UAV CH_4 DETECTION AND CAPTURE SYSTEM

TEAM: 62

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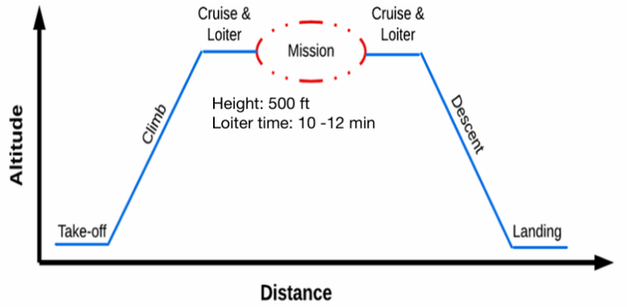
- **Elevator Pitch:** Governments and the oil and gas industry face significant challenges in safely capturing and controlling methane emissions. Our UAV-based solution addresses this by utilizing advanced suction technology to capture methane directly from leak sources, even in remote environments. This innovative system detects leaks and actively helps minimize emissions, offering a safer, more effective way to tackle methane management.

- **Specification:**

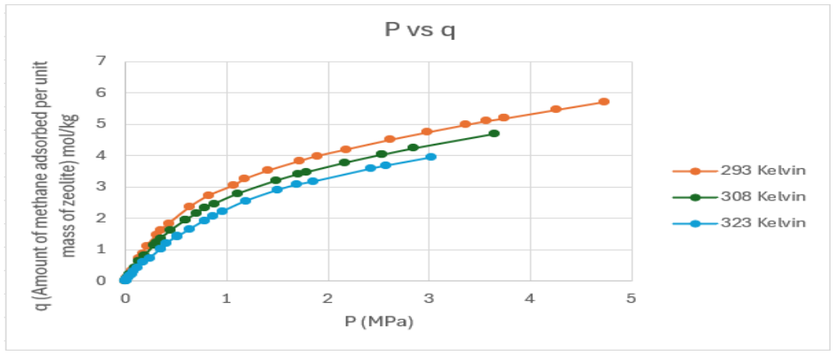
Maximum Endurance	15 min
Loiter Speed	10 m/s
Maximum Range	9 km
Thrust to Weight Ratio	(1.4-2)
Zeolite Powder Capacity	250 g
Maximum Payload	5000g

- **Constraints:**
  - Budget under 8000 SAR
  - Flight height <= 500 ft
  - Lack of experience in programming and electric circuit design

- **Mission Profile**



- **Effect of the temperature on the adsorption:**



- **Prototype (SOLIDWORKS)**

- **Equation:**

Freundlich Isotherm gas phase relation:

$$\frac{x}{m} = K \times P^{(\frac{1}{n})} = q \qquad (1)$$

The surface of zeolite covered by methane:

$$\Phi = \frac{K_A P_A}{1+K_A P_A+K_B P_B+ K_C P_C} \qquad (2)$$

- **Validation**

Specifications	Outputs calculations	Results
Endurance	15 min	15.8 min
Maximum Range:	9 km	9 km
T/W	1.4 - 2	1.5
Zeolite capacity	250 g	300 g

- **Conclusion:**

This study proposed a UAV-based system for methane detection and capture, combining advanced sensors for precise hotspot identification with zeolite-based adsorption for efficient methane reduction. The system offers a scalable solution for mitigating methane emissions in diverse environments.