



BIN PICKING and YOU

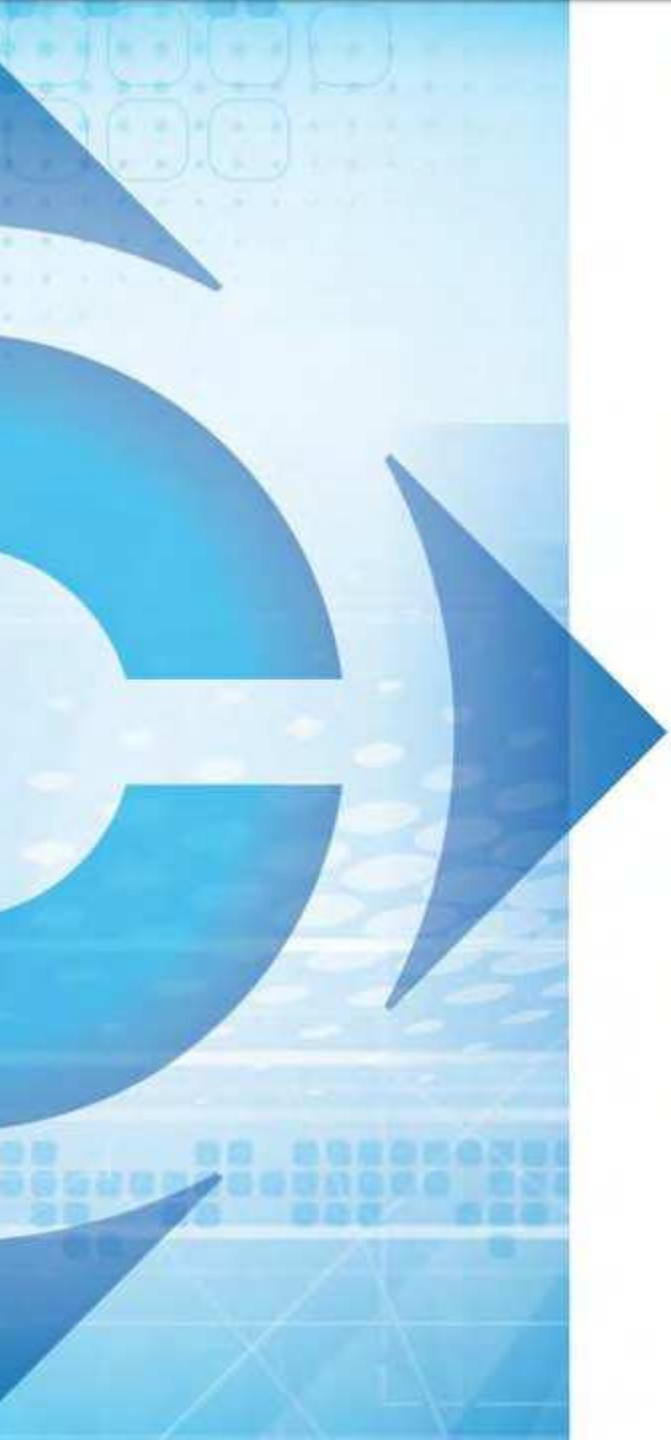
A G E N D A

- Who is Cross Robotics?
- What is Bin Picking?
- How Bin Picking provides ROI
- When to consider (and NOT to consider) Bin Picking
- What is CrossRobotics' Bin Picking Solution?
- Live Demo and Q&A

CROSS ROBOTICS

- Robots
- End Effectors
- Components
- À La Carte Services and Support
 - End of Arm Tooling components and design
 - Training
 - Proof of Concepts
 - Robotic Integration and Programming

We help our customers achieve their business goals by addressing their most challenging automation applications

