Northeastern University

Automotive Manufacturing Automation

A - Team

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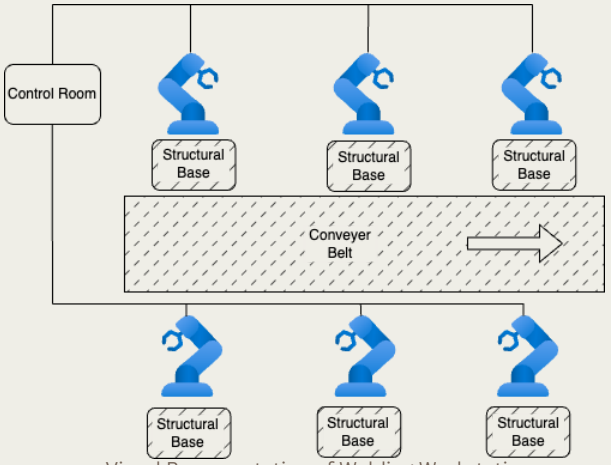
Project Management Spring '24

PURPOSE

Enhancing the production process by leveraging industry 4.0 for improving accuracy, reducing material wastage & optimizing production cycle through automated solutions in the Welding, Painting, Tyre & windshield assembly area allowing a decrease In operational cost and enhancing overall competitiveness

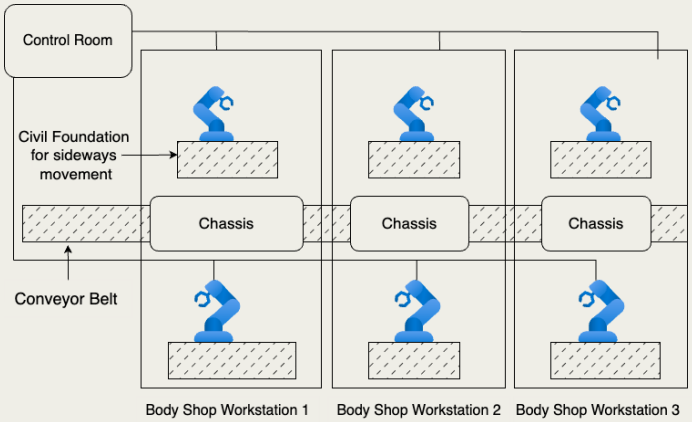
WELDING WORKSTATION



Visual Representation of Welding Workstation

- Automating the welding area with 6 robots
- 6 Motoman MA1400 robots will be controlled by Motoman DX100 controller
- Goal is to achieve reduction in asymmetric weld lines & spot marks to achieve stronger & superior welds
- Controller operated by YEC1000 software

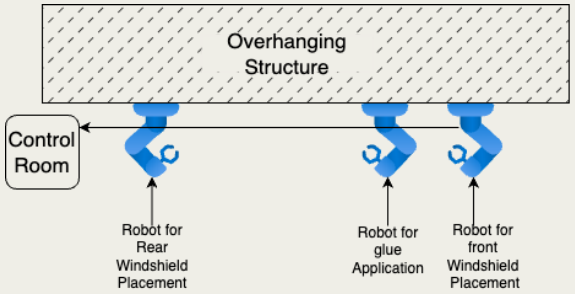
BODYSHOP WORKSTATION

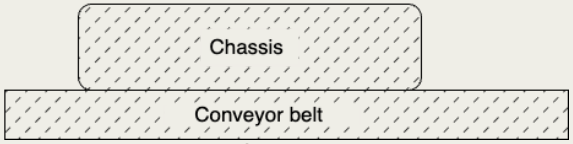


Visual Representation of Bodyshop Workstation

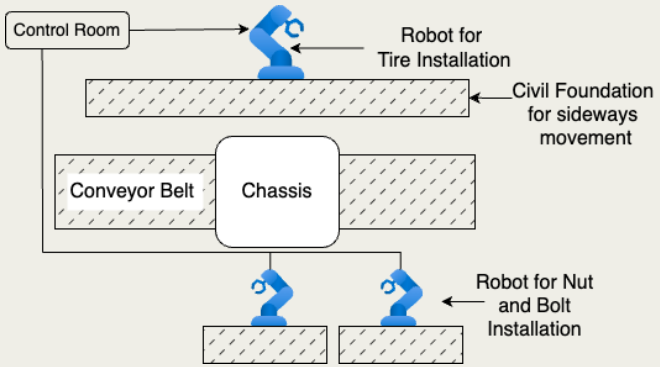
- Painting the entire vehicle body without human intervention
- 6 FANUC P-250iB/15 robots will be controlled by FANUC R-30iB controller
- Focusing on overcoming the color mismatch and sagging defect due to human error
- Spray paint nozzle and mixing chamber on robots shall be used to maintain superior finish
- The robot's base is attached to a railing that allows the robot to translate along the length of the car covering all panels that are to be painted
- Robots will utilize FANUC's comprehensive software suite and KAREL programming language
- ROBOGUIDE will be used to create programs for simulation in 3D environment

