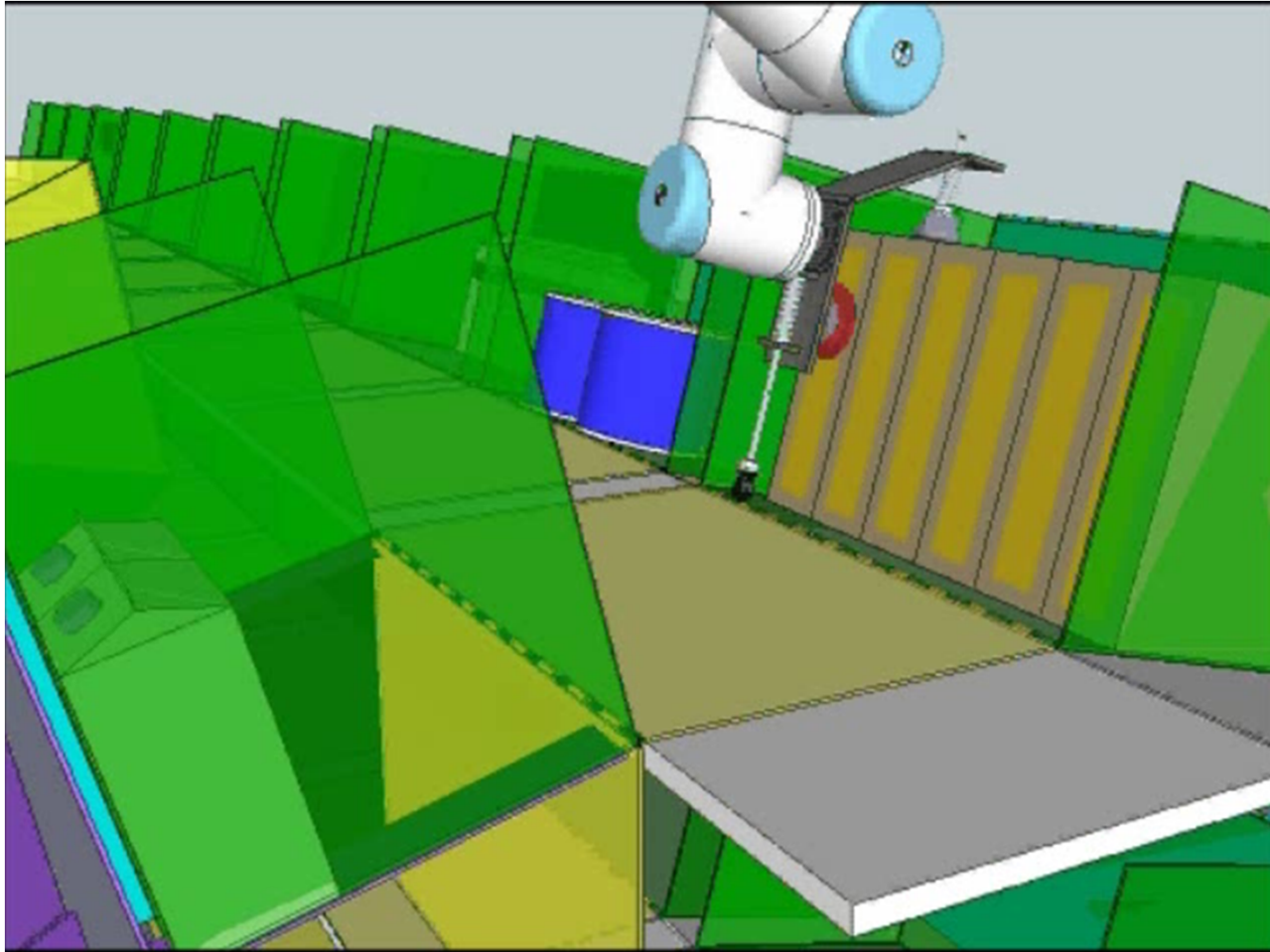


Multiple Shippers Packed

Patent Pending

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# Robotic Order Picking – Tilted Totes



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# Factory of the Future – Our Vision

## **Phase 1**

- Develop the Compact FlowBot for flexible parts feeding
- Start developing Robotic Order Picking for bulk parts feeding

## **Phase 2**

- Develop the Treadbot for high throughput assembly
- Develop the Roll Accumulator to handle motion stoppages

## **Phase 3**

- Develop variations of the Chip Bag Case Packer
- Develop updated Docking End Effector

## **Phase 4**

- Develop Assembly Work Table

## **Phase 5**

- Integration

**Refer to White Paper for Additional Devices**



# Contact Information

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