MANTEC

Ensuring Automation Success

ONExia Inc
Excellence in Automation

Introductions

Greg Selke: CEO
Andrew Cook: VP Engineering
Jonathan Lewis: Senior Sales Engineer

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Who is ONExia?

- Located in Exton, Pennsylvania
- 32 Years in High Technology Distribution
- 28 Years in Custom Machine Building and Integration

AHTD THE SOURCE FOR AUTOMATION SOLUTIONS

csia control system integrators association

mcma Motion Control & Motor Association

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Greg Selke

Topics for This Morning

- Reasons to Automate
- Characteristics of a Successful Automation Project
- Case Studies of ONExia Past Projects
- Collaborative Robots
- Questions

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Why Automate?

- Improve Quality
- Improve Throughput
- Eliminate Ergonomic Injuries
- Improve Safety
- Reduce Costs
- The Process Cannot be Done Manually
- Can the process or application accommodate Automation?
- Will the upstream and downstream processes be affected with the Automation implemented?

What makes an automation project successful?

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Choose the Right Automation Partner

- Does your company have the experience to develop the automation in house?
- Does your company have the time and resources to make the project a success?
- How do you choose the right partner?

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Choosing the Right Automation Partner Can Lead to Automation Success

- What level of experience do they have?
- At ONExia, it is truly a collaborative experience
  - You are very knowledgeable about your process and product
  - ONExia has a high level of expertise when it comes to Motion Control, Robotics and Machinery Automation
- Get your Partner involved early on in a project, as we typically offer Automation Suggestions based on our Extensive Experience
- ONExia is frequently considered an Extension of our Customer's Engineering Department

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Automation Success Characteristics

- Defining a Clear Objective
- Pursuing a Feasible Concept
- Control the Process Variables
- Keep the Scope of the Project Clear and Controlled
- Specify the Proper Components for the Machine
- Skilled Personnel
- Keep it Simple
- Pay Attention to Details
- Collaboration through Communication
- Collaboration with End Users
- Well Structured Software
- Sufficient Time / Parts for Testing
- Complete Final Documentation
- Training
- Support
- End User Ownership
- **These Characteristics ensure a Successful Automation Project**

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ONExia's Machine Design Process

- **Initial Concept / Budget**
  - Specification Development
  - Proposal Development
- **Order Received**
- **Kick-Off Meeting**
  - Introduction
  - Review
  - Inspection
  - Schedule
  - Acceptance Criteria
  - Technical Review
  - Samples
- **End Result**

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Machine Design Process

- **Design**
  - Prototype Review
  - Preliminary Design Review
- **Design Completion**
- **Design Review**
- **Machine Assembly**
- **Machine Testing**
- **Acceptance**
- **Shipment**
- **Additional Services**
  - Installation
  - Startup
  - Training Services
  - Field Service
  - Maintenance

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ONExia Case Studies

28 Years of Custom Machine Building and Integration

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Part Assembly

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Reasons for Success

- Identify And Prototype Potential Risk Areas
- Software Approach – State Logic
- Collaborate With The Client And End User About Their Existing Process And Its Strengths and Weaknesses
- Met The Project Throughput Objective Handling a Variety of SKUs

Precision Assembly

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Reasons for Success

- Proper Component Selection:
  - Precision Positioning Stages
  - High Resolution Cameras
- Experienced Engineers understood the challenges of Designing to meet the precision requirements
- Extensive Testing with Customer Supplied Parts to ensure success with varying parts
- Met the Project Objectives of Schedule, Precision, Simplicity and Reliability overseas

Plastic Parts Assembly

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Reasons for Success

- Proper Component Selection:
  - Servo Motors To Collect The Parts To Identify Missing Parts
- A Strong Concept That Kept The Number Of Parts To A Minimum
- Keep Control Of The Products Once Obtained
- Met The Project Objectives Of Improving Quality And Cost Savings Through A Reduction In Labor

Component Inspection, Marking and Packaging

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Reasons for Success

- A Strong Concept That Was Expandable To Meet The Variety of Products with Minimal Changeover
- Attention to Detail That Considered The Variety Of Parts Through Every Stage Of Design
- Close Collaboration With The Customer's Design Team To Improve Reliability
- Met The Goals Of The Project's Schedule, Robustness For Overseas Startup, Flexible Design To Handle A Variety Of Parts

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Collaborative Robots

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Collaborative Robots

- A collaborative robot is one designed to work side by side with humans.
- A smart collaborative robot is one designed to work side by side with humans and which exhibits a degree of “artificial intelligence”.