WINDSHIELD & TIRE INSTALLATION WORKSTATION





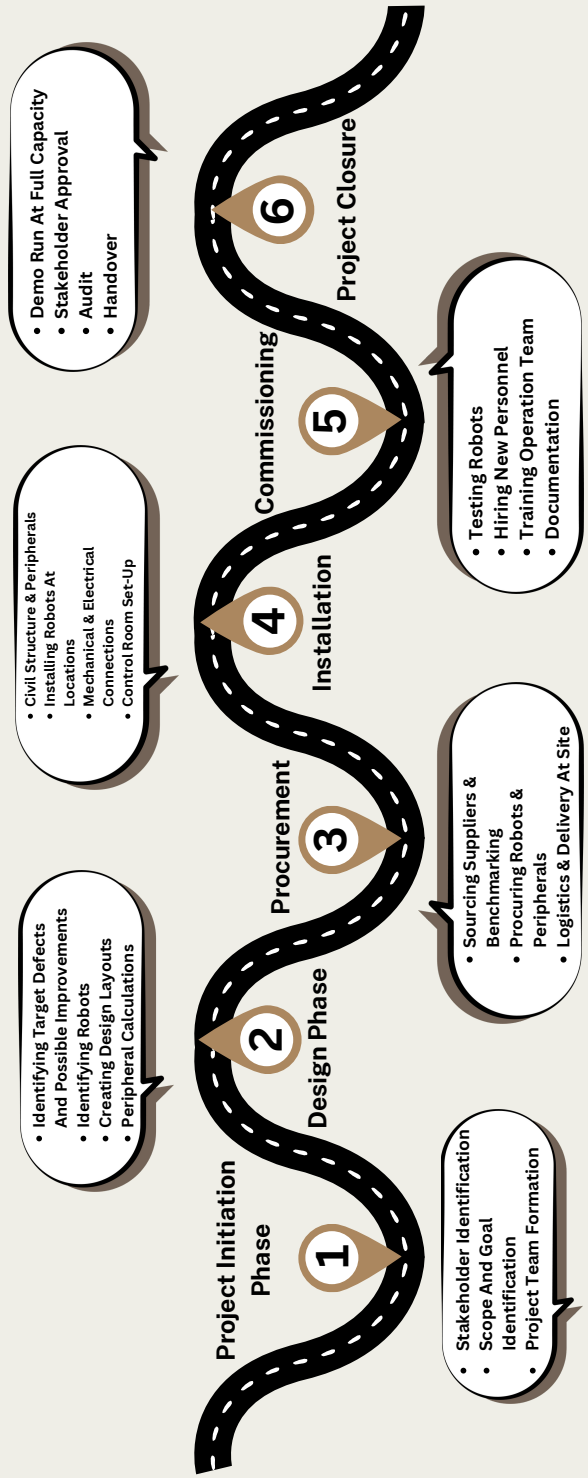
Visual Representation of Windshield Assembly Workstation



Visual Representation of Tire Assembly Workstation

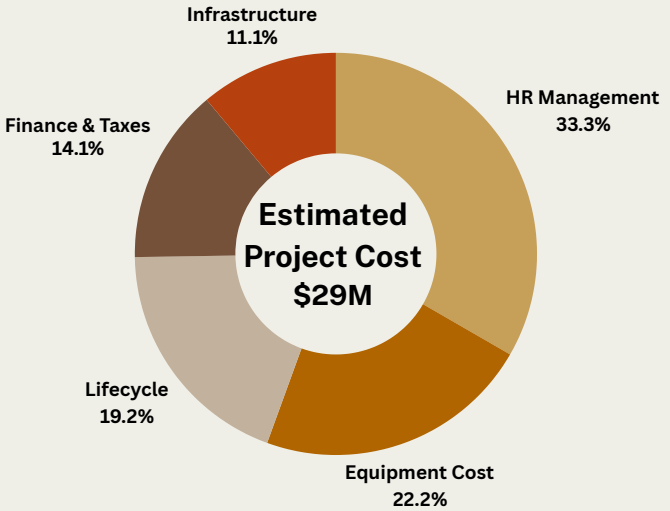
- 2 robotic arms mounted in structural beams for windshield installation
- 2 robots erected on the ground to attach tires
- Robotic arms for Windshield- FANUC R-2000iA/165F
- Robots for Tire- FANUC R-2000iC/210R
- Issues like uneven sealant application and lengthy tire installation are solved by automating assembly area for windshield and tire
- Controller for FANUC R-2000iA/165F- FANUC R-30iB
- Controller for FANUC R-2000iC/210R- FANUC R-30iB
- Operations supervised by dedicated robotics engineers

PROJECT ROADMAP

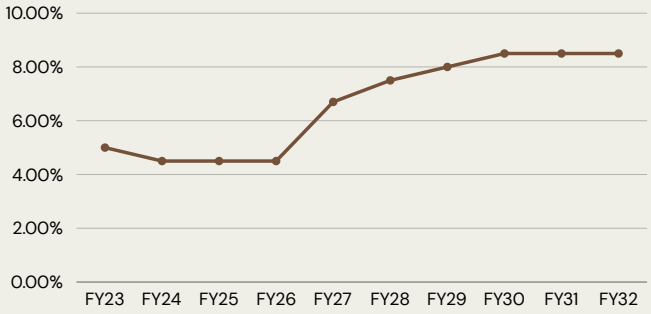


FINANCIAL PLAN

Assumptions: Our Company generates an annual revenue of **$63M** with an average net profit rate of **5%**.



Growing from 5% to 8.5% in 7 Years via Automation



Savings in direct costs (operational) after automation

Direct	Old Operating Spend	New Operating Spend	%Savings
Labor	$ 10,000,000	$ 8,500,000.0	15%
Material Cost	$ 20,000,000	$ 19,600,000	2%
Energy Usage	$ 2,000,000	$ 2,600,000.0	-30%
Procurement & Logistics	$ 4,000,000	$ 4,000,000	
Consumables	$ 1,600,000	$ 1,760,000	-10%
Maintenance & Repairs	$ 2,000,000	$ 2,200,000.0	9%
Inspection & Testing	$ 1,200,000	$ 960,000.0	20%
		Total Savings	2%