GODDARD
PRODUCT DEVELOPMENT

CASE STUDY

Goddard ACE: How Advanced Collaborative Engineering Brought a Warehouse Automation Project Over the Finish Line

Overview

Service

Goddard ACE (Advanced Collaborative Engineering)

Project

Automated Workstation for Warehouses

Discipline

Warehouse & Industrial Automation

Teams

Mechanical Engineering, Electrical Engineering, Controls Engineering

Systems Expertise

SolidWorks, AutoCAD, Rockwell Studio 5000, Siemens TIA Portal, Machining, Sheet Metal, Welding, Network Engineering/Architecture

Introduction

Goddard Product Development, a bi-coastal product development consultancy, was hired by a large, global company building automated systems for their warehouses. When an engineer on their team left suddenly, they needed to move forward without any delays. They chose the Goddard Advanced Collaborative Engineering (ACE) program which embeds Goddard engineers directly into a client project.

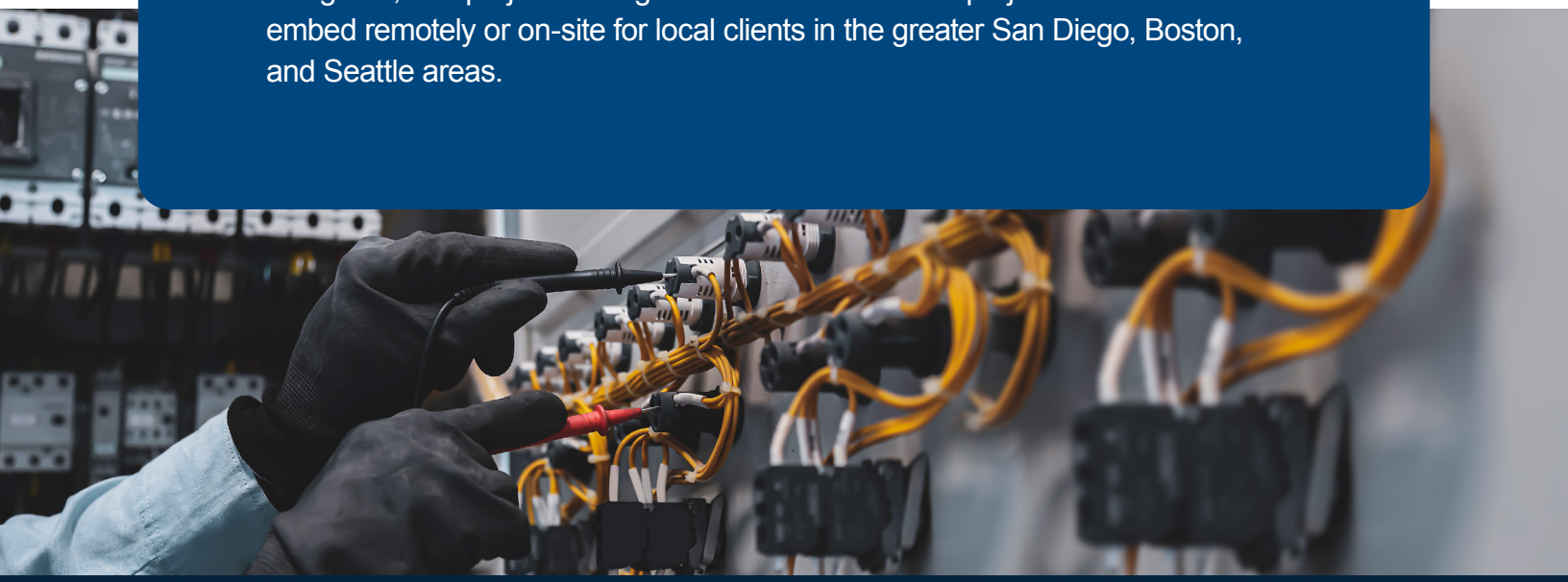
The company selected Goddard for its proven experience in the warehouse and industrial automation field. The project involved creating a fully automated workstation, or work cell, that sorts filled packages by destination. The system reads the barcode, and a robotic arm picks and places the packages into one of four bins. The work cell itself runs 20 hours a day with scheduled downtime.

Goddard was responsible for the conveyor subassembly of the work cell, where packages enter to be picked up by the robot. Mechanical engineers were tasked with determining the dimensions, strength, and weight capacity of the conveyor belts. Electrical engineers worked on the Variable Frequency Drive (VFD), which controls the belt's operation and speed. They ensured the VFD's sizing and ratings were correct and the connections were properly rated.

