

Brain Bolt - The Engineers Sprint

10th September 2025 | HICC, Hyderabad

IMECE India 2025

Preliminary Problem Statement

ROUND 1

Smart Glass Cleaning Robot

Background

eGlean Facilities Management company planning to design a Smart Glass cleaning Robot for high rise buildings with minimal Human intervention (Apartments and Offices)

Problem Considerations

Due to excessive dust and pollution in metro cities, cleaning of wide windows on tall and multi-story buildings is quite tedious and very dangerous procedure which leads to following problems:

- **Safety concerns:** Cleaning windows on high-rise buildings can be dangerous and requires specialized equipment and training. There is a risk of falls or other accidents that can result in serious injury or death.
- **Health concerns:** Exposure to dust and pollutants can have negative health effects on people who live and work in buildings with glass panels. Regular cleaning and maintenance can help to reduce these risks.
- **Cost:** Regular cleaning and maintenance can be costly, especially for large buildings with numerous windows. The cost of hiring professional cleaners or purchasing the necessary equipment and cleaning solutions can add up quickly.
- **Time-consuming:** Cleaning and maintaining glass panels can be a time-consuming process, especially for larger buildings. This can be a significant inconvenience for property owners and tenants.
- **Energy Efficiency:** Dirty windows can reduce the energy efficiency of a building by blocking sunlight and increasing the need for artificial lighting and heating or cooling systems

Design Considerations

Research & Develop a Design on “Smart Glass Cleaning Robot” which does smooth Cleaning, Climbing and self carrying liquid cleaners.

The “Smart Glass Cleaning Robot” should focus on quick Cleaning of dust from High rise buildings by ensuring hygiene.

- The Robot should clean and collect the dust from glass panels & windows .
- The robot liquid cleaner capacity should be in between 01-10 litres (depends on size of the building).
- Robot can be autonomous or remote controlled.
- Select the appropriate material to make the Smart Robot light in weight and flexible to transport
- Max size of the Smart Robot should not exceed **100cm H/100cm L/100cm W**
- Rendered images and Animations of the design must be added in the PPT.
- Min 1 component must be optimized using Generative Design Module.
- Implement the industry 4.0 applications like IOT, AI to create a “Smart Glass Cleaning Robot”.