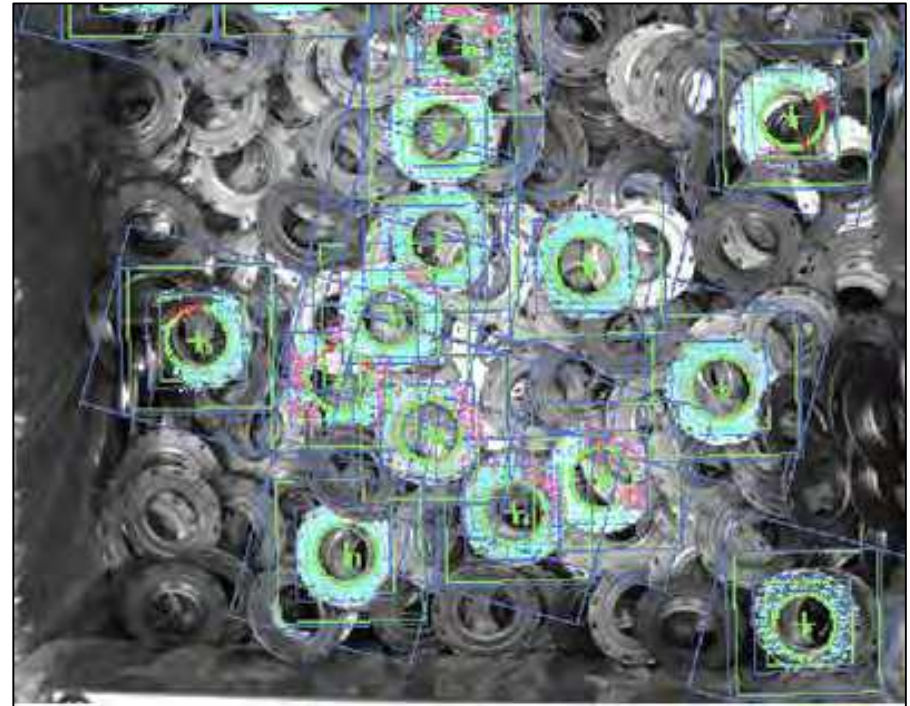


WHAT IS BIN PICKING ?

... pretty much what it sounds like

IN A NUTSHELL

- Sophisticated vision systems “see” the contents in the bin and identify the best candidate to pick up
- Very easy for people.
- Not the cheapest option for part presentation
- Historically difficult to reliably automate



