GasCheck
Gas Level Indicator

Group EN-17

The Problem

- In Sri Lankan households, LPG is the common fuel used for cooking.
- In the prevailing economic crisis, it has become a difficulty to purchase gas in many households.
- Because of that, it has become a necessity to carefully manage the usage of gas and make it last longer.
- As there is no method of measuring the remaining gas level precisely, the only current way of doing this is by guesswork.

Problem Validation

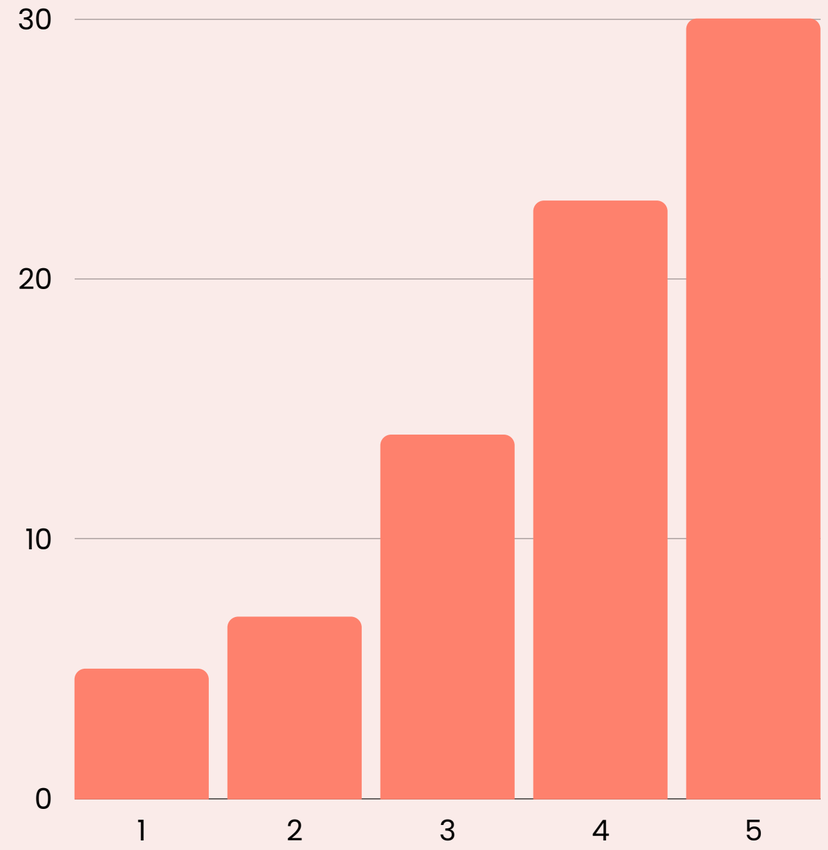
To help people conserve gas optimally, our idea was to design a method to measure the remaining gas level in the cylinder.

We conducted a survey to validate whether the problem we identified is worth handling and whether our solution is useful.

79 people responded and 76 were gas users.

Necessity of gas conservation

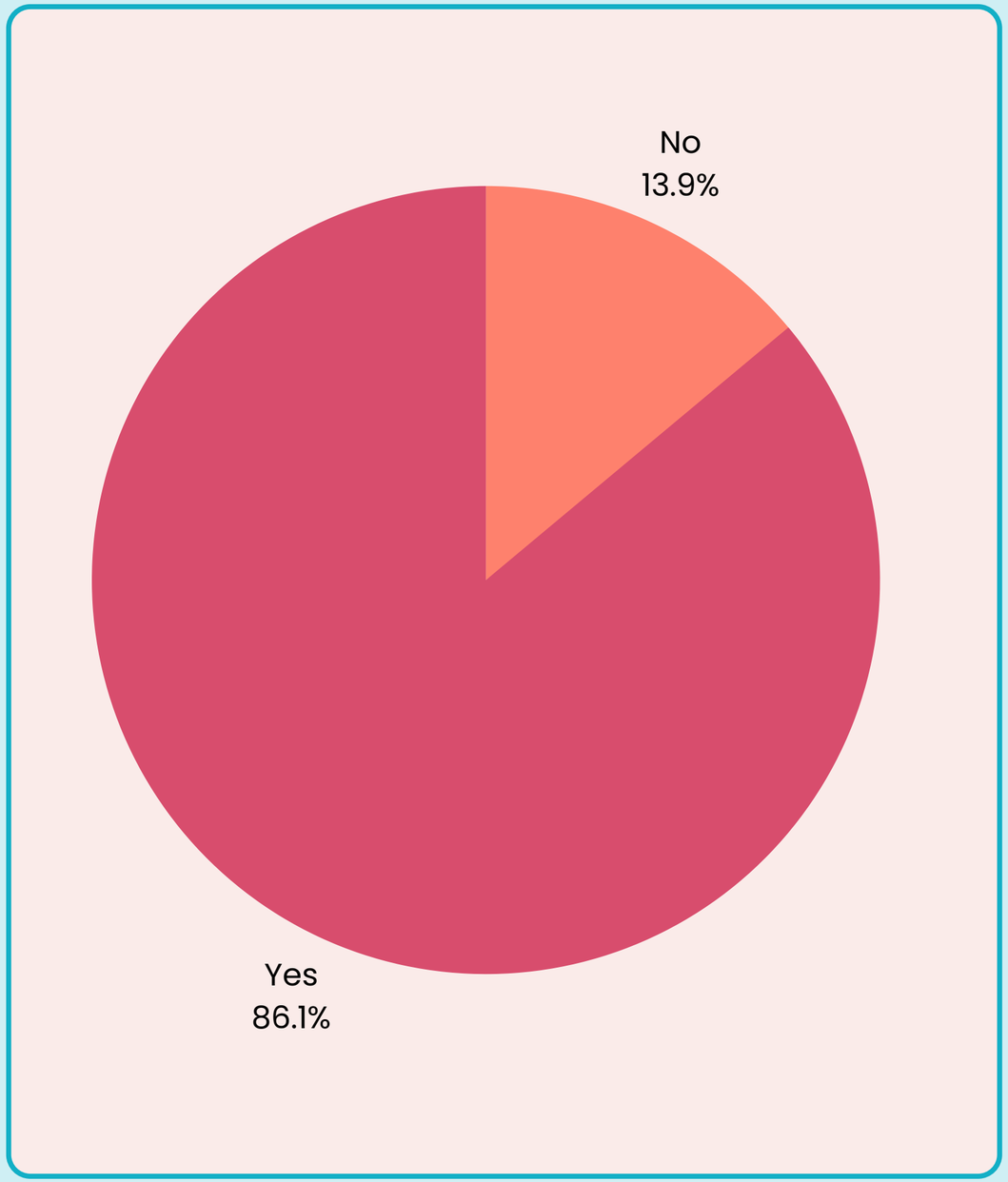
Gas conservation at home is extremely necessary for 38% of the respondents, and **84.6%** considered it to be at least a moderate necessity.