CHALLENGES FACING MANUFACTURERS TODAY

Labor shortage

Rising labor cost

Manufacturing agility

- Short life cycles
- Fast ramp to volume
- Manufacture near customers

Existing automation solutions can be expensive and inflexible

Low cost labor models have run their course

Difficulty **finding** and **retaining** skilled (and unskilled) laborers

Manufacturers seek agility

Short runs, time to volume, build local

INDUSTRIAL ROBOTS

Caged

Expensive

Fixed

SMART COLLABORATIVE ROBOTS

Our customers are building factories of the future, today

Our smart, collaborative robots adapt to real-world variability, are agile enough to change applications quickly, and perform tasks like humans do

We've created this new category of robots for the 95% of tasks that couldn't be economically or practically automated before

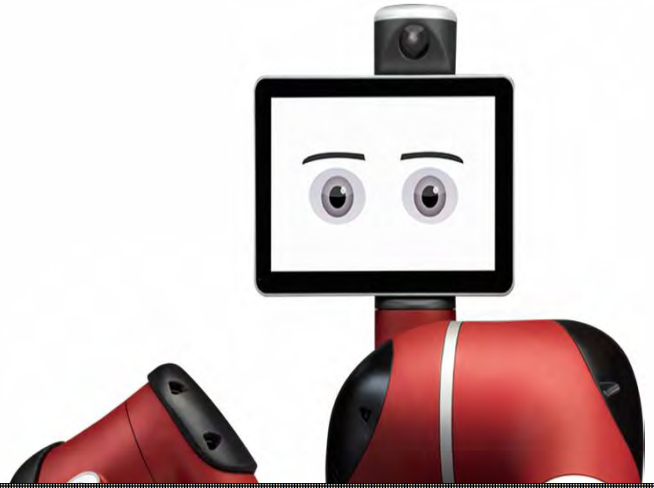
BASIC **COLLABORATIVE** ROBOTS

Safer

Rapid ROI

Small Footprint

rethink robotics



SMART COLLABORATIVE ROBOTS

Safer

Rapid ROI

Small Footprint

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SAFETY STRATEGY

ISO 10218/R15.06

Takes the robot out of the cage!

Describes 4 Categories for Collaborative Robot

- Safety-Rated Monitored Stop
- Hand Guiding
- Speed and Separation Monitoring
- **Power and Force Limiting**

ISO/TS15066

New Collaborative Robot Standard

- Robot that is purposefully designed to work in direct cooperation with people
- Defines criteria for **Risk Assessment**

Power and Force Limited

Defined under ISO 10218/R15.06

- Our ‘inherent safety’ strategy flows from this categorization

Risk Assessment

A Risk Assessment must be performed when work cell is set up

- The robot is a partially complete piece of machinery
- End effector and parts are considered

