

“SAMVED” HACKATHON 2026

TITLE PAGE

- **Problem Statement ID** - 04
- **Problem Statement Title** – Semi-Automatic Manhole Cleaning Machine
- **Theme-** Safety & Assistance for Sanitation Workers
- **Team ID-** MITVPU_SAMVED_Team 1
- **Team Name :** SURAKSHA



Semi-Automatic Manhole Cleaning Machine

❖ Proposed Solution:-

- Semi-Automatic Manhole Cleaning Machine a portable tripod with hand-crank/electric winch and clamshell grabber for remote debris removal from sewers, ensuring zero-entry safety for sanitation workers.
- We approached the sanitary workers and identified the problem.
- They are facing problems to extract the drain from the manhole.

❖ Innovation and Uniqueness:-

- Zero-Entry Safety Design
- Mechanical Lift Optimization
- Precision cleaning for confined urban spaces
- Bridging the gap between manual labor and heavy machinery
- Gas Detector is added



Fig : 1



Fig : 2

TECHNICAL APPROACH



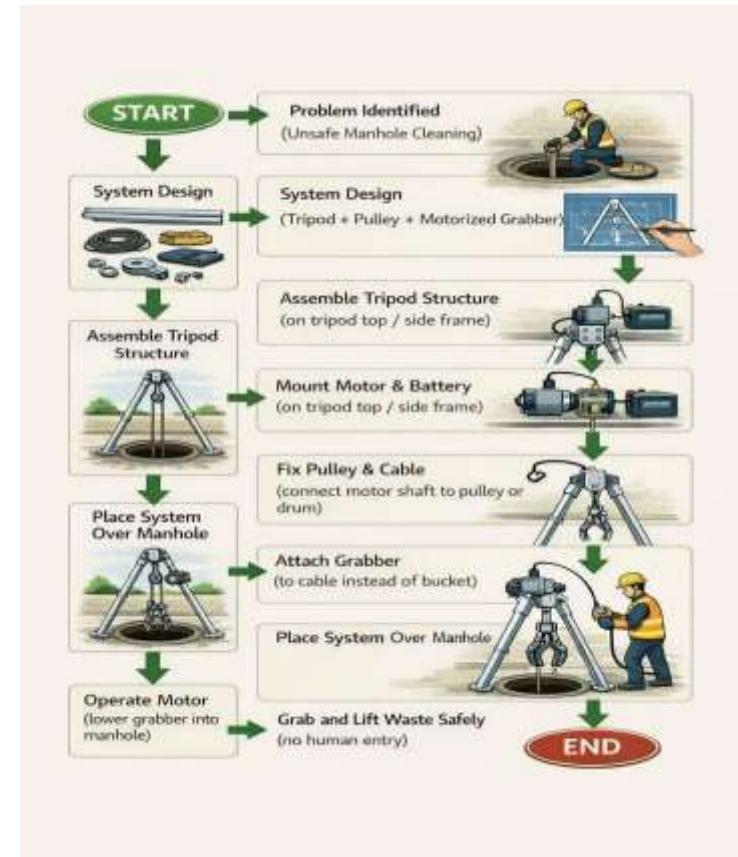
❖ Technologies Used :-

- Mechanical & structural technology
- Grabbing & desilting technology
- Safety & material technology

❖ Methodology :-

- Problem Identification – Unsafe manual manhole cleaning
- System Design – Tripod + pulley + motor + battery + grabber
- Material Selection – Lightweight, strong, corrosion-resistant
- Assembly – Tripod setup, motor & grabber integration
- Installation – Placed over manhole, stable alignment
- Operation – Motorized lifting, waste grabbing
- Testing – Load & safety check
- Evaluation – Safety, efficiency, ease of use

Flow chart for proposed idea



FEASIBILITY AND VIABILITY



❖ Feasibility Analysis:-

Uses simple and easily available components (tripod, motor, grabber, battery). Low cost and easy to operate.

Improves worker safety by avoiding human entry into manholes. Suitable for municipal and small-scale use.

❖ Potential Challenges & Risks:-

Mechanical wear of pulley, cable, or grabber. Battery or motor failure.

Overloading of the system.

Operation in wet and corrosive environments.

❖ Strategies to Overcome :-

Perform regular maintenance and inspections. Use reliable batteries and basic operator training. Follow safe load limits.

Use strong, corrosion-resistant materials.

IMPACT AND BENEFITS



❖ Potential Impact on Target Audience:-

- Reduces health risks for sanitation workers
- Improves safety and dignity of labor
- Easy to use with minimal training



Fig : 3

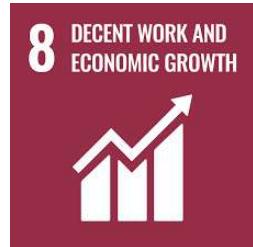


Fig : 4



Fig : 5

❖ Benefits of the Solution:-

- Social: Prevents manual scavenging and improves worker safety
- Economic: Low-cost system, reduces medical and accident expenses
- Environmental: Cleaner manholes, reduced waste spillage
- Sustainability and SDG alignment: SDG 6 – Clean Water and Sanitation, SDG 8 – Decent Work and Economic Growth, SDG 11 – Sustainable Cities and Communities (Fig : 3,4,5)



- MoHUA – SOP for Sewer and Septic Tank Operations:-
<https://mohua.gov.in/upload/uploadfiles/files/AMRUT%20SOP%20Book%20Final.pdf>
- Ban on Manual Sewer Entry & Use of Machines:-
<https://timesofindia.indiatimes.com/city/gurgaon/gurgaon-civic-body-tightens-curbs-on-manual-sewer-entry-safety-gear-must/articleshow/127785149.cms>
- Manual Scavenging – Overview & Risks:-
https://en.wikipedia.org/wiki/Manual_scavenging
- Hazardous Cleaning Issues in India:-
<https://anantamias.com/current-affairs/hazardous-cleaning-and-manual-scavenging/>
- SOLINAS Technologies - Innovation in Locating [Plastic Pipe, NonMetallic Pipe, Lead Pipe]