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# Portable AC With Peltier Modules



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Team: Mobile AC  
060

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## INTRODUCTION

Heat stress significantly impacts productivity in industrial fields, particularly during hot weather when front-line workers operate in brief intervals. Traditional mobile AC units fail due to their need for direct electric power. Our solution is a mobile, battery-powered air conditioner using a thermoelectric Peltier element, which provides efficient cooling without a compressor. This lightweight module generates temperatures down to  $-20^{\circ}\text{C}$  and up to  $120^{\circ}\text{C}$ , powered by a simple 12V DC input. Developing this prototype requires expertise in mechanical, electrical, chemical, and industrial engineering, along with raw materials.

## IDENTIFICATION OF CONSTRAINTS:

The weight will be less than 20 kg

The hoses will handle up to  $120^{\circ}\text{C}$

The noise will be less than 50 dB

Battery full charge time less than 60 min

## TARGET SPECIFICATION

### Functionality

- Work Time more than 30 min
- Ambient Temperature less than  $65^{\circ}\text{C}$

### Casing

- Weight less than 20 Kg
- Durable can stand 50N

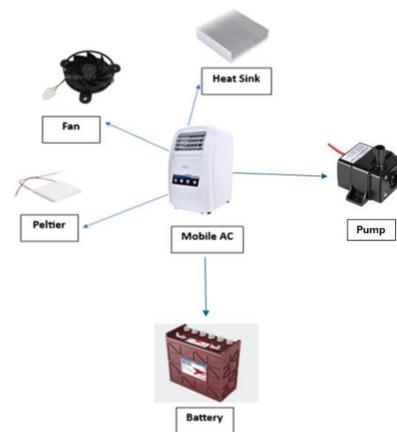
### Regulations

- noise less than 40 dB
- Compliance with Codes and Regulations

## OUR OBJECTIVES

- ❖ Develop a portable, energy-efficient air conditioning system using Peltier modules, focusing on reliability and mobility.
- ❖ Provide a versatile cooling solution tailored for the industrial, camping, and agricultural sectors to meet their diverse cooling needs.
- ❖ Aim to exceed customer expectations and set new industry standards by adhering to strict engineering and quality benchmarks.

## PROTOTYPE DESIGN



## TESTING

### Functionality Testing

Cooling Performance:

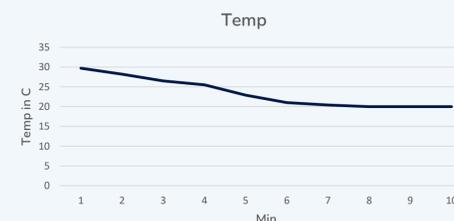
Measure the temperature drop achieved in a controlled environment.

The temperature dropped in the targeted area by  $10^{\circ}\text{C}$ , which was a satisfying result.

System Testing:

Evaluate noise levels generated during operation.

The noise that the prototype produced is 30 dB, that result was more than enough for our targeted specifications.



### Durability Testing

Environmental Stress Testing:

Prototype exposed to temperatures ranging from  $-5^{\circ}\text{C}$  to  $40^{\circ}\text{C}$  for 2 hours. No significant damage or performance degradation observed.

The prototype is subjected to heavy vibration for 5 minutes simulating transportation conditions or rough use. No malfunctions detected.

## VALIDATION

Specification	Result
Work Time more than 30 min	Testing Duration: 30 minutes for majority of tests, No malfunctions detected
Ambient Temperature less than $65^{\circ}\text{C}$	The heat produced by the prototype did not exceed $50^{\circ}\text{C}$ .
Weight less than 20 Kg	The weight of the prototype is 16 kg.
Durable can stand 50N	The prototype withstood durability tests without significant damage or deterioration in performance.
noise less than 40 dB	The noise that the prototype produced is 30 dB

The prototype passed all tests and showed results that meet the specified specifications.

## CONCLUSION

The mobile air conditioner project using the Peltier technology is anticipated to be successful due to its ability to effectively balance the detailed specifications with the practical needs of customers. By integrating Peltier technology, we aim to significantly reduce energy consumption while enhancing the overall efficiency of the device. This approach not only makes the air conditioner more environmentally friendly but also improves its portability, making it easier to transport and use in various settings. Additionally, the design focuses on user-friendliness, ensuring that the air conditioner is accessible and simple to operate for all users. This strategic alignment of technology and user requirements positions the project well for market acceptance and success.

Final Report