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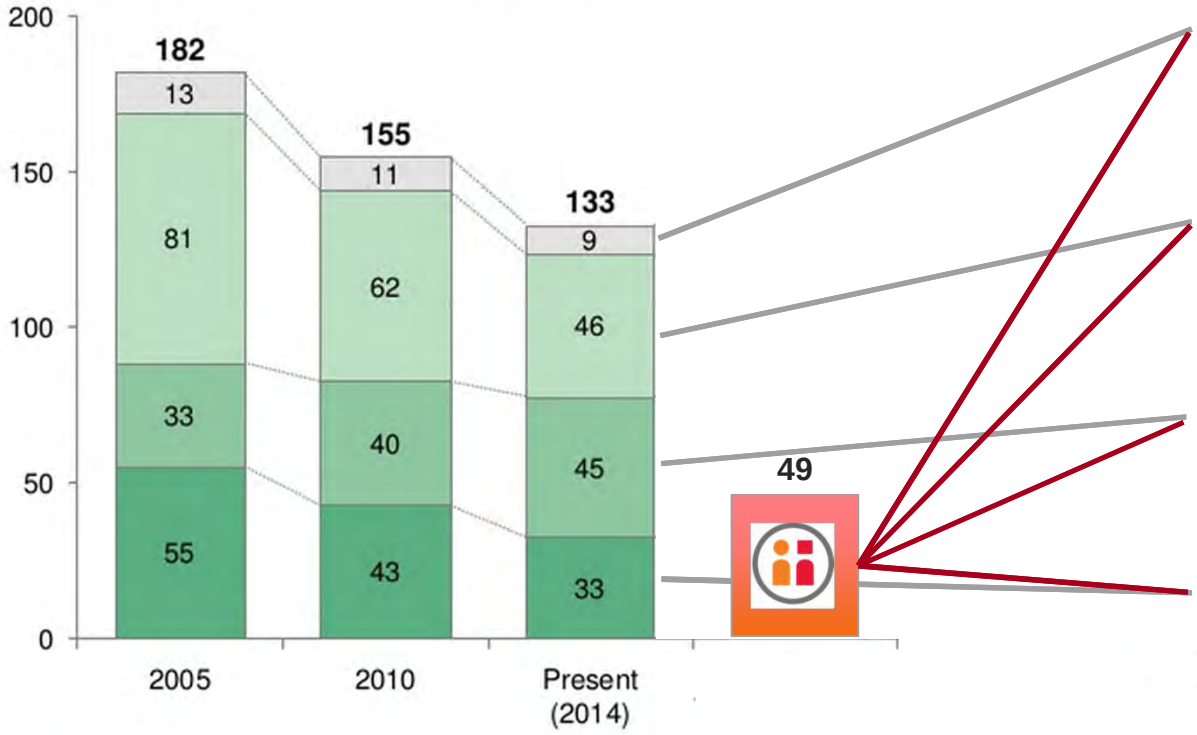
Advanced industrial robots are increasing in performance while costs continue to fall steadily

Example of total industrial robot system costs ($USD, thousands)



Future costs trends

Project management
Has consistently been ~5%–10% of total system costs; absolute cost decline expected

Systems engineering (e.g., programming, installation)
Gains from offline programming mostly obtained; decrease expected to slow given the minimum cost of installation

Peripherals (e.g., safety barriers/systems, sensors)
Will see additional drop due to removal of safety barriers

Robot (includes software)
Minimal declines expected given pricing is close to material cost for high-purchase-volume automotive industry

Meanwhile, robot performance is increasing at an estimated 5% per year[1]

[1]Average quality adjustment from 1990-2004 was ~5% on top of price change.
Note: Example costs are for a spot welder (largest current application) in the US automotive industry, numbers in nominal dollars.
Sources: ABB "Economic Justification for Industrial Robotic Systems" (2007), IFR "World Robotics-Industrial Robots 2013," expert interviews, BCG analysis