PART PRESENTATION



NESTED TRAYS



BOWL FEEDING



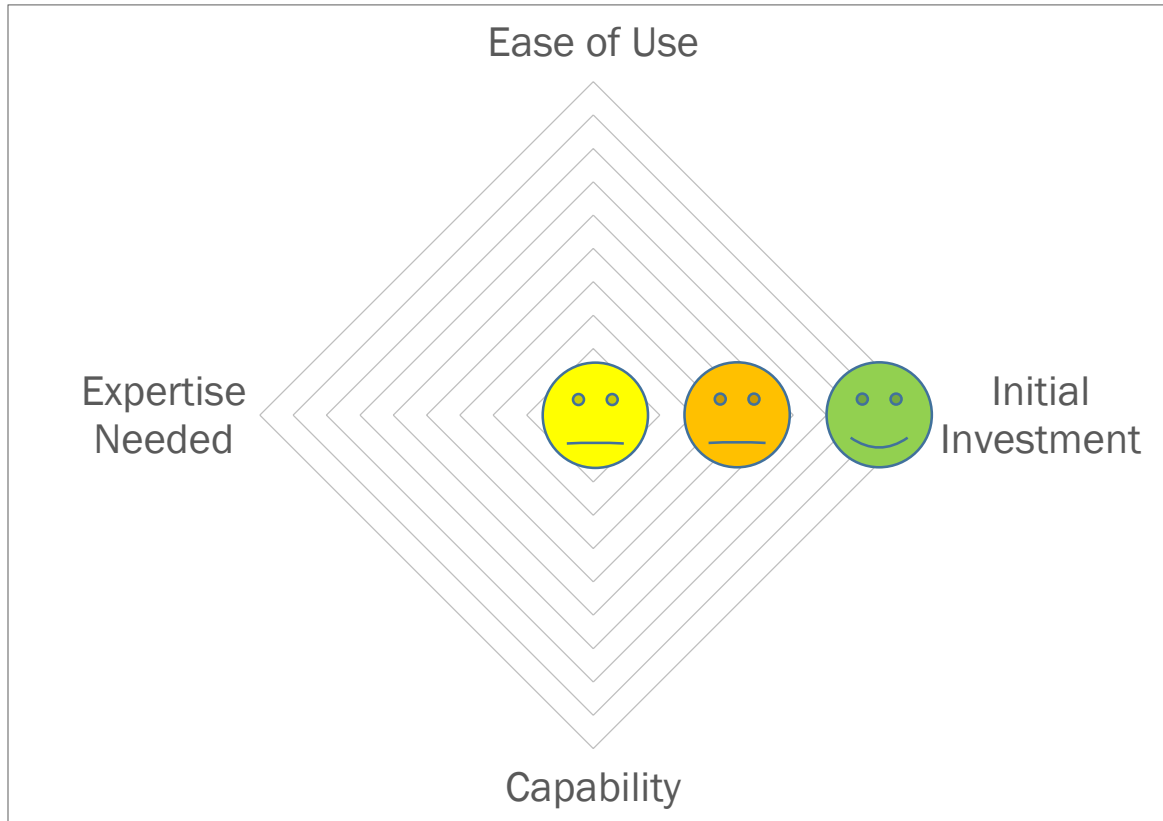
2D VISION



FLEXIBLE FEEDING

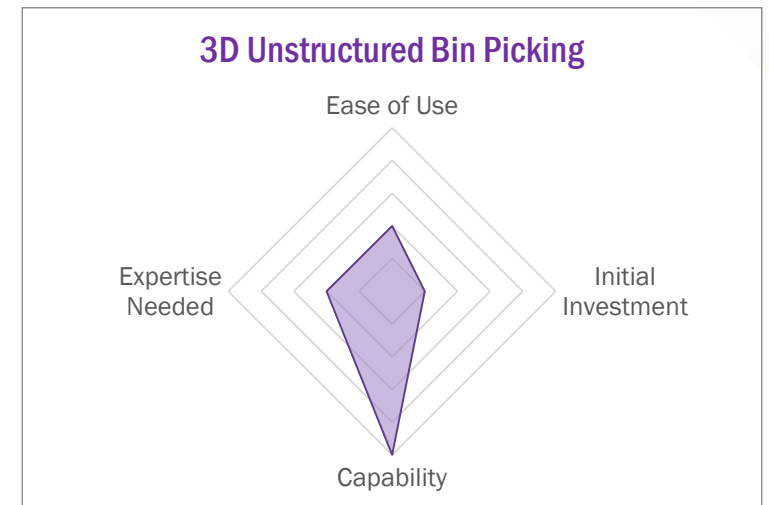
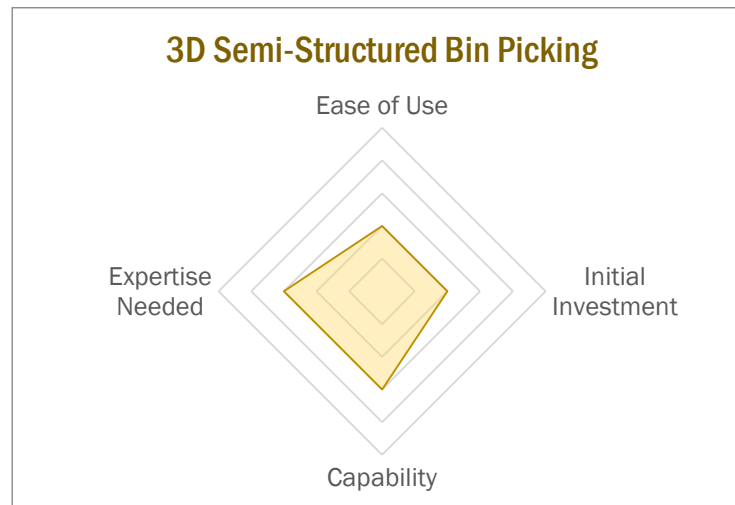
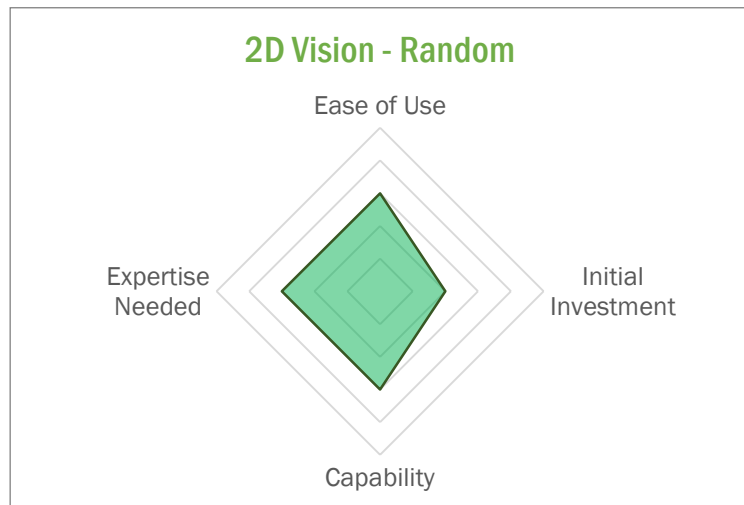