1 - Not at all necessary
5 - Extremely necessary

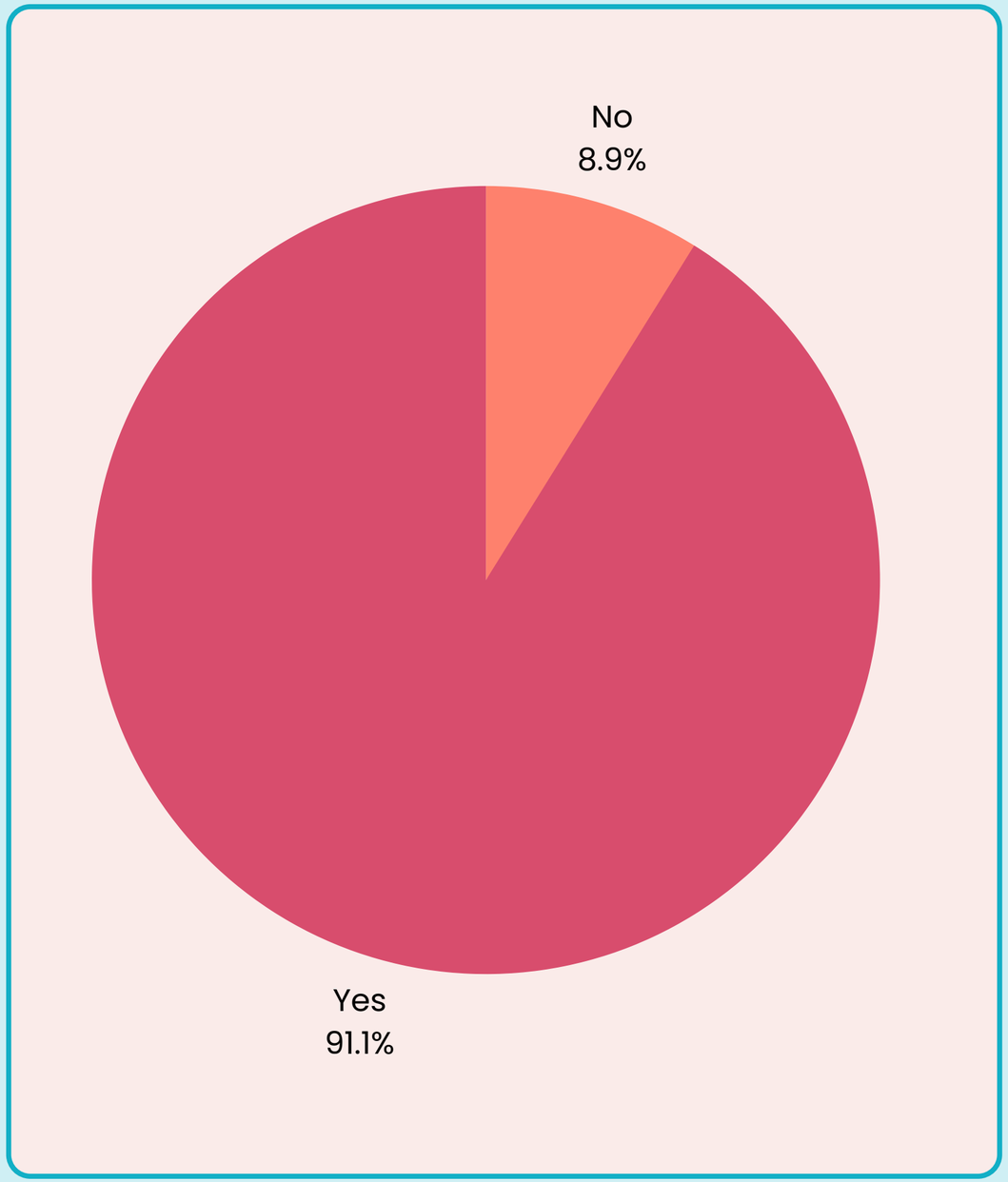
Usefulness of the solution

86.1% of the respondents agreed that a method of checking the gas level will make it easier to conserve and manage gas usage in their households.



