DYNAMIC DUSTERS

C9 - LUKE BEAUSOLEIL, NICK MARTINS, HARRISON MEEDS, MICHAEL MEKALOPOLOS

PROBLEM STATEMENT

A need exists for a safe, cost-effective dust detection system that can pre-emptively measure varying industrial quantities of both organic and sedimentary dust and record this information periodically. This process should be easily maintained without substantial risks or changes to brewery operations.

WHO CARES?

Mill Street Brewery Wants:

- Pre-emptive Detection
- Low Maintenance
- Cost Effective

Mill Street Brewery Has:

- No pre-emptive detection
- High Maintenance

We will **save** Mill Street Brewery **time** and **money**

OUR SOLUTION

Design Criteria	Priority
Pre-Emptive Dust Reading	1
Ease of Operation	2
Cost-Effective	3
Handleability of all dust qualities	4
Safety	5
Applicability or current process	6

WHY US?

- Easy Installation
  - Only need to modify one pipe
- Low Maintenance
  - Empty dust bag one time per day
- Easy Error Catching
  - Load sensors can be easily tested

A different solution already exists!

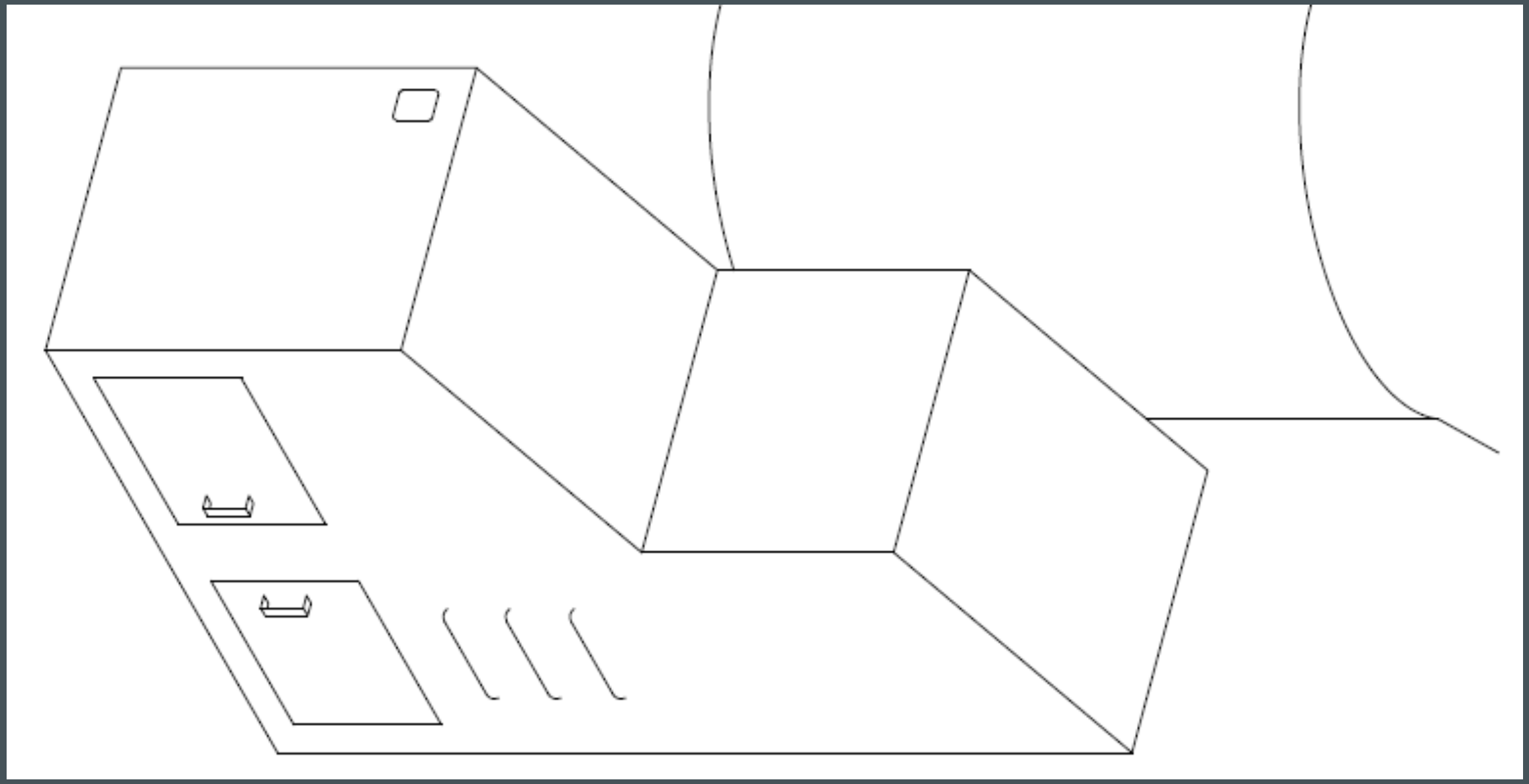
- Requires **constant vacuuming** in the **entire silo**
- Consumes **drastic amounts of power**
- Costs upwards of **$10000**

