Company Overview

Victor Trotter
Overview

- Our Mission
- Some details on our company
- Project Examples
- Resources
Mission

Our mission is to develop and deploy systems having a high level of integration in order to maximize performance and reliability while minimizing system maintenance, cost, and overall risk to our customers.

We will strive to strategically partner with companies that compliment Trotter Controls to both company's mutual benefit. Target partners include sales organizations and OEM equipment builders who can design our highly integrated products into their ongoing product lines.
Company Overview

- Formed in 2004 from employees that had worked together for 10+ years in the automation & robotics industry
- Key technical assets with a common goal of excellence were added to the team as needed
- Development of highly integrated systems for OEM and other target users is our focus
- Infrastructure, process control, and quality have been major areas of focus for the company
- Partnered with a national sales organization for custom automation and assembly sales
Company Focus

- Development of high value products for our customers
- We provide turnkey embedded circuit board level products for OEM's and system integrators
- We provide turnkey control systems and automation work-cells
- We design and support systems for the aerospace, electronic, and industrial markets
Company Growth

Trotter Controls Annual Revenue

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual Revenue</th>
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<tbody>
<tr>
<td>2004*</td>
<td>$-</td>
</tr>
<tr>
<td>2005</td>
<td>$500,000</td>
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<tr>
<td>2006</td>
<td>$1,000,000</td>
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<tr>
<td>2007**</td>
<td>$2,000,000</td>
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Areas of Expertise

- Systems engineering
- Systems reliability per 1309 airworthiness standards
  - Fault tree and reliability analysis per NASA and FAA guidelines
  - Functional hazard assessment techniques
- High end robotics applications
- Vision guidance and inspection
- Embedded controls hardware and software development
- Circuit board design and layout
- In-house prototype SMT capability
- PC based controls and software
- Programmable logic controls and industrial controls design to NFPA 79
- Hydraulics servo systems and pneumatics control
- 3D modeling of mechanical components and systems
- Animation of systems and turnkey video creation
- Full audio and video production capability
- Web site development expertise
- Safety systems and advanced process control
- Experience attained on over 300+ automation controls over a twenty year period
- Highly qualified production team
- Training and support for the systems and equipment we supply

Trotter Controls has a proven track record on technically challenging projects over the last 3 years. Our people have a proven track record for 20+ years.
Robotic Assembly Deployment Experience

11 Axis Precision Dispensing Cell

Cell Phone Assembly Line

Laser Soldering

2004 2005
Project Example

- Automatic laser soldering work-cell
- Designed and built for a large automotive OEM
- In production 24/7 since October 2007 with no service calls required
- Trotter Controls provided the turnkey solution including documentation, training, and installation in 16 weeks
Process Control

- Precise control required
- Recognition of the circuit location
- Robot position within 0.003”
- Laser wattage controlled real time
- Precise control of the amount of solder dispensed
- Laser compliant safety systems and guarding
Application Example
Pick, Place, and Solder Randomly Oriented Components
Solder arrays of circuits
Application Example
Fire Retardant Dispersal System

- Computer control of bomb doors to maintain constant flow rate
- Hardware and software design and qualification to meet FAA guidelines

Over 80 systems in service since 1991
Trotter Controls provides turnkey design, manufacturing, training, and world wide support for this system
Technology
Second Generation System

- Increase reliability
- Provide real time monitoring of wiring faults
- Provide triple redundancy
- Reduce overall size and weight
- Provide a plug and play solution for operators
Project Goals

- Create a simple, reliable system that can withstand humidity and vibration environment with little or no maintenance
- Reduce hydraulics and controls cost
- Provide built in “self test” so ANY problem with wiring or valves is reported to mechanics & pilots during automatic “self test” mode
- Provide pilot with “real time” feedback on readiness of system
- Incorporate “Auto Salvo” function into design with secondary components
- Replaces the current FRDS system
New System Overview

- Hydraulics redesigned
  - No servo valve or servo card
  - Only two valve types used (dirt tolerant valves)
  - Redesigned dual pump head package
  - Identical manifold for AT1002F or AT802F
  - Higher reliability on controls & lower cost

- Redesign of the system for reliability
  - Pilot interface & PLC consolidated into small “radio” package
  - Relay box to allow electro-mechanical only operation
  - SEALED connectors used throughout. “Environmental” series MS connectors or IP68 rated connectors used.
Embedded Products

- Design of embedded products to meet a specific need
- Hardware and software solutions are developed and deployed
- High performance due to very specific design criteria per application

Reduce installation and maintenance complexity
Size reduction
Lower installed cost
Improve reliability
Our Recipe for Success

- Development of the requirements dictated by the application
- Agreement on requirements
- Development of detailed task lists based on requirements and investigation of applicable technology
- Management of resources to meet requirements
- Constant communication between mechanical, electrical, and software disciplines during the design phase
- Documentation to NFPA 79 standards to production
- Constant communication between engineering and production during the build phases of the project.
- Rigorous testing on prototype and production systems
- Documentation of engineering and process related items via engineering reports and process specifications maintained for all projects
Summary

- Trotter Controls is well qualified to provide complex control and turnkey process solutions
- Our designs are based on a systems multi-disciplinary approach to automation
- Safety, maintainability, and ease of operation are paramount in our designs

*Provides the required reliability and serviceability*