Appeal of the product

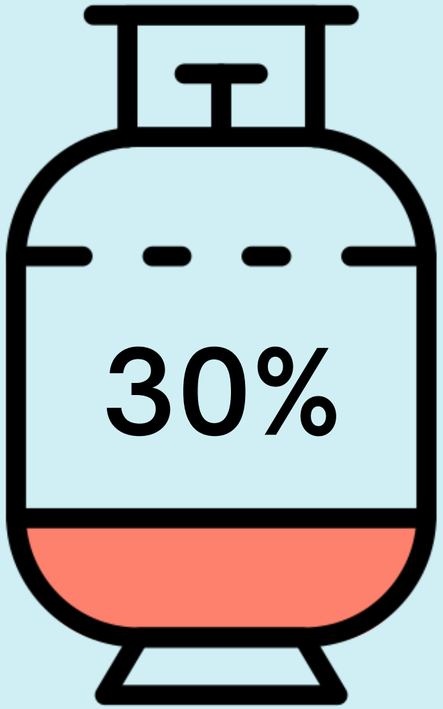
More than 90% responded that they are willing to use our product, which indicates that our product addresses the problem in an appealing manner to the users, and will be beneficial to a significant portion of LP gas users.



Our product

A device which will be able to calculate the percentage of gas remaining in the cylinder by measuring its weight.

- Consists of a weighing scale and a mobile application connected using Bluetooth
- The cylinder is continuously kept on the scale
- The mobile app will show the remaining gas percentage and other statistics about gas usage, and notify when the gas level is low
- The scale lights up LEDs with different colors depending on the gas level
- Compatible with all cylinder sizes used in households



Technical Specifications

Accuracy of gas percentage	12.5kg : 1.6% 5kg : 4%
Power supply	4 AA batteries
Power consumption	~200 mW
Dimensions of the scale	35 x 35 x 3 cm
Expected lifetime	4 years
Warranty period	1 year

- The measurements will be updated in the app once per hour whenever the mobile phone is within 10 meters of the scale.
- The mobile app will be able to store data up to one year.

Main Components

- Four half-bridge strain gauge load cells (50 kg capacity)
- HX711 load cell amplifier
- ATmega328P microcontroller
- HC-06 Bluetooth module

All these components are commonly found at an affordable cost.

Technical Feasibility

Accuracy

- Maximum error for one load cell - 0.1% of full scale
- Minimum accurate measurement - 200 g

