Inputs

IR sensor → Presence of the pipe

1. At the beginning detect the presence of the pipe to move the clutches forward to tight the pipe.
2. At the end of the cutting process, check whether the remaining piece of pipe is less than 10 cm.

Inductive Proximity sensor → Material of the Pipe

At the beginning detect the material of the pipe.

4x4 Keypad → 1. Required Length, 2. Required Quantity

At the beginning enter the needed length and quantity.

Ultrasonic sensor HCSR04 → Distance to the pipe (left)

Get the distance between pipe and clutch 1 of the machine.

Ultrasonic sensor HCSR04 → Distance to the pipe (right)

Get the distance between pipe and clutch 2 of the machine.

IR sensor (2) → Presence of the pipe

Two IR sensors are used to get the presence of the pipe edge to set it to the cutting point. (aligning)

Ultrasonic sensor HCSR04 → Distance to clutch 1

Get the distance between clutch 1 and the sensor (this is equal to moved length of the pipe)

Microcontroller Atmega 32

Identifying the material of the pipe (Metal or PVC) and set the speed to the DC motor 3

Calculating the number of rotations of the stepper1,2 and 3.

Checking the correct aligned position of the pipe at the cutting point.

Control the rotation of DC motor 1 and 2 until the given length (by user) is satisfied.

Cutting the pipe and identifying the wastage

Separating and collecting wastage to the relevant bin.

Outputs

Commands and user inputs → 16x2 LCD Display

Guide the user to enter the needed length and the quantity of the pipe.

Turn on stepper motor → Stepper motor 1 (clutch 1) Driver: ULN2003

Rotate the stepper motor to move clutch 1 forward to tight the pipe.

Turn on stepper motor → Stepper motor 2 (clutch 2) Driver: ULN2003

Rotate the stepper motor to move clutch 2 forward to tight the pipe.

Turn on stepper motor → Stepper motor 3 (clutch 3) Driver: ULN2003

Rotate the stepper motor to move clutch 3 forward to tight the pipe.

Turn on DC motor → DC motor 1 (Rail system) Driver: L293D

Move the clutches on the rails.

Turn on DC motor → DC motor 2 (Rail system) Driver: L293D

Move the clutches on the rails.

Turn on stepper motor → Stepper motor 4 (cutting arm) Driver: ULN2003

Rotate the motor to control the cutting arm (Up and Down)

Turn on DC motor → DC motor 3 (cutting blade) Driver: L293D

Rotate the cutting blade.