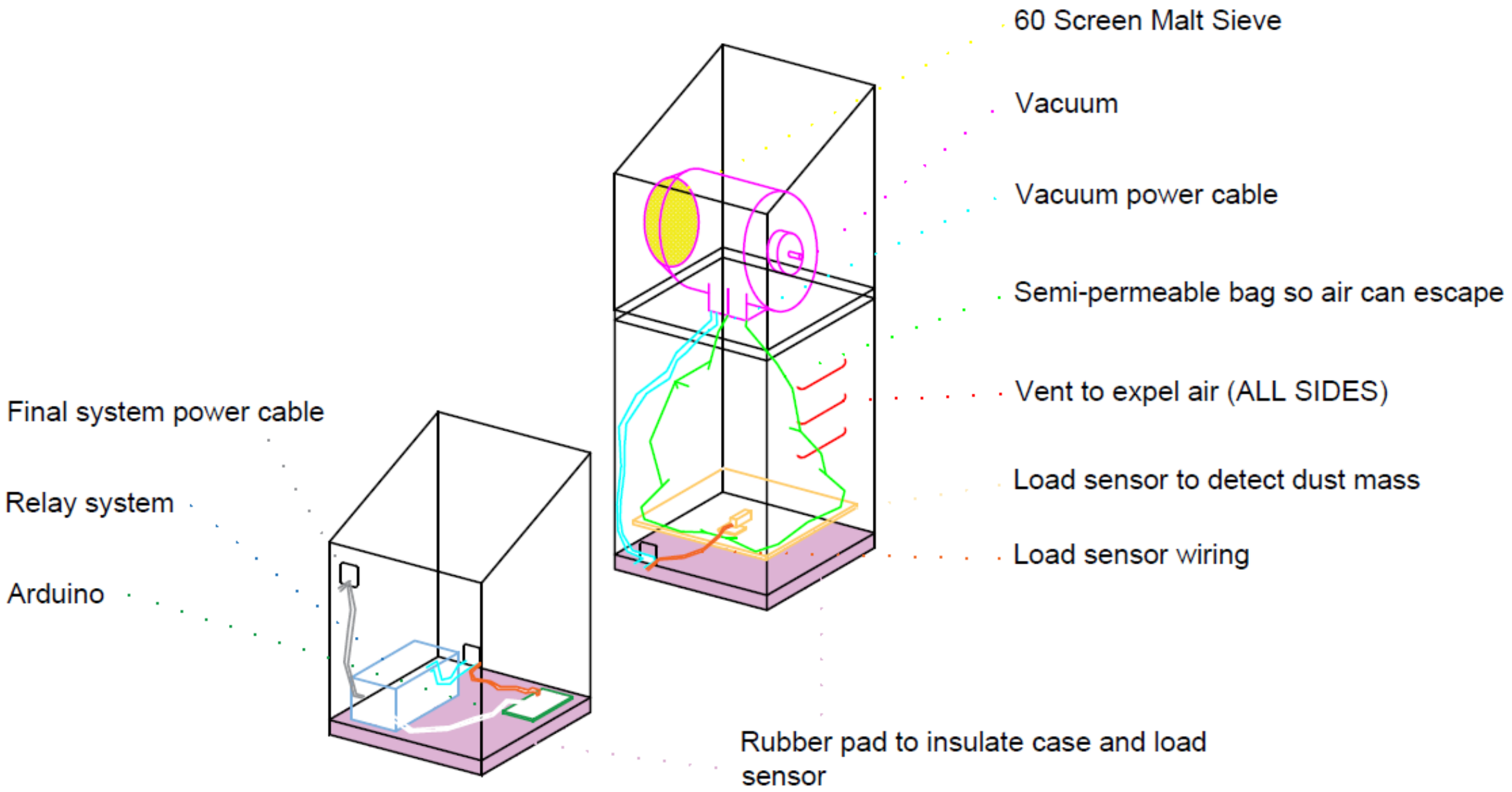
Our solution **fixes** all these problems!

