



DESIGN STUDY AND RAPID PROTOTYPING PROVES KEY TO LOCUS ROBOTICS' SUCCESS

With the world turning to online retailers more than ever before, warehouse operators are leaning on automated solutions to keep up with the skyrocketing demand. In fact, warehouse automation has experienced nearly double-digit growth among retailers due to the explosion of e-commerce fueled by the pandemic.

Locus Robotics is working fast and furious to help warehouse operators adapt to this new reality, which has accelerated due to staffing shortages. Based in Wilmington, Massachusetts, Locus Robotics makes autonomous mobile robots (AMRs) that support human labor in the warehouse fulfillment and e-commerce industries.

Founded in 2014, Locus Robotics brings a strong heritage and in-depth, firsthand experience in the development and evolution of warehouse automation. In fact, the company's founders were early adopters of leveraging robotics technology to improve warehouse productivity. It helped them quickly discover what robots were capable of ... and what they were not. This realization inspired Locus Robotics to engineer something better.

As a result, Locus Robotics built a complete end-to-end system designed to meet modern needs for e-commerce fulfillment. Locus Robotics' innovative AMRs make it easy to optimize warehouse operations and respond to e-commerce volume growth and seasonal peaks while giving warehouse operators more control over their labor costs.

The company's robots operate safely alongside people, making them more efficient and effective than traditional order fulfillment systems. Workers are able to fulfill more orders with less labor, without the need to reconfigure or disrupt the warehouse.

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SITUATION: Locus Robotics needed to reduce charging time and maintenance costs

Locus Robotics identified two main improvement areas to reduce the charging time and decrease maintenance costs:

1. **Eliminate the time-consuming wireless handshake connection** and replace it with direct contacts for signal connections.
2. **Increase the current-carrying rating of the charging contacts** so that more power could be transmitted in a shorter charging period.

However, using direct connections for signal connections and higher power charging contacts complicated the docking alignment and electrical contact pressures needed for the robot to automatically dock and undock to the charging stations.

Therefore, a more rugged and durable connector system with built-in guides that allowed for minor misalignment, higher contact pressure, and a high number of mating cycles was needed to increase reliability and decrease maintenance requirements. In addition, having easier access to replace the electrical contacts would also help to decrease the maintenance effort when required.

CHALLENGE: Addressing multiple specifications simultaneously

Locus Robotics challenged TE Connectivity (TE) to devise a solution to meet these needs. There were also several specifications that needed to be met:

1. The AMRs must autonomously dock to the charging station.
2. The robots must be charged up to 40A.
3. The connector must be used for both power and communication.

WHY PROTOTYPING IS IMPORTANT FOR ROBOTICS PROBLEM-SOLVING

It is almost impossible to fully visualize or realize a solution without physically seeing it first. While drawings and 3D models can help fill gaps in the imagination, they cannot actually fill the existing physical space.

This is where a working sample or prototype enters the equation. It is the best way to communicate a design in realistic detail so concepts and ideas do not get lost in translation.

Here are a couple of reasons why prototypes are the key to robotics troubleshooting.

Shorter development time

The first reason to use prototypes when developing a complex robotics solution is to shorten the development time. This may seem counterintuitive, as it sounds like adding this step will only create busywork. But it simply is not true.

