

## CIM 2.1.1 Design Flaws for the Automated Guide Vehicle



### FMEA Failure Mode & Effects Analysis

#### Introduction:

A critical review is an important process for the sustainability of a product. In this activity, you analyze your AGV product to identify design flaws and suggest improvements.

1. Review the Failure Mode Effects Analysis video.

[VIDEO:](https://www.youtube.com/watch?v=qoXlC3oJl3g&ab_channel=InstituteforHealthcareImprovement-IHI)

[https://www.youtube.com/watch?v=qoXlC3oJl3g&ab\\_channel=InstituteforHealthcareImprovement-IHI](https://www.youtube.com/watch?v=qoXlC3oJl3g&ab_channel=InstituteforHealthcareImprovement-IHI)

2. What would you recommend for the process of designing an AGV if funding for your project was endless? Your customer has given you the flexibility to spend what you need to make the project work.

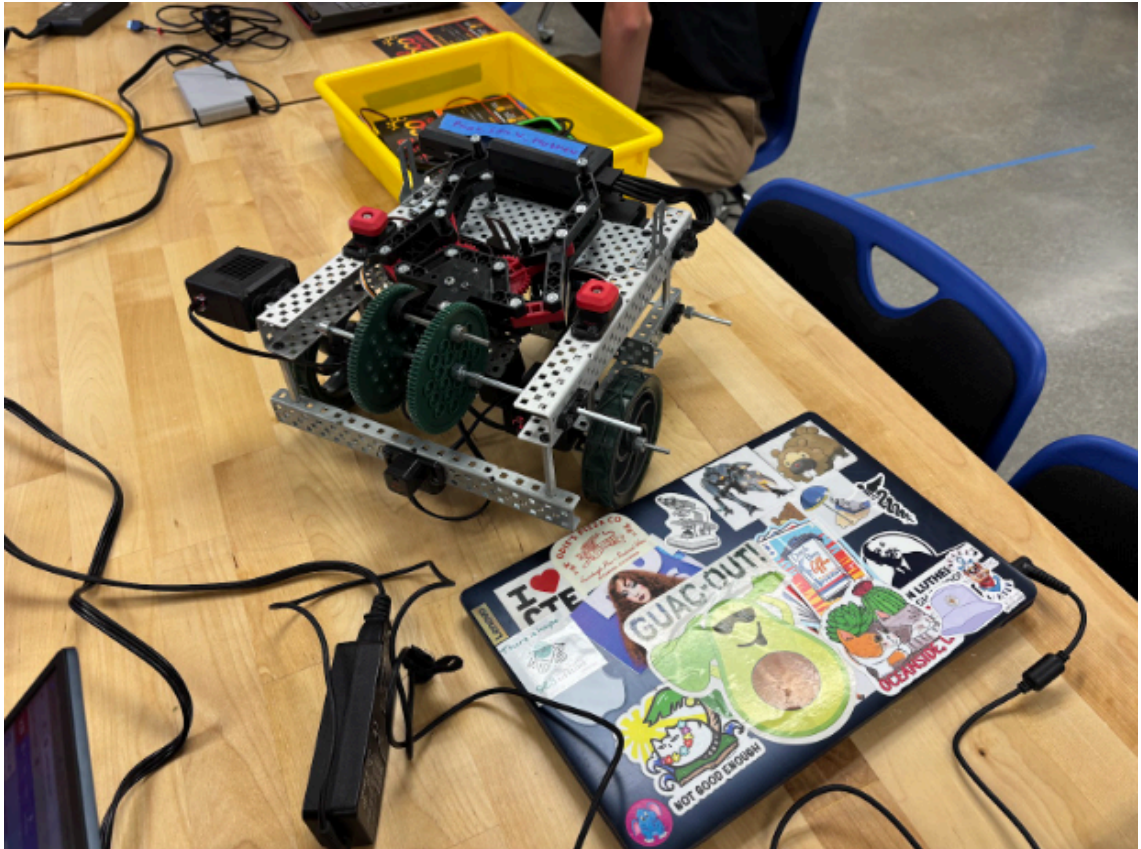
Depends on what the customer desires from the AGV or prioritizes. If we had endless funding, we could easily design an AGV that excels in every aspect, such as speed, logic, efficiency, stability, or even cosmetics. I would recommend consulting with the customer to determine their wants.

