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## BANDICOOT – MANHOLE CLEANING ROBOT

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The ‘Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013’, recognises manual cleaning of sewers as a dehumanising practice arising from the continuing existence of insanitary latrines and a highly iniquitous caste system. Four young minds decided to address this social problem by replacing manual scavengers with robots in manholes. They kept the technology simple so that anyone can operate the Bandicoot with a little training. The scavengers are not out of jobs: they are now busy guiding the robots to clean the manholes.

### **What is the project about?**

The journey began following a tragedy in Kozhikode, Kerala, in 2015 when three people had died in a manhole during a cleaning operation. This prompted the four young former students of MES College of Engineering at Kuttippuram, Kozhikode, to design a solution. They have a passion for robotics and experience with exoskeleton technology-powered armour to assist in tasks involving manual labour right from their engineering days. During their corporate days in 2015, they created a prototype robotic iron man suit to ferry bulk material in the construction and defence sectors.

When the Kerala government presented them with an opportunity, the team initially worked with friends and college interns. They built a prototype, tested it, and followed up with the beta product. The Kerala Water Authority was the first public utility to officially deploy the Bandicoot in Thiruvananthapuram, in 2018. After that, the co-founders inaugurated the latest version of bandicoot 2.0 in the presence of Prime Minister Narendra Modi and UN Secretary-General Antonio Guterres in New Delhi in 2018.

### **How does it work?**

The robot consists of two major units, a stand unit and a robotic drone unit. The drone unit which will dive into the manholes for the cleaning operations or unblocking operations. The diving depth of the robotic drone is customizable according to the maximum depth needed for the manholes. Add-on feature of nano-coating in addition to the powder coating surface enables the robot to perform its operation in any hazardous or corrosive sewerage environments effectively for a longer period.

The drone unit is equipped with an extendable robotic arm with four degrees of freedom to perform grabbing, shovelling and unblocking actions inside the manholes. To gain stability while performing these actions the robotic drones are designed with 4 expandable legs, with the help of an integrated waste-collecting bucket system the collected waste can lift out from the manhole. The operator can control the drone unit by monitoring through a high definition display which will get input from IP68 waterproof cameras mounted on the drone unit. The stand unit also has a second display on the user interface area for various other interactions such as checking the quantity of poisonous gas inside the manhole and training assistance for better user experience and easy rehabilitation of sanitation workers.

The sensor-based feedback system incorporated in the robot will allow the user to know the position of the robotic drone unit inside the manhole, thus the user can do a surgical cleaning process with high efficiency. The bandicoots come with automatic mode also by taking initial boundary conditions of manholes.

**What is the impact?**

Within a short time, the Bandicoot has wheeled its way into 10 states and over hundreds of manual scavengers have gone through the rehabilitation program to become the robot operators.

The team calls this #MissionRobohole, which is about converting manholes into ‘robohales’ and replacing men with robots in manholes. It has kept the technology simple so that anyone can operate the Bandicoot with a little training. They may no longer be going down manholes, but the manual scavengers are not out of jobs: they are busy guiding the robots to clean the manholes.

#MissionRobohole aims to eliminate manual scavenging from our society by replacing it with robotics and to rehabilitate sanitation workers to robotic operators, harmonize their livelihoods, and are poised to bring social mobility.

Yadav, the BMC worker Says: “The Bandicoot has made a big difference, making life that much easier. It is very easy to operate the robot machine. I was initially doubtful whether I would be able to master the controls. But after training, I find it very easy.” Technology has not taken away his livelihood; it has only made it a safer livelihood.

Kumar from Punjab echoes Yadav’s sentiments: “Bandicoot’s camera shows me where the manhole sewer lines are blocked and helps me remove the blockage. The robot has made a world of difference to me.”

The workers in Thanjavur, too, are overjoyed at the change that the Bandicoot has brought into their lives. “*It’s a fantastic machine invented with a lot of care and love for us,*” says one of them. Genrobotics could not hope for a more ringing endorsement.

**Project Funded by**

The project and its different stages are funded by Unicorn Ventures India Pvt Ltd, Anand Mahindra, and SEA Fund.

**Stakeholders Involved**

Genrobotics has already been working along with the Central Ministry as well as with State Governments in the mission of eradicating manual scavenging. The company is recognized by the Ministry of Housing and Urban Affairs and Smart City Mission India, suggested Bandicoot Robot, and quoted them as an

excellent example for enabling Zero Human-Intervention in the sewerage cleaning process.

Genrobotics has collaborated with Smart City missions and with various municipal corporations.

Genrobotics has also signed an MOU with Dubai municipality.

Genrobotics have collaborated with BRABO Robotics – a 100% subsidiary company of TATA, In the mission of revolutionizing India's Make in India Journey through enhancing robotic technologies.

**About Genrobotic Innovations:**

Founded in 2015, Genrobotics is a robotics company primarily focusing on designing and development of robotic solutions to address the most relevant social issues, headquartered in Trivandrum, Kerala. For a long time, robots are on board to transform our lives, we are inclined to think of ways to simplify life-risking situations and amplify livelihood through bringing the missing social space for robots in our society.

We are working on developing technologies ensuring safety to the ones who face the extremities, through human-friendly robotic solutions. Developing tailor-made products and services have keen importance in a Nation's prospering progression. It's a great honour to be a part of India's most prestigious initiatives "Swachh Bharat Abhiyan and MakeInIndia".

Our innovation "Bandicoot" has been making transformative changes in many sanitation workers who were daring themselves every time without thinking of the extremities hidden in the manholes and ensuring cleanliness to all. We are spearheading the perseverance to create, develop and implement systems of change that are beneficial to all sentient beings and the environment- by triggering off the distressed elements on the people, fostering a better place to live.

**Links to read more:**

[Industhan Outreach](#)