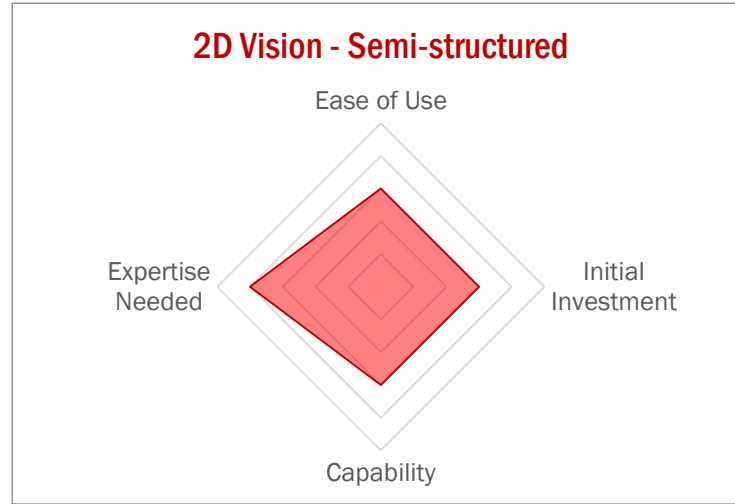
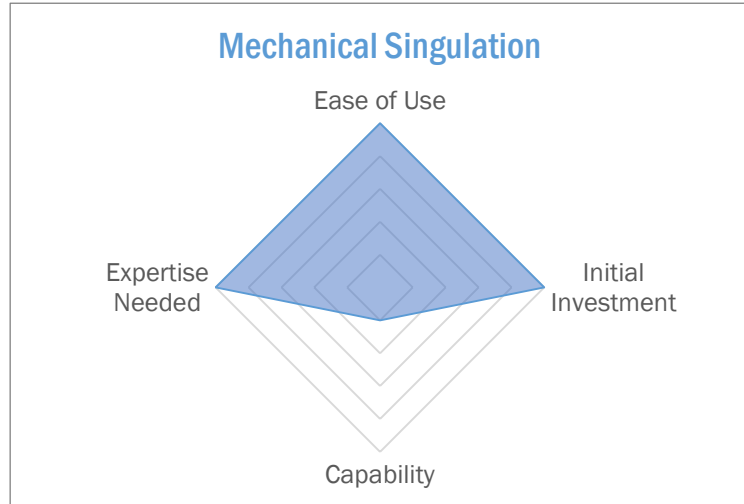
- Major part of discrete manufacturing automation, especially robotics
- Considerable time, effort, and money is dedicated to this!
- Bin picking is one of several ways to handle this