Power supply

- All the components require 5V or less

Technical Feasibility

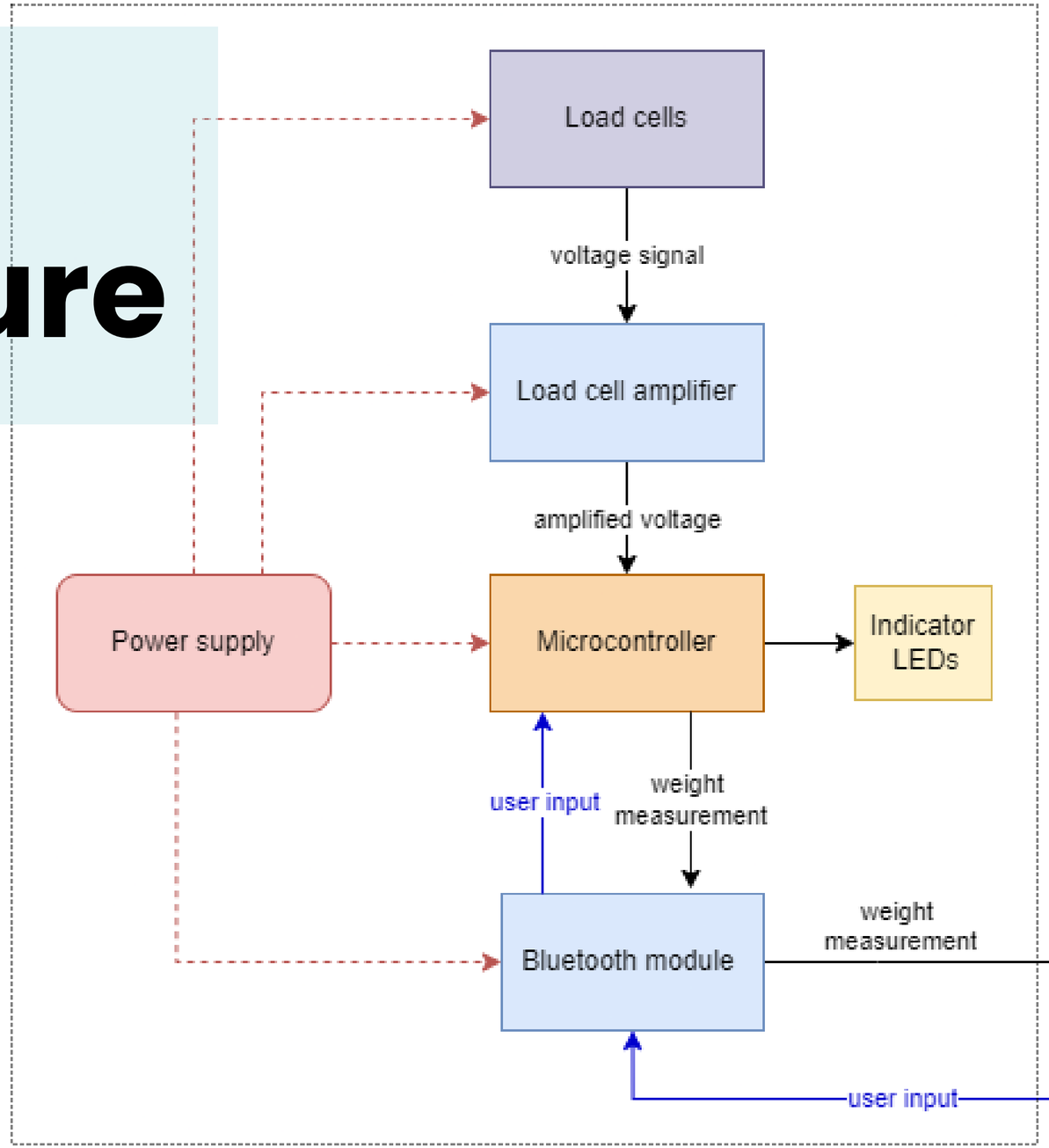
Load cell creep

- Measurement can change over time when under a constant load
- Specified as 0.1% when loaded at full capacity
- Should be negligible as the maximum expected load (30 kg) is much lower than the capacity of 200 kg
- Should stabilize eventually

Shock loads

- Effect is minimized by using higher capacity load cells than required
- Maximum safe overload force is 300 kg
- Top surface of the enclosure will be strong enough to protect the internal components
- Dropping from a height is deterred by the frame of the scale

