

**1. Project Proposal Reference Number:** 46S\_BE\_5420

**2. Title of the project:** Advanced In-line Pipe Inspection Robot

**3. Name of the College and Department:** JSS Academy of Technical Education, Bangalore,  
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**4. Name of the Guides:**

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**5. Keywords:** Inline pipe inspection, Robot, Human interventions

## **6. Introduction:**

Robotics is one of the fastest growing engineering fields. Primarily robots are designed in such way that they reduce human intervention from labour intensive and hazardous work environment. The complex internal geometry and hazard content constraints of pipes require robots for inspection purpose. With these constraints, inspection of pipe becomes so more necessary that, tolerating it may lead to some serious industrial accidents which contaminate environment and loss of human lives also. For inspection of such pipes, robot requirement is must especially in order to check corrosion level of pipe, recovery of usable parts from pipe interior, for sampling of sludge and scale formation on pipe internal surface etc. Designing of a new in-pipe inspection robot is carried out in this research work. A very important design goal of the robotic systems is the adaptability to the inner diameters of the pipes. The major advantage of this robot is that it could be used in case of pipe diameter variation with the simple mechanism. A pipe inspection robot that can be applied to certain inch diameter pipeline was

developed to test the feasibility of this robot for inspection of pipelines. (Dinesh Kumar D.S, et al., Aug 2020 )

Pipe Inspection Robots are widely used in petrochemical, water supply and fluid transportation industries. Many researchers have done work to develop new pipe inspection robots to enhance various aspects of in pipe inspection robot like vision, control and motion of robot.

## 7. Objectives:

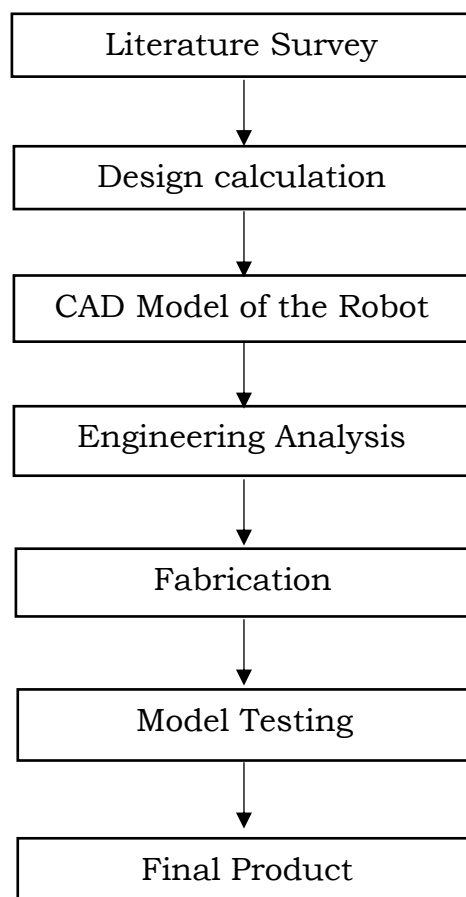
To build efficient and economical In-Line Pipe Inspection Robot using sensors to solve the problems occurring in the pipelines.

To easily inspect the damages in the pipelines which are buried under the soil and water without any human interventions.

The primary objectives of an inline pipe inspection robot include:

1. Detection of pipe defects.
2. Assessment of pipe condition.
3. Data collection and analysis.
4. Remote operation and real-time monitoring.

## 8. Methodology:



1. Conducting a literature survey of existing pipe inspection robots or machines.
2. Calculating the various dimensions for the design.
3. Development of CAD or 3D Model using CAD software.
4. Fabricating the robot as per the CAD design.
5. Testing the model and finding areas of improvements if any.
6. Final product is prepared for use.

### 3D CAD Models:

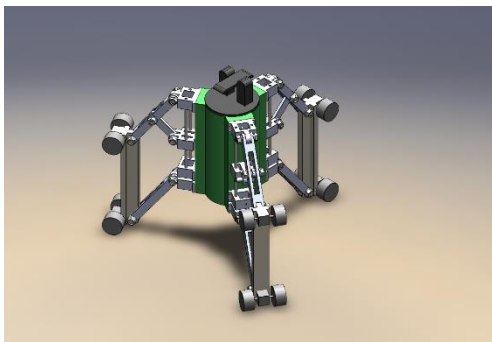


Fig-1: Isometric View

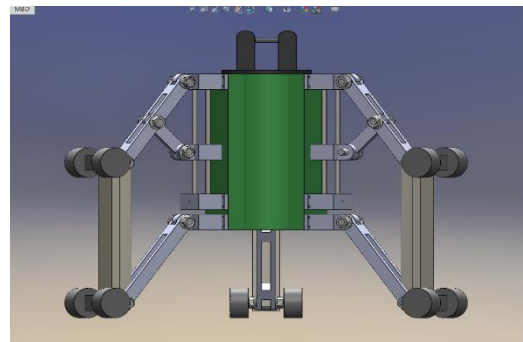
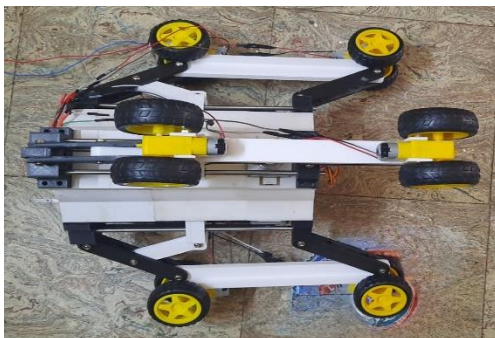
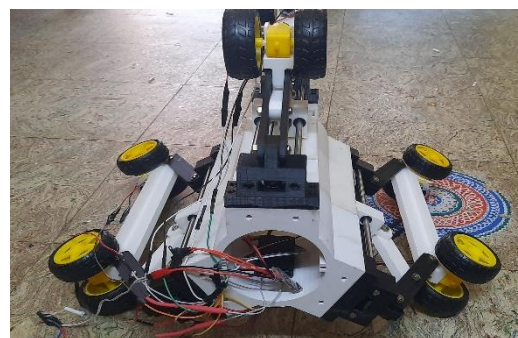


Fig-2: Front View



(a)



(b)

Fig-3 (a) (b): Robot Prototype developed

## 9. Results and Conclusions:

The expected result will be the crawling of the robot inside the pipe at any inclination and capturing image which will be viewed simultaneously through the monitor. The defects in the pipelines can easily be identifiable with the help of sensors and cameras present in the robot.

The captured image will be monitored to detect the cracks and defects present in the pipe by image processing and the clear view of the pipes which are buried under the ground and areas

where human interventions are impossible will be viewed.

### **What is the innovation in the project?**

The major advantage of the developed prototype of a inline inspection robot is that it could be used in different diametric pipe size variations using four bar and slider mechanisms.

The specialty of the developed inline inspection robot is that, it can travel at any inclination of pipe lines. And it also helps in monitoring and measuring of the cracks, cavities present and thickness of the pipelines by utilizing the IR camera and ultrasonic sensors provided in the robot.

### **10. Scope for future work**

Defects in the pipelines are the major problem for industries like Gas industries, Petroleum and oil industries and also in sewage pipelines. With the help of Advanced In-line Pipe Inspection Robot the cracks and defects which are present in the pipelines can be easily recognizable in such areas where human interventions are impossible. The data obtained can be utilized for taking the suitable measures, to restore or to repair the damages occurring in the pipelines, which leads to minimizing the future hazardous events caused due to leakage of Gas, flammable oils, sewage water and etc. The main advantage of this robot is, one can inspect irrespective of various diametric pipes without changing the equipment's.