AT A GLANCE



Radar graphs on following page – outer rim is “better”

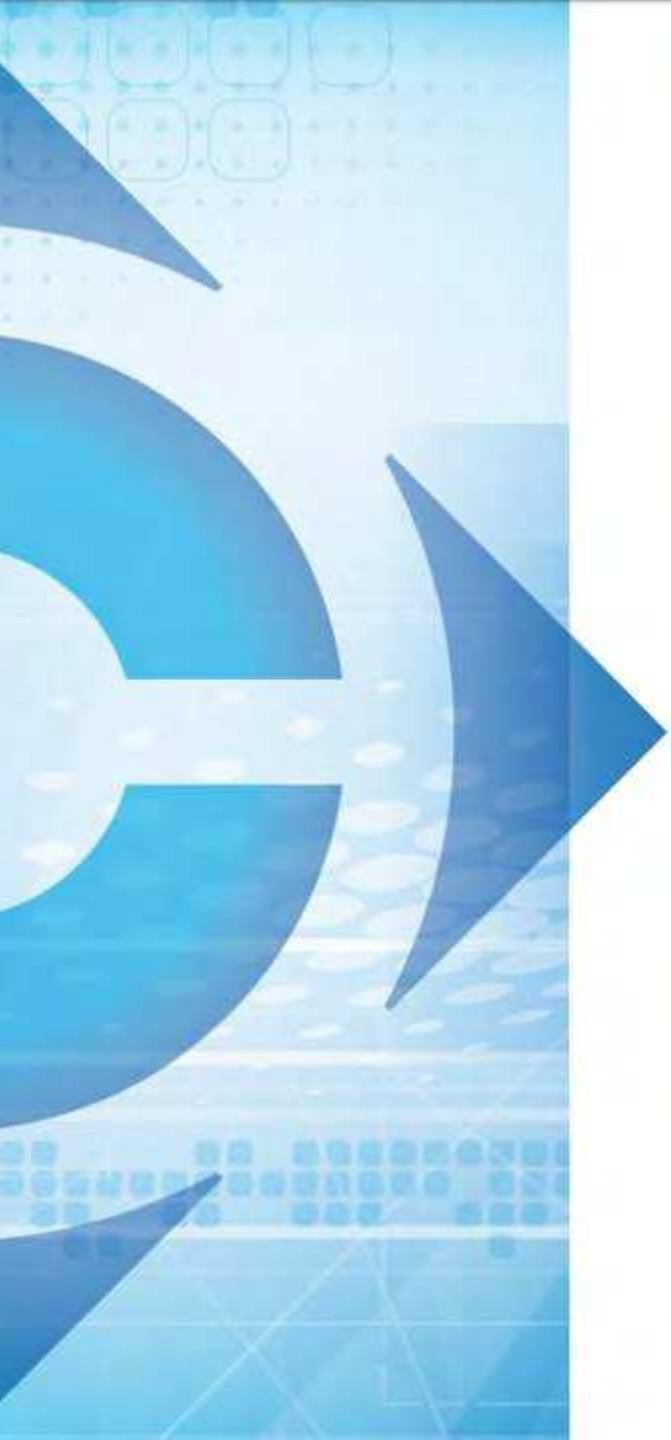
ATA GLANCE



WHAT IS DIFFICULT ABOUT IT?

Almost Unlimited Variability

- No specific DOF is predictable
- Part approach can be obscured by other parts
- Need to account for collision between EOAT and bin
- Cannot fully predict robot pose requirements
- etc. etc.



RETURN ON INVESTMENT

How does our Bin Picking platform provide it?

ROI ELEMENTS

Labor Cost

- Avg. burden rate is \$22-\$25/hr for an operator
- Turnover, onboarding, training, etc. all increase the burden rate for a single position on your floor

Labor cost is the #1 metric used when evaluating ROI on a robotic system

ROI ELEMENTS

Throughput

- Scales well with increasing volumes
- Absolute minimum operator attention required
- Especially for high-value parts

**Even if cycle time is initially slower than human operator,
the robotic system quickly completes more cycles**

ROI ELEMENTS

Flexibility

- A single system with a robot can handle multiple parts and processes
 - Mechanical fixturing or feeding cannot do this
 - 2D Vision can heavily depend on part symmetry
- Enables automation where previously a single system would not be sufficient
- No need to incorporate non-value-add touches for pre-orienting parts

ROI scales rapidly when a single system can be deployed to multiple processes

ROI ELEMENTS

Changeover

- Dictionary option - All possible part orientations are stored for fast part matching
- Minimizes changeover time by eliminating need for part-specific fixturing

Less Changeover = More Production Time

ROI ELEMENTS

No New (Re)Tooling

- May be able to use existing dunnage/part containers
- Eliminates need for new part presentation process
 - If existing bins are unsuitable, new bins are most likely cheaper than full fixturing

If the system is deployed to new process later, those parts do not need their own presentation method

ROI ELEMENTS

Retrofit

- Directly replace non-value add manual processes
- Can “bolt on” to existing process without need for extensive overhaul
- Collaborative Robot mitigates the need for physical guarding in most applications

Retrofits cost less and deploy faster than a full machine build

ROI ELEMENTS

Value Add

- Reallocate people to less repetitive and higher-value tasks
- Picking parts out of a bin
 - Is extremely dull work
 - Rarely adds value

Automating these processes allows people to do work where they add the most value