Product Architecture

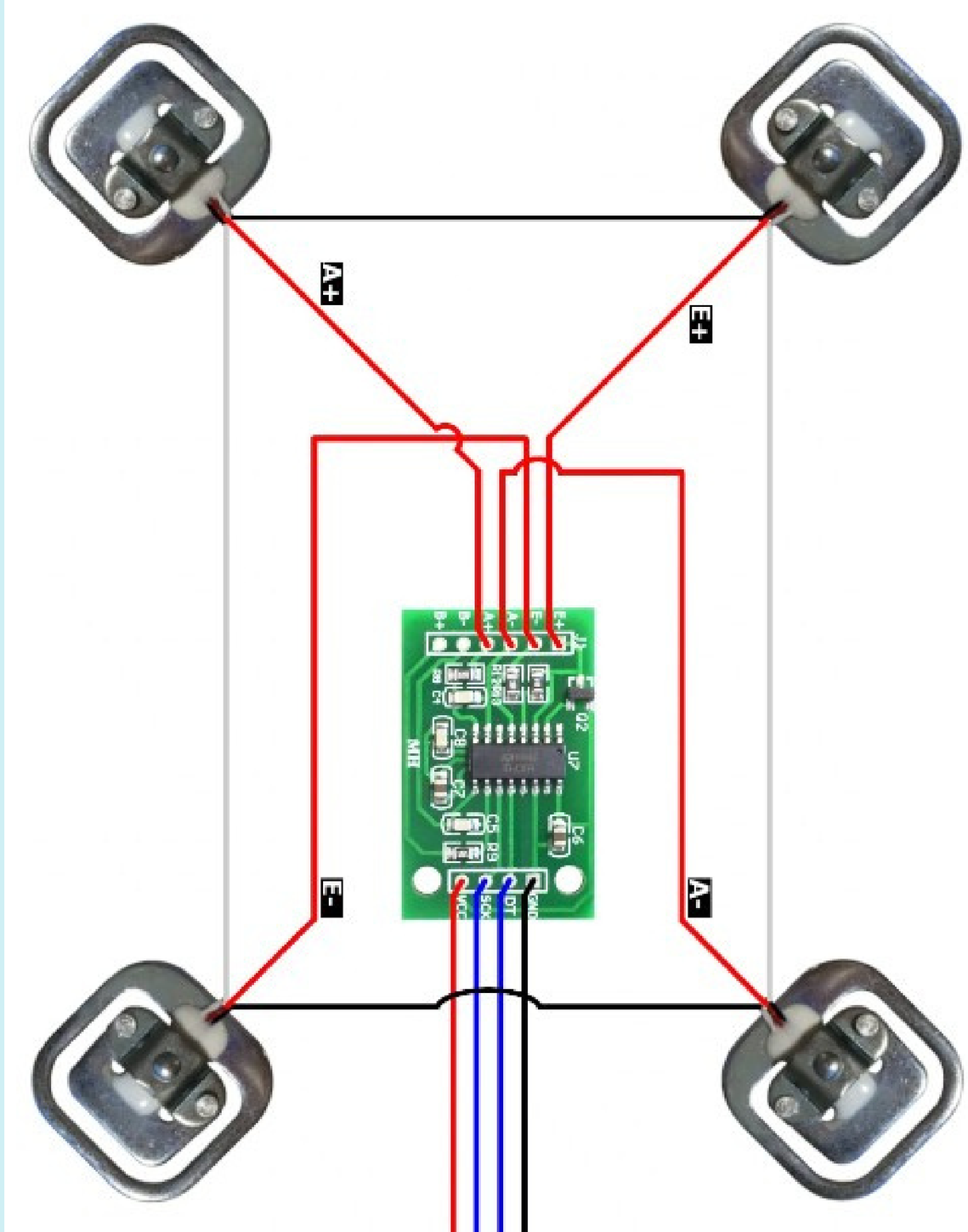


Load cells

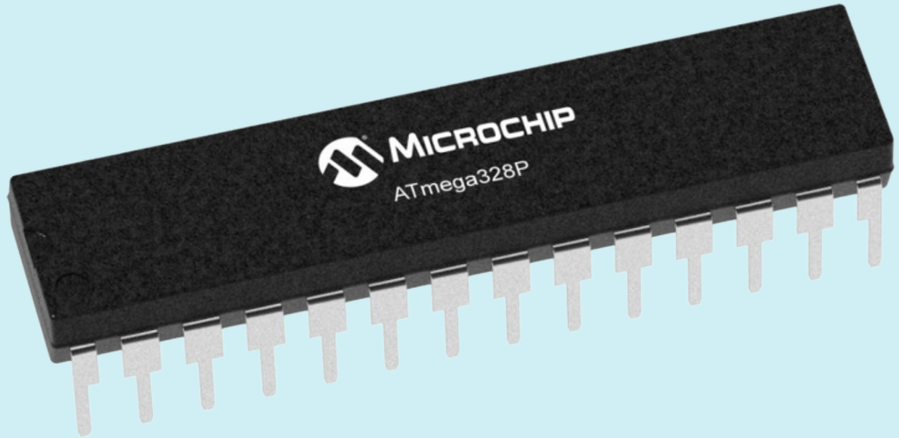
- Change output voltage proportional to the applied load
- Placed in the four corners and connected in a Wheatstone bridge formation

Load cell amplifier

- Amplifies the voltage change detected from the load cells



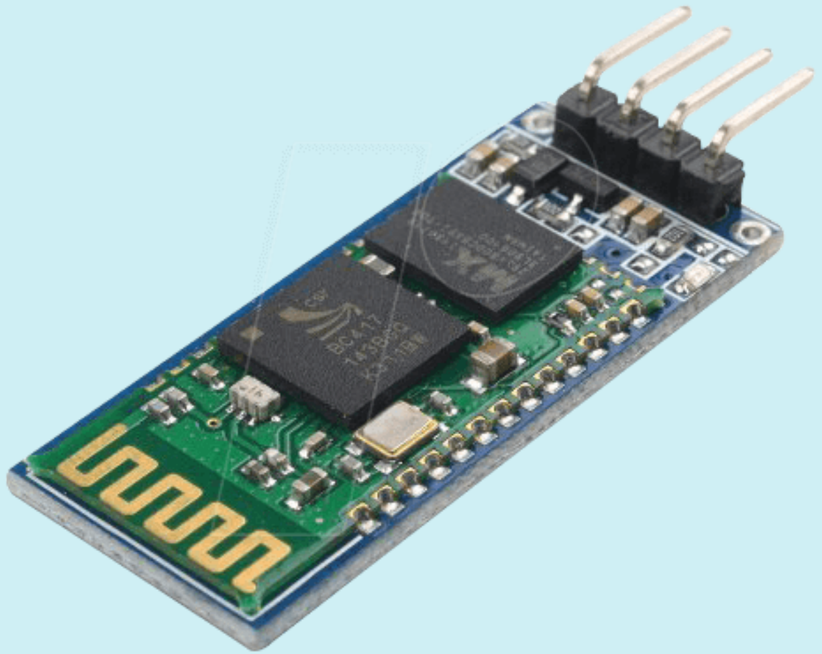
Microcontroller



- Take weight measurements once per hour
- Compensate for errors caused by load cell creep
- Calculate remaining gas percentage using weight measurement and empty cylinder weight (received from mobile app)
- Light up LEDs corresponding to the calculated gas level (low - red, half - yellow, full - green)
- Send measurement to mobile app using Bluetooth module
- Operate zero button to reset the scale

Bluetooth Module

- Send measurements to mobile app
- Receive user input from mobile app
- Operates when the phone is within 10m of the device