THE BOSTON CONSULTING GROUP

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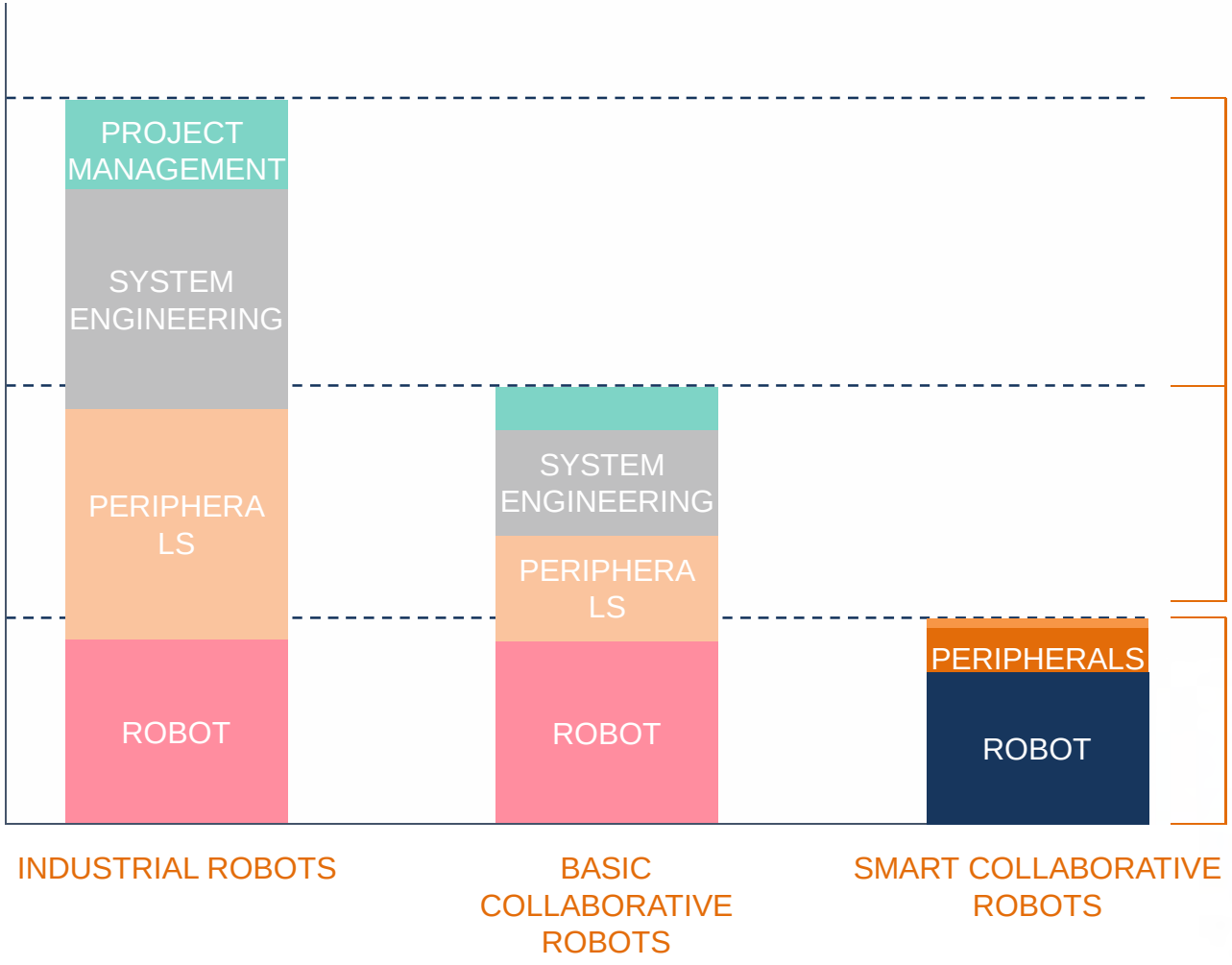
TOTAL INVESTMENT

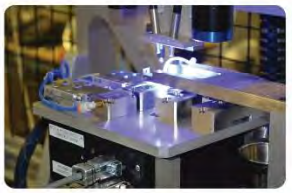


ROI

6-8 Months

2-4x

LOWER COST



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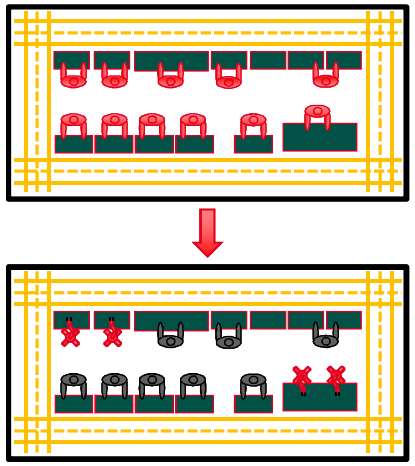
CUSTOMER RETURN ON INVESTMENT IN UNDER A YEAR

	List Price
Robot	$29,000
End effector)	$1,750
Pedestal	$3,500
3-Year warranty & software subscription	$7,000
Total	$41,250
Services	$5k-$10k



SMB customer economics

1 direct labor per shift x 2 shifts = $60,000/yr ($30,000/operator/shift)