TOP 5 REASONS TO BIN PICK

1. When part presentation cannot be changed upstream
2. When flexibility is more important than cycle time
 - Can afford 1-4 seconds for camera to establish next pick
 - Can be done in parallel with robot movement as long as robot arm is not in camera FOV
3. High part volumes
4. When multiple SKUs are run through the same station
 - Bowl feeders/manual singulation would get expensive and require more changeover time
5. High-value parts

BIN PICKING SWEET SPOTS

PROCESSES

Collaborative Robot Applications

- Ideal camera cycle times align with CoBot cycle times
- Typically no guarding required
- Programming is MUCH easier
- Translates well from human part recognition and pickup

BIN PICKING SWEET SPOTS

PROCESSES

High Volume with Mixed Product (3+ SKUs)

- Part presentation cost is much lower than mechanical feeding
- High volume = faster ROI
 - Robot allows greater throughput via consistency
 - Repetitive high-volume tasks present greater risk of injury
 - People don't want to do dull tasks

BIN PICKING SWEET SPOTS

PROCESSES

Kitting

- Multiple bin recognition
- Bin picking becomes an attractive option very quickly
- Only one camera snapshot to capture all three bins



BIN PICKING SWEET SPOTS

PROCESSES

High-Value Product

- (More likely would be “pile” picking)
- ROI increases / Break-even decreases rapidly with throughput
- Burden rate of the picking process likely high enough to justify sophisticated automation
- Automation: ↓ Variability | ↑ Quality | ↓ Waste

BIN PICKING SWEET SPOTS

INDUSTRIES

Medical Device Manufacturing

- High-value products
- Tends to be mostly manual processes with lots of semi- or unstructured presentation
- **Bonus:** Data logging and traceability

BIN PICKING SWEET SPOTS

INDUSTRIES

Plastics

- Lots and lots of unstructured parts
- Extruders cannot be stopped
- Injection molding often outfeeds onto flat conveyor or bin
- Overmolding processes generally present parts from bins
- Environment leads to high turnover, especially for packaging and mold tending