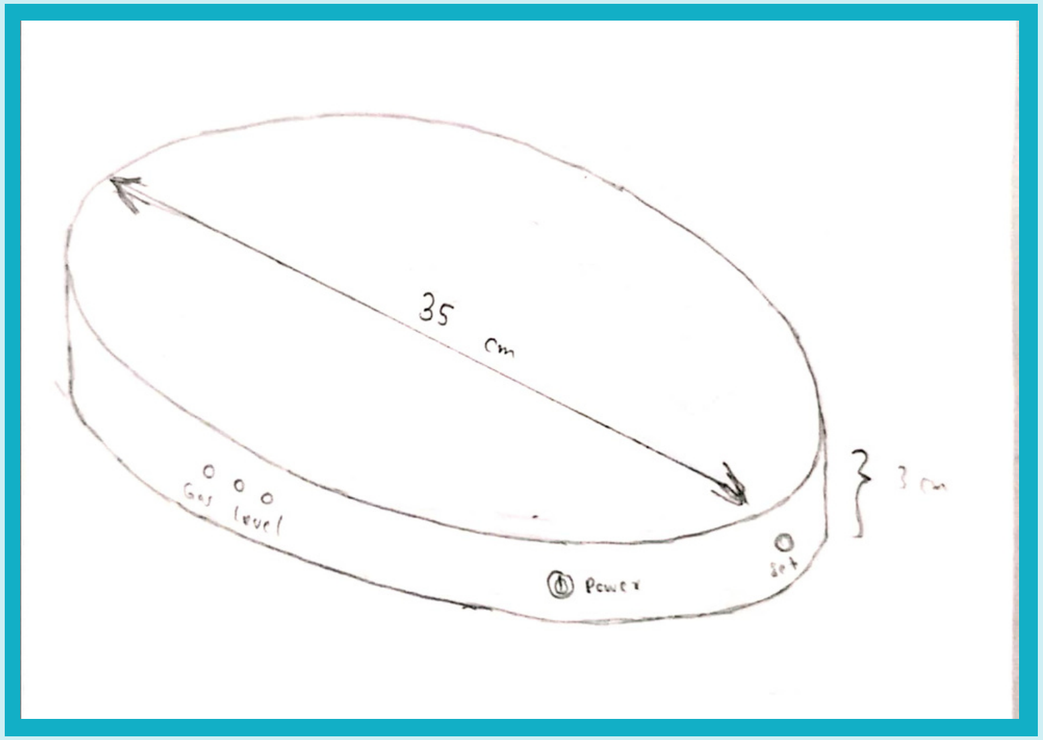
Alternative approach

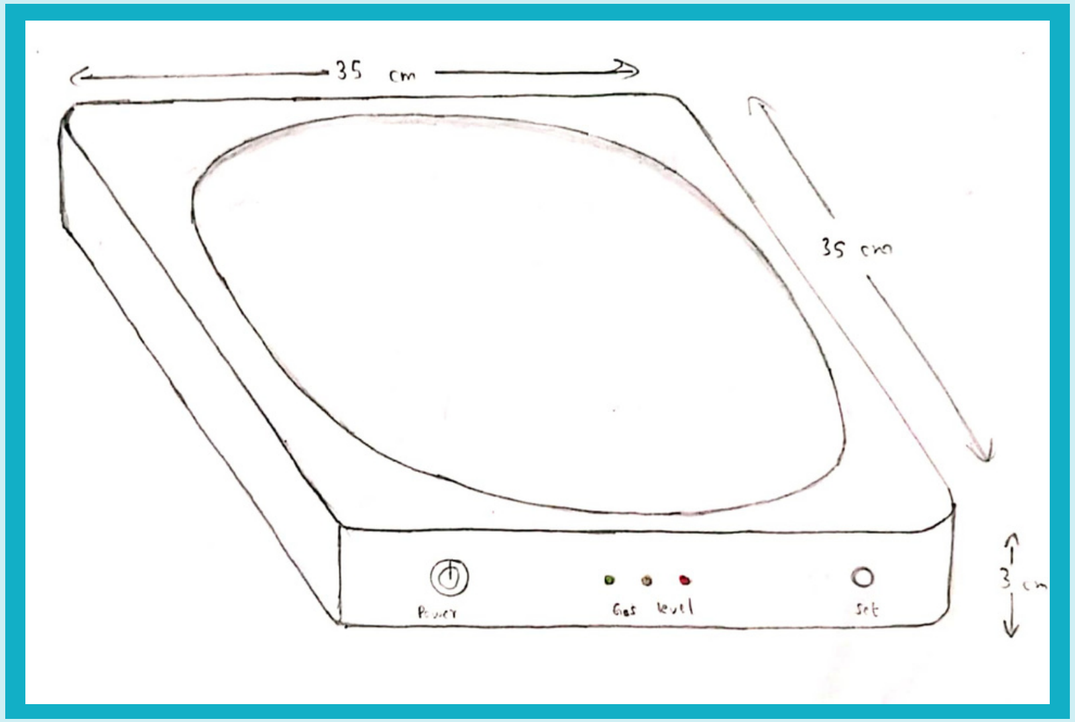
Instead of connecting to a mobile app with Bluetooth, use an LCD display with an SD card to store data

- Cost of both methods are roughly equal
- Difficult to display all statistics in a small display
- Less convenient for the user

