



CASE STUDY: ROBOTIC PIT CLEANING AT BPCL CHEMBUR REFINERY

Transforming Hazardous Manhole Maintenance with Bandicoot Robots

**CLIENT :**

Bharat Petroleum Corporation
Ltd. (BPCL) – Mumbai Refinery

LOCATION :

Chembur, Mumbai, India

SECTOR :

Oil & Gas / Refinery

ROBOTIC SOLUTION DEPLOYED :

Bandicoot Robot*

*Designed for confined space cleaning of pits and manholes in hazardous environments.

PROJECT BACKGROUND

In high-risk operational zones like OWS (Oil Water Separator), SWS (Sour Water Stripper), and CRWS (Clean Refinery Wastewater Systems), manual pit cleaning posed significant safety and compliance challenges.

In 2021, BPCL initiated a strategic transition to robotic cleaning using Genrobotics' Bandicoot robot. The objective was to eliminate manual entry, enhance safety, and streamline maintenance of critical wastewater handling infrastructure.

CLEANING PROCESS



The cleaning begins with remote inspection and gas detection to identify toxic gases like H₂S and VOCs in confined sludge pits. A robotic unit, equipped with explosion-proof components, is then deployed into the space. Using precision-controlled arm, it collects hazardous oil sludge, which is lifted via a bucket system. IP68 rated cameras provide real-time monitoring, ensuring thorough cleaning. The entire process avoids human entry, enhances safety, and complies with strict refinery and ESG standards.

DEPLOYMENT METRICS (2021–2024)

YEAR	MANHOLES CLEANED	TARGETED ZONES
2021	1,200	OWS, SWS, CRWS
2022	500	OWS & SWS
2023	500	OWS & SWS
2024	500 (On Going)	OWS & SWS

- 60–70% cleaned under preventive maintenance plans.
- 30–40% were blocked or operationally critical manholes.

CHALLENGES ADDRESSED

- High concentrations of toxic gases (H₂S, VOCs).
- Structural constraints in deep, confined pits.
- Risk of human exposure during sludge removal.
- Regulatory and ESG compliance in hazardous cleaning.

SOLUTIONS DELIVERED

- Remote Operation:** No human entry inside manholes.
- 24x7 Operability:** Enabled night shifts and reduced turnaround time.
- Precision Cleaning:** Robotic scooping and jetting ensured complete sludge removal.

RESULTS & IMPACT

- 100% elimination of manual entry in hazardous zones.
- Consistent throughput across three years with minimal operational downtime.