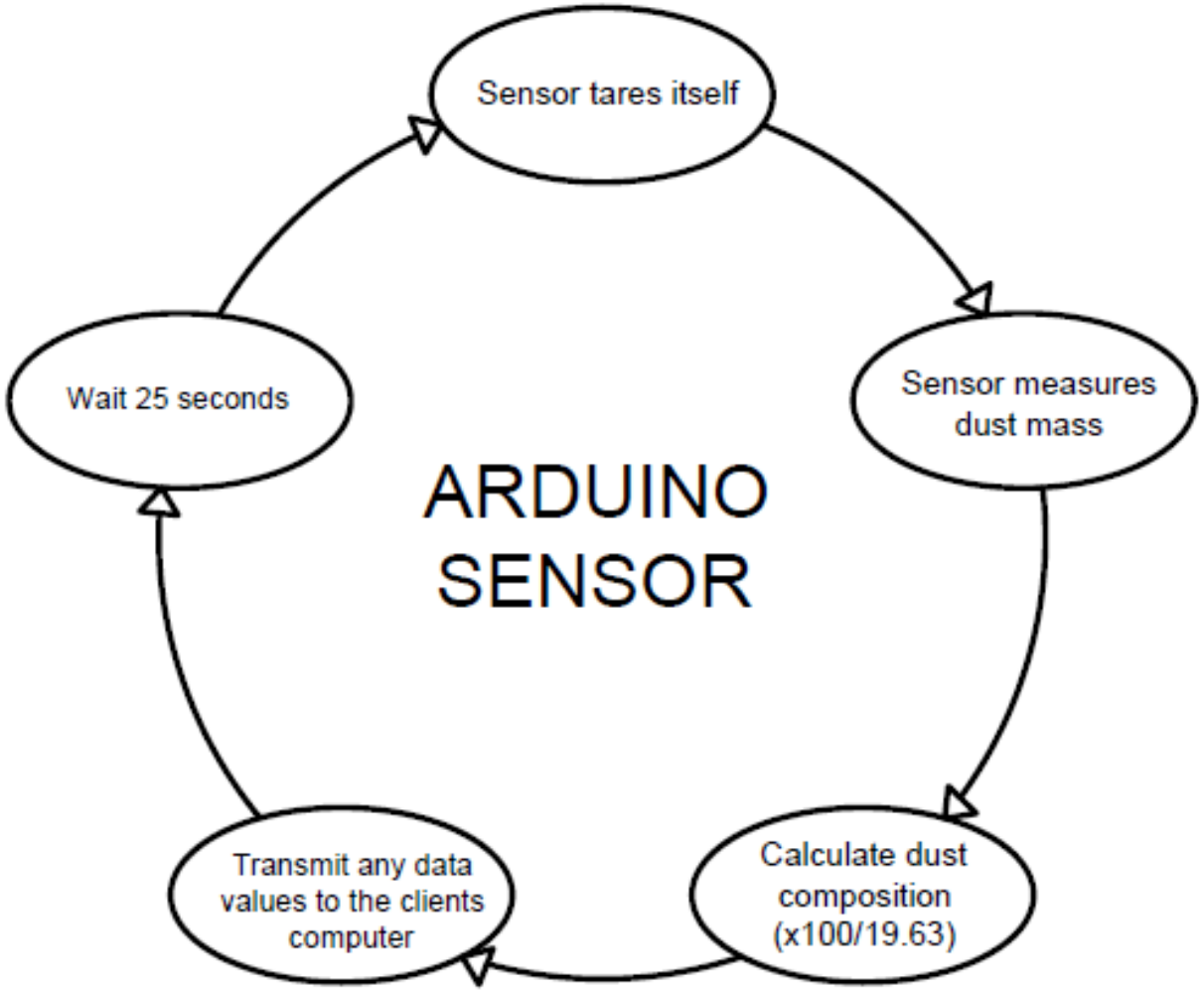
- Requires **1/6th of the vacuuming**
- Consumes **much less power**
- Costs **$600**