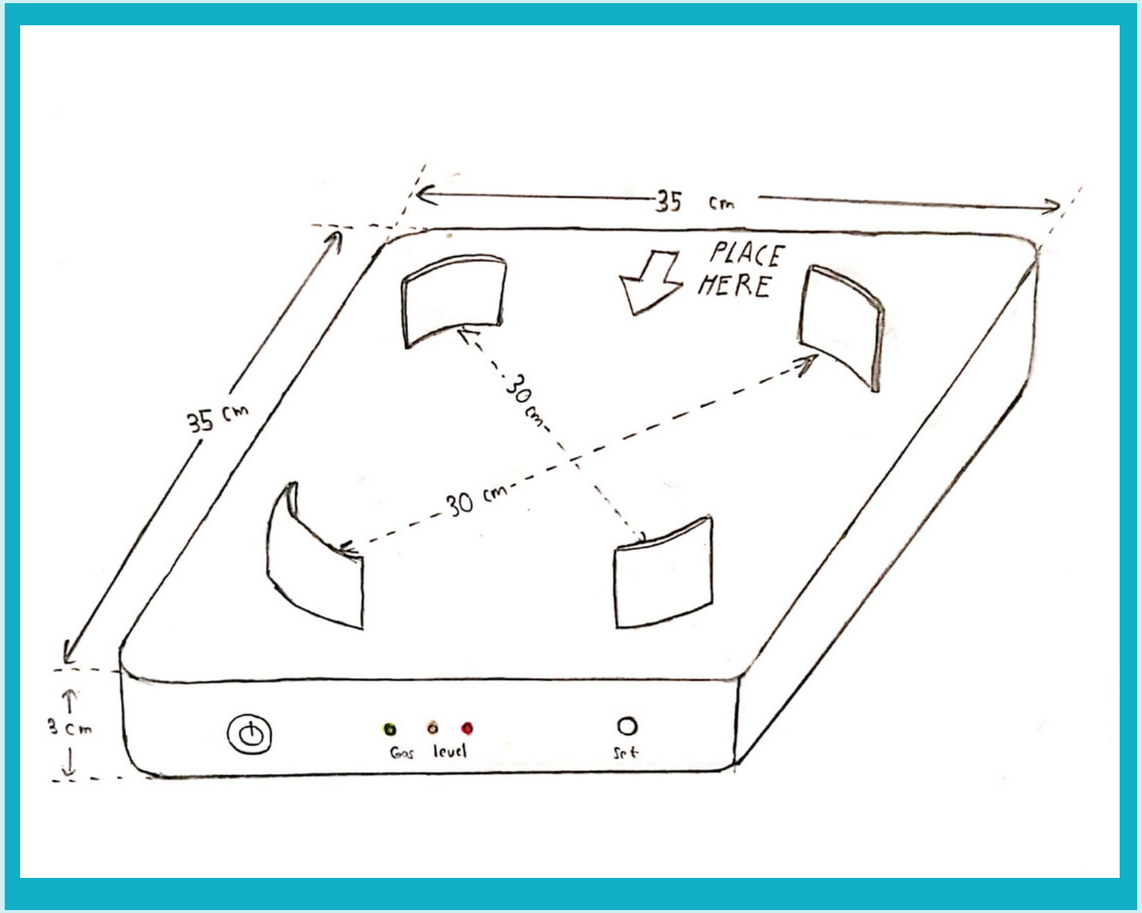
Enclosure and UI Design

Initial Ideas

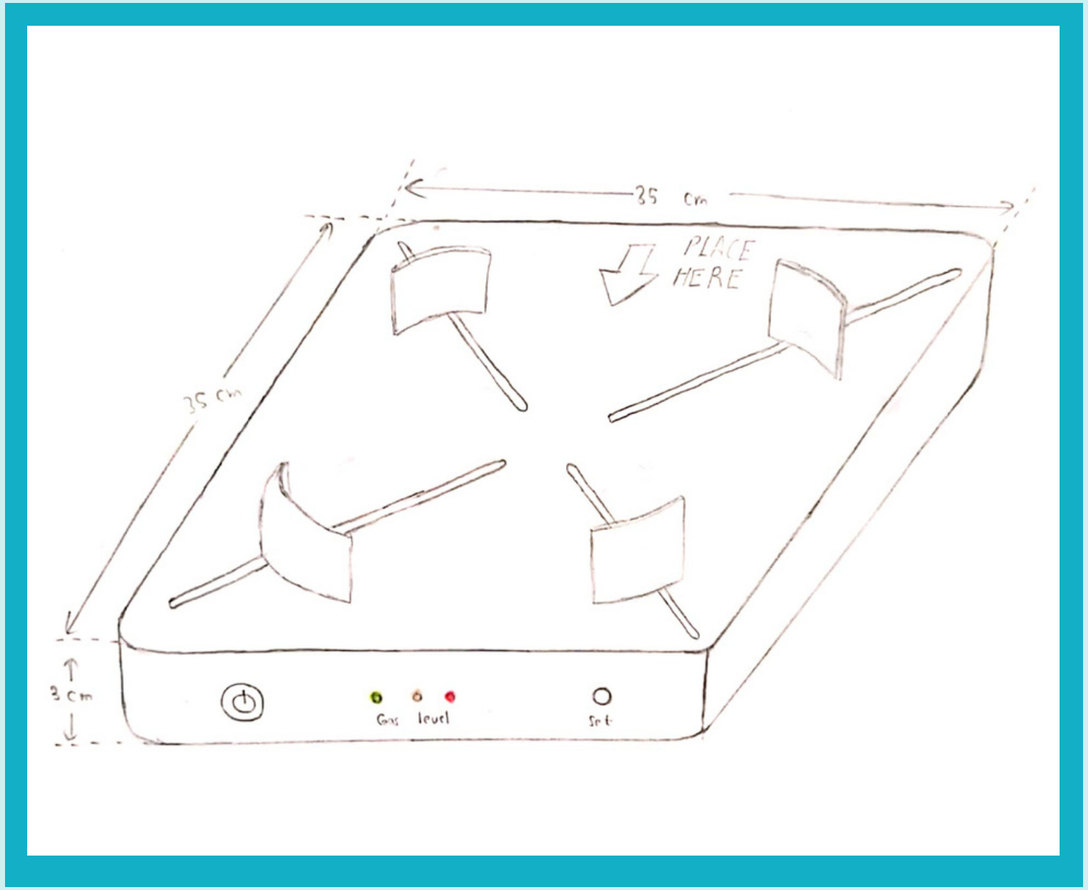




Final Sketch



Improvement



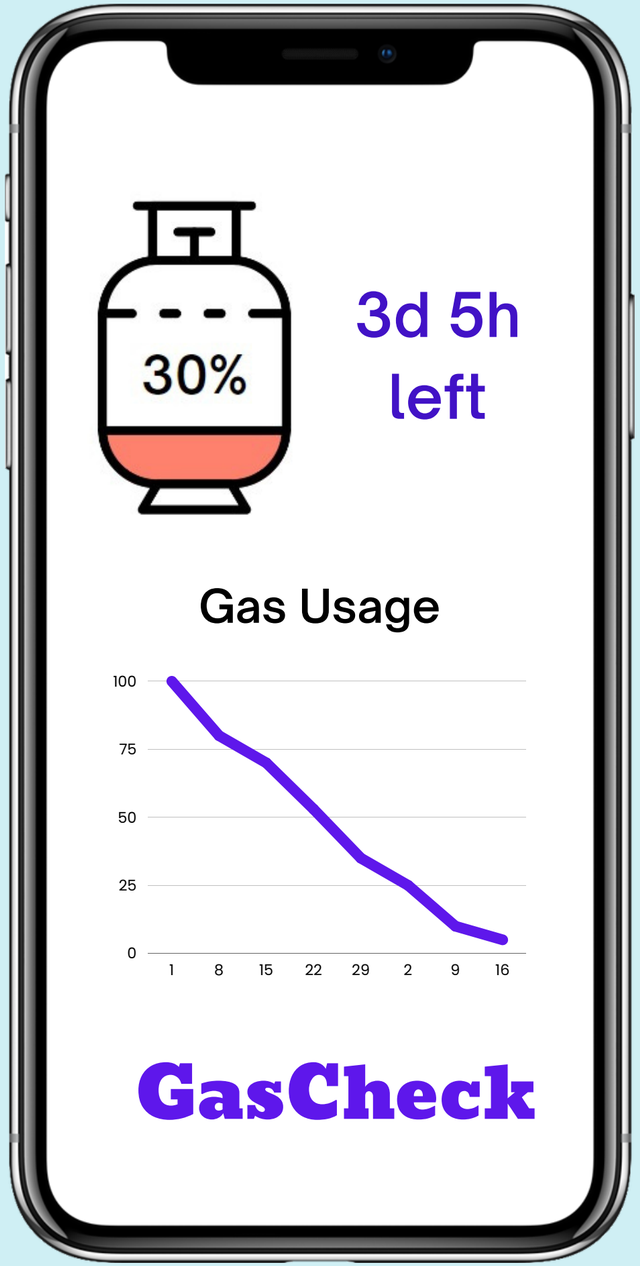
UI Design – Weighing Scale

UI Design – Mobile App

- Will show,
  - The remaining gas percentage
  - A graph of usage over time
  - Estimated time until gas runs out

- Will send a notification when gas level is low

- Will prompt the user to select the size of the cylinder when a new cylinder is detected



Project Budget

	Item	Units	Unit Price (Rs.)	Total Price (Rs.)
Scale	Half bridge strain gauge load cell	4	260.00	1040.00
	HX711 load cell amplifier module	1	340.00	340.00
	HC-06 bluetooth module	1	750.00	750.00
Interface	Push button	2	10.00	20.00
	LEDs	3	4.00	12.00
	330Ω Resisitor	3	1.00	3.00
Microcontroller	ATMEGA328P-PU	1	1800.00	1800.00
	16 MHz Crystal oscillator	1	40.00	40.00
	22pF Capacitor	2	0.75	1.50
Power circuit	LM7805 voltage regulator	1	60.00	60.00
	0.33µF Capacitor	1	1.50	1.50
	0.1µF Capacitor	1	2.00	2.00
	470Ω Resisitor	1	1.00	1.00
	PCB			250.00
	Enclosure			1500.00
Other costs for manufacturing and packaging				100.00
Total Cost				**5921.00**

Keeping a 10% profit margin, the product can be sold at **Rs. 6500**.

The manufacturing costs will be reduced by buying components in bulk.

Marketing

- The main marketing medium is planned to be social media platforms. (Posts and videos about the product will be shared on these platforms.)

- In addition to that, the product will have an official website, and advertisements can be posted on online shopping websites.

Sales

- Initially, we are planning to limit manufacturing to 20 units.

- A 15% discount can be given to encourage people to buy it.

- The product will be sold through:

1. Online stores
2. Local electronic appliance stores
3. The official website

Maintenance and Repair

- No regular maintenance, but recommended to zero the scale before placing a new cylinder
- Periodic software updates will be provided for the mobile app
- As only common components are used, it will be possible to repair the device from general electronic repair centers. 1 year warranty will be provided.

Reuse of Components

- The load cells are likely to be the point of failure
- In that case, the more expensive electronic components such as the microcontroller and Bluetooth module can be taken out and reused.
- The metal parts of the enclosure can be recycled and used for other purposes.

Thank you