BIN PICKING SWEET SPOTS

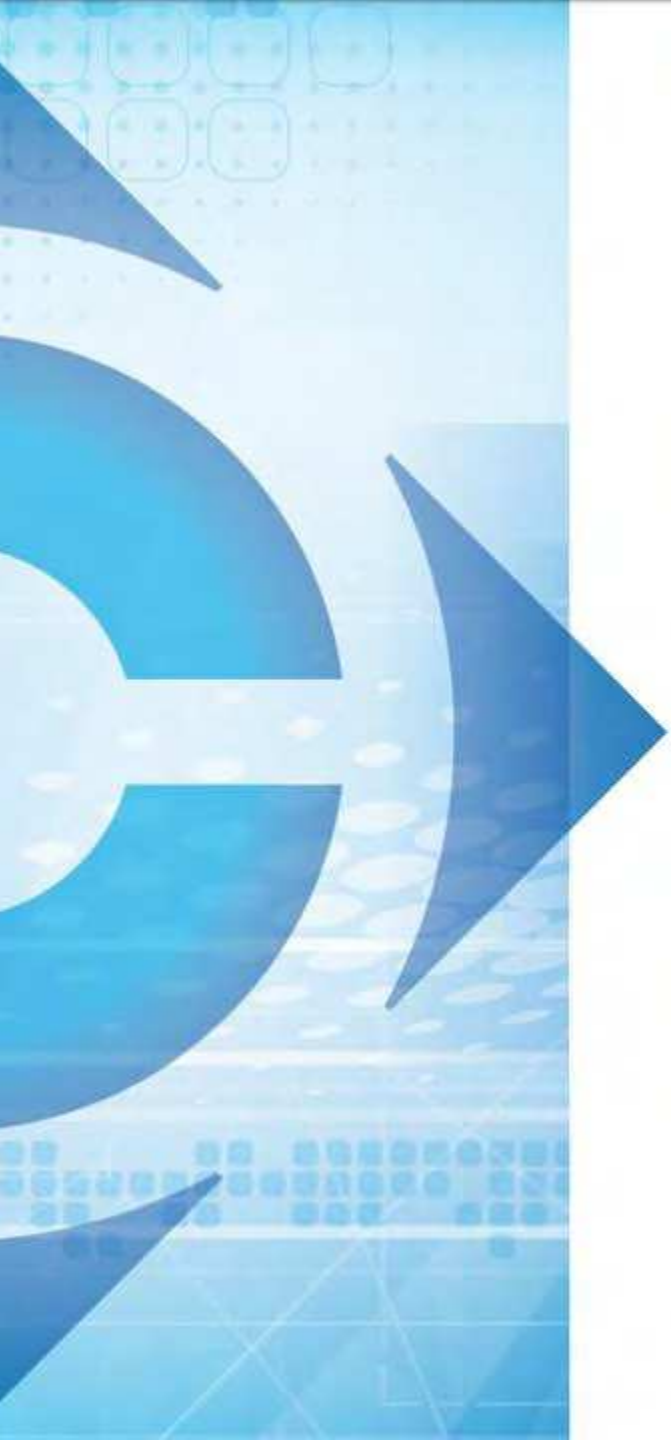
INDUSTRIES

Automotive/Tier 1

- High Volume
- High Value
- High Mix
- Have well-defined and tracked processes

BIN PICKING “SOUR” SPOTS

- Cheapest automation solution is desired
- Fast cycle times - <~4 seconds
 - Application-dependent
 - Part complexity, lighting, etc. are all factors
- Parts partially oriented upstream
 - 2D Vision may be sufficient
 - Multi-layered semi-structured bin is always an option
- Small batch sizes
- Easily entangled parts



OUR SOLUTION

CrossRobotics Bin Picking Platform

THE C RP- BP SERIES

- Turnkey Camera and Robot system
- Collaborative Robot with 3/5/10kg payload capacities
- 3D Camera and Control PC
- Mobile platform
- Includes onsite installation, startup, and training

C O L L A B O R A T I V E R O B O T

- 3/5/10kg payloads
- 500mm/850mm/1300mm reach
- No guarding required for most applications
 - Pick & Place and Machine Tending are typically not very hazardous

CAMERA UNIT

- The “Cadillac” of 3D camera units
- Can handle parts most other cameras cannot
 - Thin parts
 - Slender parts
 - Shiny parts
 - Matte black parts
- Consecutive picks (faster cycle times)
- Multiple Part Recognition

WHY DO THEY WORK SO WELL TOGETHER?

Flexibility	The overall system is more like a tool to be used rather than a dedicated workcell
Retrofit	No guarding = easier retrofit. The solution is closer to how a person would carry out the process.
Cycle Time	Typical “comfortable” cycle times of camera and CoBot are very close



4 THINGS TO KNOW BEFORE EVALUATING BIN PICKING

Parts

How can they be gripped?

Process

How much do they weigh?

Constraints

How many SKUs in production?

Environment

% Volume of each SKU?

Overall dimensions?

Material? Color? Surface Finish?

Easily entangled?

Feature Resolution?



4 THINGS TO KNOW BEFORE EVALUATING BIN PICKING

Parts

How are the parts produced upstream?

Process

Dimensions of existing dunnage?

Constraints

What needs to happen immediately after parts are picked up?

Environment

How often are operators available to replenish parts?



4 THINGS TO KNOW BEFORE EVALUATING BIN PICKING

Parts

Maximum cycle time?

Process

Desired payback period?

Constraints

Internal safety requirements?

Environment

Budget? Cost of doing nothing?

Burden rate on labor?

Part consumption rate? Upstream
production rate?



4 THINGS TO KNOW BEFORE EVALUATING BIN PICKING

Parts

Available floor space?

Process

Available vertical height?

Constraints

Clean? Dirty? Debris? Dusty? Wet?

Environment

Ambient Light conditions?

Highly trafficked area?

KEY TAKEAWAYS

Bin Picking is **not an easy or cheap solution**. If you can manage bowl feeding or 2D vision... you should!

Bin Picking is most cost-effective when **3+ SKUs** are processed by the same robot and/or **parts cannot be staged upstream**.

The **CrossRobotics Bin Picking Platform** is a tool that can **directly replace manual picking** from a bin – **when and where you need it**.

Regardless of which part presentation option you choose,
CrossRobotics can help!

THANK YOU

Let's see the system in action

(and take any remaining questions)

Our Technology Partners



UNIVERSAL ROBOTS



Canon
SEE IMPOSSIBLE

SCHUNK 