Goddard's mechanical, electrical, and core engineers assimilated into the team as the project transitioned from the client's alpha phase to the beta phase. This transition meant the work cell had already gone through proof of concept and early design, and it was time for sizable design and workflow changes.

Goddard ACE: Advanced Collaborative Engineering

Embed Goddard's expertise to reduce risk and accelerate productivity. Goddard has a robust staff of multi-disciplinary, dedicated engineers, designers, and project managers to embed on client's projects. Staff can embed remotely or on-site for local clients in the greater San Diego, Boston, and Seattle areas.



The Project

Goddard ACE embedded onsite with the client in 2023. As the work cell was already an existing project, Goddard integrated seamlessly, with the expectation that they would meet all the set production milestones.

Mechanical Engineering

Goddard's mechanical engineers took the alpha-level product and applied manufacturing, assembly, processing, serviceability, and design inputs to improve and create a production-ready system. Starting with the client's alpha proof of concept, they spent a year developing a work cell that could be fully assembled, serviced, and manufactured. They started with a list of changes and starting points from the client and continued the iterative process of making improvements and testing based on client feedback. Additionally, the client introduced new requirements throughout the process, which were incorporated into the design.

The mechanical engineering team brought expertise in Design for X ("DfX"), prototyping, and testing. In addition to creating the design itself in SolidWorks®, they also optimized it for manufacturability and assembly. Product development doesn't stop at meeting requirements; the product must also be physically manufacturable and buildable. The Goddard team achieved this through Geometric Dimensioning & Tolerancing (GD&T), applying positioning and tolerances to ensure that parts created and sourced from different places fit together correctly, function effectively, and meet all requirements. After applying DfX principles, Goddard's mechanical engineers moved into prototyping and testing by ordering samples, going on-site, installing new parts, and ensuring that everything functioned as designed.

Electrical & Controls Engineering

Electrical and controls engineers from Goddard worked on the computer system that ran the work cell, the programmable logic controller (PLC). When Goddard joined the project, the client switched to a new PLC. As a result, all the existing code needed to be updated in a new language, and the electrical cabinets needed to be redesigned. The team took on both tasks. The work cell is a complex automated system with two electrical cabinets and multiple components. The team created and updated schematics for the cabinets, maintained awareness of any changes made by the mechanical engineers, and ensured that those changes did not affect the wiring. The controls engineers updated the PLC code, incorporating features, workflow, and safety changes. Additionally, the team oversaw measurements and power budgets to inform the component selection done by the mechanical engineering team.

Safety, standards, and best practices are crucial for the workflow. The electrical engineers worked closely with the client's safety team to interpret and translate safety specifications, including functional safety and preparing protections for human use. They also oversaw electrical standards and best practices, ensuring that all the components used in the system were correctly certified and rated.[1]

What Did We Learn?

A crucial part of integrating a team into an existing project is communication and alignment. Here are a few lessons Goddard learned from our time with this partner:

Revision Processes

The customer revision process functioned differently from Goddard's standard revision processes. The customer's process, which included Engineering Change Orders (ECOs), was slower than the Goddard engineers expected, affecting project deliverables and timelines. The team adjusted for this by creating more internal reviews with the client along the way, avoiding large, time-consuming reviews at the end of the development process. They created smaller engineering change orders that moved faster with fewer reviewers to streamline the process and factored in new review time amounts into future plans.

Documentation

The customer did not have a traditional "requirements document" that Goddard typically creates in their product development processes. In the absence of hard requirements, Goddard found that there could be a disconnect between our understanding and the client's expectations. For example, if they said, "We want the conveyor belt to be stronger," it's unclear what that means to them. The customer provided their initial vision for the product at the start of the project, but this vision evolved through real-world testing and learning.

To meet this challenge, the Goddard engineers created a document outlining their understanding of a problem, detailing their solution, and confirming its accuracy and alignment with the client's expectations. This approach established clearer, firmer requirements upfront. We learned that investing more time upfront allows for more agile progress and less redesign later. It also required ensuring that all information received from internal client resources was accurate.

Conclusion

After a little over a year, the product went from a proof-of-concept design to a fully automated workstation. It is currently leaving the client's beta phase, with final design submission and evaluation beginning. 20 – 30 work cells will be installed on site next year. If those work cells are effective, they will move to wider production. The benefit to the client will be nearly immeasurable in the work cell's ability to expedite workflow and improve productivity and efficiency while maintaining a safe work environment. How can Goddard ACE benefit your project?

Sources and Citations

[1] Certifications include but are not limited to OSHA's NRTL, TUV, UL, and CSA.

Let’s Build Something Great. Talk to Our Team.

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