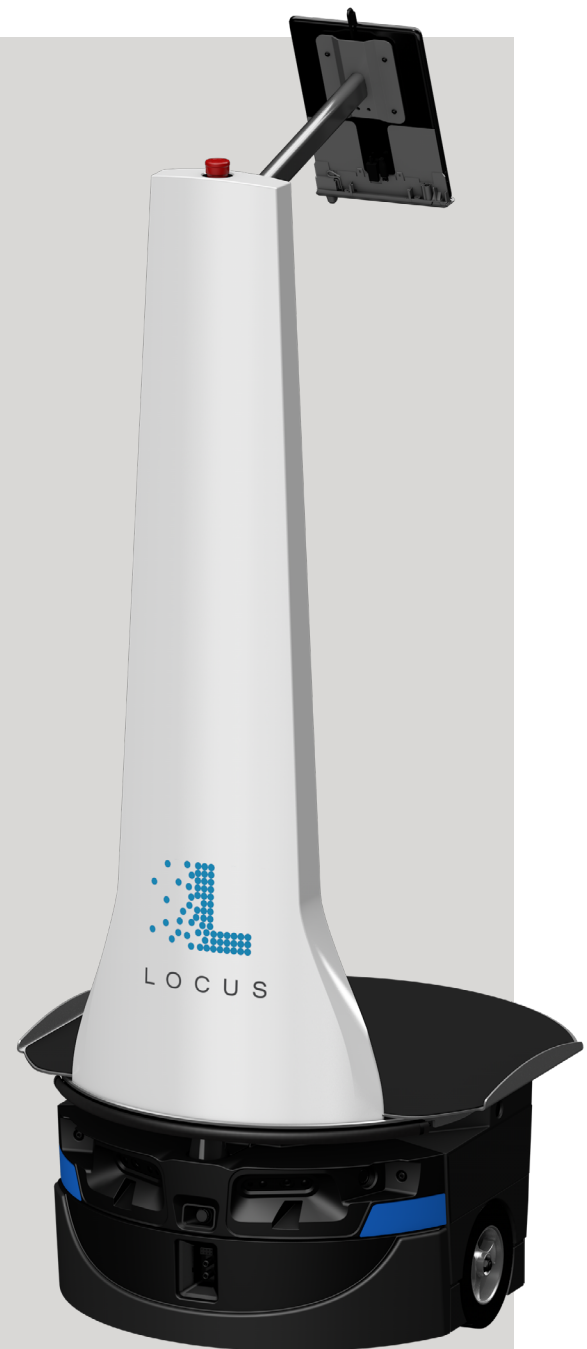
Engineers are more likely to solve problems that may arise by testing the prototype, which ultimately cuts down on the time and expense that would otherwise be required to fix issues later.

In other words, there is less guesswork involved when a physical product is available to test, which leads to more productive problem-solving.

Cost-effective problem-solving

It is also much more cost-effective to create a prototype. Ironing out the kinks on a working prototype is essential to see that everything is working reliably before more money is poured into an imagined solution.

Once the proof of concept works as planned, the end product can be developed with confidence. Prototyping ultimately helps engineers stay on budget and produce a solution that works as flawlessly as possible.



SOLUTION: Engineer teams worked tandemly to solve connector challenges

Two engineering teams—one at TE and one at Locus Robotics—worked separately but in tandem with one another to achieve the charging station and robot needs. Together, they learned, shared, optimized, and eventually achieved the needed parameters.

TE engineers began by conducting a design study to determine how to best improve Locus Robotics' existing solution while addressing the company's new needs and specifications. TE leveraged a wall-mounted docking connector (with integrated signal connectivity for communication) to test various solutions. Next, the TE team designed different mechanical features to address the multiple technical challenges. In addition, TE provided functional samples to the Locus Robotics team as rapid prototypes for field and ergonomic testing. In the end, TE ultimately replaced the docking station contacts, which offered five times the duty cycle of the previous AMR connector.

CONCLUSION: Rapid prototyping proves successful in solving connectivity issues

TE enlisted rapid prototyping to test the team's design concept and confirm that the new self-aligning connector was durable and functional. With the proof of concept ready, the product was quickly optimized with iterative designs to meet Locus Robotics' exact specifications.

The final solution TE delivered not only improved the charging time, but it also decreased the maintenance efforts by up to four times the electrical life.

TE WAS A GREAT PARTNER IN ENGINEERING AN IMPROVED SOLUTION TO OUR CRITICAL CHARGING CONNECTION. THEY'VE BEEN FLEXIBLE, HELPFUL, AND ON-TIME THROUGHOUT.

Mike Sussman
S.V.P. Hardware Engineering, Locus Robotics

Interested in learning more about how TE's expertise can help address your specifications for automated warehousing?

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