ROI = 8-9 months

Large customer economics – Contract Mfr in Mexico

4 robots per line, redirecting 3 direct labor operators per shift

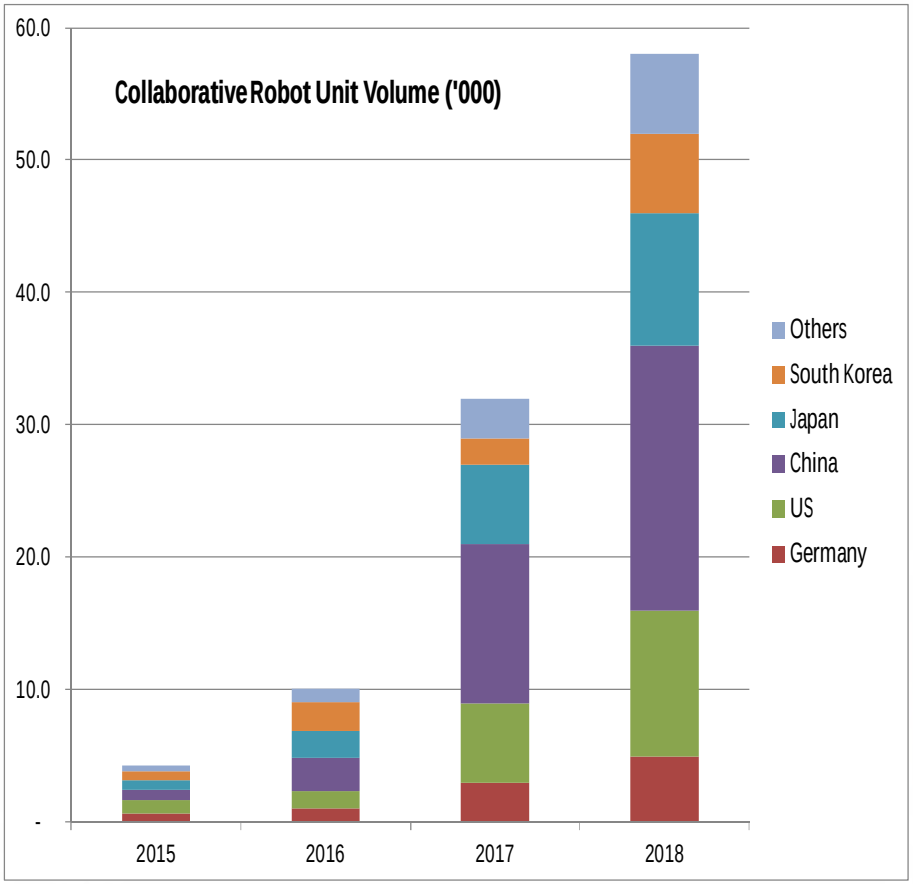
1,000 robots instead of 2,250 workers (750 workers x 3 shifts)

At $1,100 /worker/shift/month in Mexico = $29.7M annual labor savings and an 18-month ROI

In the US; ~3x labor costs; 6 month ROI

Collaborative robot market

Dramatic Market Expansion



Source: Barclays

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A NEW CATEGORY: SMART COLLABORATIVE ROBOTS

rethink robotics

Smart. Simple. Fast. Affordable.

- Software + Sensing = Intelligence
- Simple, ubiquitous, manual tasks
- Fast deployment and change-over
- Payback in a year
- Safe around people

Large Manufacturers

GE, GENCO, FLEXTRONICS, Steelcase, TRANE, Nypro, Continental, TESLA, Apple

Small & Medium Enterprise

STENNER PUMPS, Vanguard Plastics Corporation, CLAYTON KENDRICK INCORPORATED, KING INNOVATION, Schneider Electric, THE RODON GROUP, KAISER PERMANENTE, PRAXIS Packaging Solutions, PANDUIT, Medtronic

Research & Education

MIT, Carnegie Mellon University, 東京大学 THE UNIVERSITY OF TOKYO, CPE

Collaborative Robots

Adapt to Variability

- Force based behaviours
- Machine vision
- Compliance allows arm to flex when necessary

Change Applications Quickly

- Robot Positioning System
- Train by Demonstration
- Intera allows easy integration with existing automation equipment

Work Like People Do

- Work with current fixturing
- Often no need to change the way parts are presented or handed off
- Share workspace with people

Packaging

PCB Handling

Line Loading

CNC Tending

Metal Fabrication

Molding Operations

Test & Inspection

Sawyer™

Thank-you For Attending Our Presentation!

We will be available at the ONExia display in the main room.

Questions?

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