3. Choose an example from your AGV that could use improvement of the design. The aspect of the AGV that you choose to improve must take into account that your customer wants to use a path of green, yellow, and red. What recommendations would you give your customer for improvement of the idea?

Our AGV specifically suffered from inadequate storage; it struggled sometimes even to store one of the objects, let alone two. A recommendation I would give to the customer would be to extend our deadline to create a new revision of the bot with larger storage, although this could also increase cost, so the customer must also be willing to fund more.

Prepare a report of your findings including the following items.

- a. Image of the bad design



- b. Full description of the chosen product

A rectangular-shaped robot with a servo-powered claw, which is turned by a motor. The robot has a 2-motor drive train with a caster wheel in the back. The robot has two sensors, a proximity sensor and an optical sensor, used for driving along the colored path and picking up objects. The robot has a Vex V5 Brain powered by a Vex Robot Battery Li-Ion 1100mAh alongside two push buttons.
- c. Intended use of the product

The bot is intended to be placed on a 3-color path, and the start button pressed to start the bot. The bot will follow the path and search for objects in front of it to pick up and store. Please note it's only meant to carry two objects at a time.
- d. Any design flaws with the product

The storage area is small and occasionally difficult to get to for the claw. Additionally, the speed of the bot is another concern. To ensure precision, the bot moves and turns at slow speeds so it doesn't go off the path. The stability is not a major flaw, but due to some poor construction choices, the robot's structure itself is a little bent, but the programming will account for the minute effect this problem has.
- e. Issues with the flaws, related to economy, safety, functionality, and ethics

Functionality is the biggest issue in relation to this bot; it has a slow speed and limited carrying capacity, which might be deemed unsatisfactory to consumers. Economy-wise, the bot actually excels, with a compact design using minimal components. There might be some issues related to safety; there isn't an automatic stopping mechanism if an intrusion is found between the claw and

its degrees of motion. This problem was noted when a designer's hand got stuck between the claw and the bot; however, it didn't harm the designer very much, as the claw is not high-powered. Ethics, if this were a commercial product, it might be worth considering the effect a bot like this could have on replacing jobs such as factory workers, but these jobs are also deemed undesirable society-wise.

f. Recommendation to redesign the product to correct the flaws described

An extension in designing a new revision and defining consumer-deliverables, the design team was working under the impression that cost-effectiveness was the highest priority, and it seems that might've been inaccurate. A new revision can focus on high-priority criteria while also improving on other aspects simultaneously.

## Conclusions:

Name and describe a product you typically use that has a defect related to economy, safety, functionality, and/or ethics.

A typical product I use that has a design flaw is my phone's charging cable. It frequently frays near the connector, which reduces functionality and forces early replacement. This flaw is tied to economy (cost of replacing cables) and functionality (unreliable charging). While not unsafe in normal use, exposed wires could pose safety concerns.

The Engineering Code of Ethics includes the four principles listed below. In what way, if any, do the four principles apply to the design flaws you listed above?

- a. Use knowledge and skill for the enhancement of human welfare.  
Designing more durable charging cables would reduce frustration, financial waste, and potential electrical hazards, thereby improving user safety and satisfaction.
- b. Be honest and impartial and serve with fidelity the public, their employers, and clients.  
Companies should be transparent about the expected lifespan of charging cables instead of implicitly encouraging frequent replacements.
- c. Strive to increase the competence and prestige of the engineering profession.  
Engineers can enhance the profession's credibility by developing innovative, longer-lasting cable designs that set a higher industry standard.
- d. Support the professional and technical societies of their disciplines  
By adopting and sharing best practices in electrical safety and sustainable design, engineers contribute to the advancement of technical communities and promote responsible manufacturing.