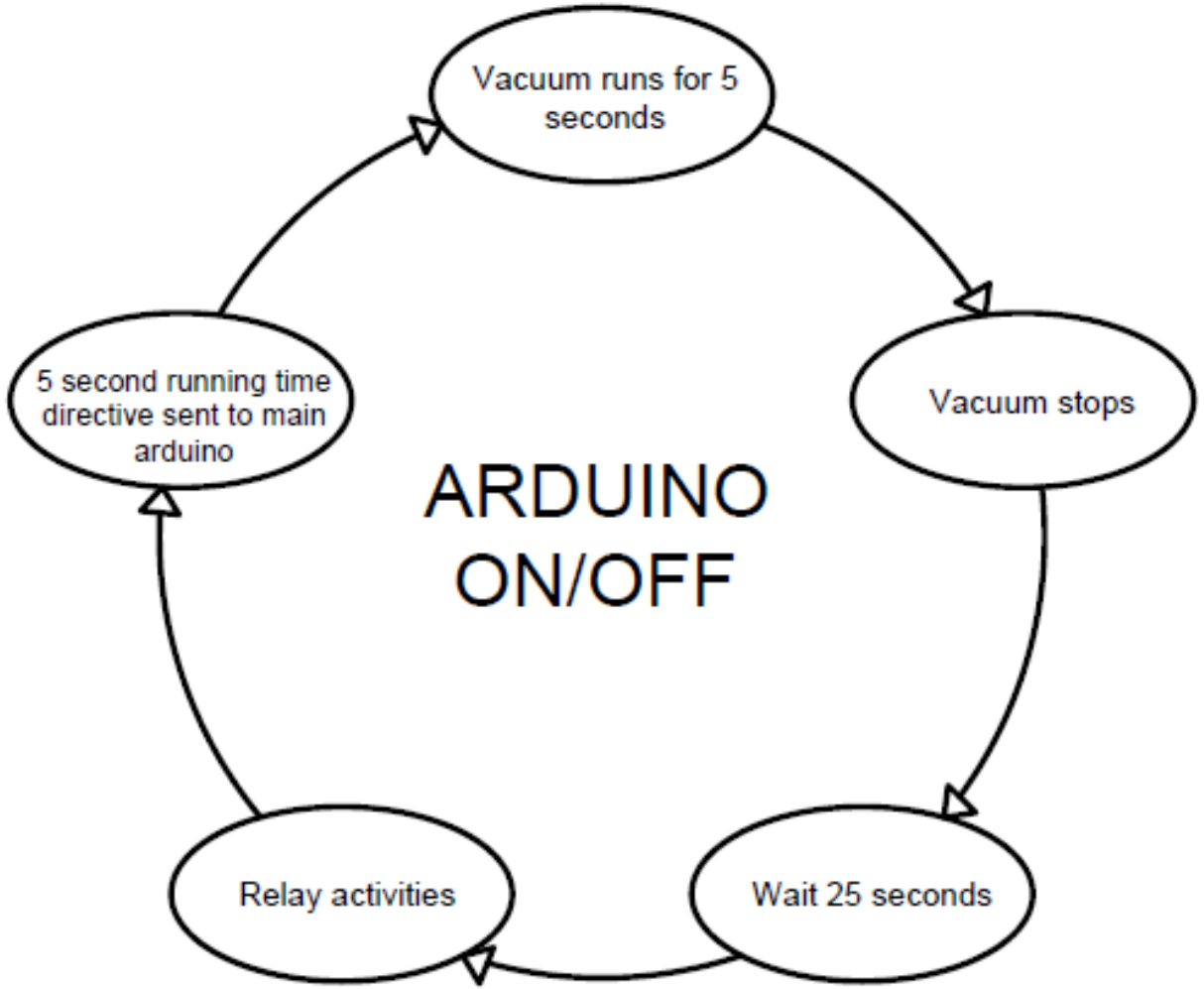
COST ESTIMATE OF FULL-SCALE DESIGN

SUBSYSTEM	PART	COST ESTIMATE
Dust sensor system	Malt Sieve	≈ $ 90
	Vacuum	≈ $ 200
	Dust bag	≈ $ 25
	Load sensor	≈ $ 35
Computer software/hardware	Arduino	≈ $ 55
	Wiring	≈ $ 8
	Relays	≈ $ 20
Protective casing	Outer case (Galvanized Steel)	≈ $ 100
	Insulation (Silicone Rubber)	≈ $ 67
		≈ $ 600




60 Screen Malt Sieve
Vacuum
Vacuum power cable
Semi-permeable bag so air can escape
Vent to expel air (ALL SIDES)
Load sensor to detect dust mass
Load sensor wiring
Final system power cable
Relay system
Arduino
Rubber pad to insulate case and load sensor


Sensor tares itself
Sensor measures dust mass
Calculate dust composition (x100/19.63)
Transmit any data values to the clients computer
Wait 25 seconds
ARDUINO SENSOR


Vacuum runs for 5 seconds
Vacuum stops
Wait 25 seconds
Relay activities
5 second running time directive sent to main arduino
ARDUINO ON/OFF

Our solution

Design Criteria	Priority
Pre-Emptive Dust Reading	1
Ease of Operation	2
Cost-Effective	3
Handleability of all dust qualities	4
Safety	5
Applicability or current process	6