International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 06 | June - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Design and Development of Ice Cream Roll Machine

Prof . Rupam Thakare[1], Hrushikesh Padule[2], Swaroop Govind [3], Harsh Patil [4], Niranjan Patil [5]

[1] Mechanical Engineering, Pes Modern College of Engineering
[2] Mechanical Engineering, Pes Modern College of Engineering
[3] Mechanical Engineering, Pes Modern College of Engineering
[4] Mechanical Engineering, Pes Modern College of Engineering
[5] Prof. Mechanical Engineering, Pes Modern College of Engineering

---

Abstract - In today's fast-paced world, people love watching their food being made fresh especially when it comes to desserts like ice cream rolls. This project aims to design and develop an ice cream roll machine that is simple, affordable, and efficient enough to be used by small food outlets, cafés, and start-ups. The main idea was to create a machine that not only looks neat and compact but also performs well in quickly freezing and rolling ice cream right in front of the customer. To do this, we built a system around the vapour compression refrigeration cycle, which brings down the temperature of a steel plate to around -20°C to -25°C. We focused on choosing the right materials, like mild steel for the frame and a suitable refrigerant and compressor to meet the cooling requirements. Every part of the machine from the cooling system to the design of the frame was developed with performance, safety, and ease of use in mind.

***Key Words*:** Ice cream roll machine, instant freezing, vapor compression system, cooling plate, rolled ice cream, low-temperature refrigeration.

1. INTRODUCTION

Ice cream rolls, also known as stir-fried ice cream, have become a trending dessert enjoyed by people of all ages. What makes them exciting isn't just the taste, but the experience of watching the ice cream being made right in front of you fresh, fast, and fun. This trend has opened new doors for small food businesses and street vendors looking to offer something different. However, most available ice cream roll machines in the market are either too expensive or not designed with local needs in mind. That's where our project steps in to design and build a machine that's affordable, efficient, and suitable for small-scale operations.

Our aim was to create a simple yet reliable system that uses a vapour compression refrigeration cycle to rapidly cool a flat metal surface, allowing the user to spread and roll the ice cream mixture with ease. We focused on designing a strong and stable frame, selecting appropriate components like the compressor and refrigerant, and ensuring that the machine is easy to use and maintain. The end result is a functional prototype that not only meets technical requirements but also brings joy to users through a hands-on, live dessert-making experience.

2. Body of Paper

1.1 Methodology

To bring this ice cream roll machine to life, we began by understanding the basic requirements of how rolled ice cream is made mainly the need for a freezing surface that quickly cools the mixture to below -20°C. We selected the vapor compression refrigeration system for its reliability and efficiency. Based on cooling load calculations, we chose the right compressor, condenser, capillary tube, and refrigerant. The freezing plate was made from stainless steel for good thermal conductivity. The frame was fabricated using mild steel to ensure strength and durability. Once all components were assembled, we tested the machine for its cooling performance, ice cream roll quality, and ease of operation. Adjustments were made wherever needed to improve efficiency and usability, making the final product ready for real-world application

1.1.1 Problem Identification and Market Survey

During our initial research, we noticed a growing demand for unique and interactive dessert experiences especially rolled ice cream, which has gained popularity in street food markets, cafes, and live dessert counters. However, most of the ice cream roll machines currently available in the market are either too expensive, bulky, or imported, making them less accessible to small businesses and local vendors. Many users also reported issues with slow cooling, high power consumption, and difficult maintenance.

Table-1: Cost and Feature Comparison Between Traditional and 3D Printed Plaster Casts

Parameter	Student Project Model	Market Model
Total Cost	Rs.15,000	Rs.45,000 Rs.80,000 (depending on brand)
Compressor Type	Medium-capacity, locally sourced	Branded, high-efficiency compressor
Refrigerant Used	R134a	R410a / R404a (eco-friendly options)
Cooling Plate Material	Stainless Steel (Grade 304)	Stainless Steel or Aluminum Alloy
Cooling Time to -20C	Approx. 57 minutes	Approx. 23 minutes
Frame Material	Mild Steel (painted)	Stainless Steel / Powder-coated steel
Automation Level	Manual operation	Semi-automatic or fully automatic
Power Consumption	Moderate (approx. 400500W)	Lower to moderate (energy-efficient models)
Maintenance Cost	Low (DIY possible)	Moderate to high (depends on brand)
Availability of Spare Parts	Easily available locally	Brand-dependent, sometimes imported
Portability	Moderate	Moderate to High (with trolley options)
Target Users	Students, startups, small vendors	Commercial ice cream parlors, franchises
Customization Option	High (can modify freely)	Low (fixed design)
Warranty / Support	None (self-built)	12 years warranty with service

1.1.2 Requirement Specification

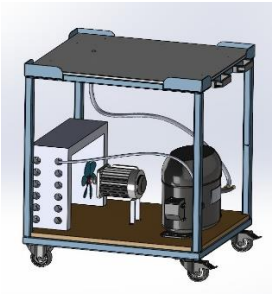
To successfully design and develop an ice cream roll machine, it was important to first identify all the key requirements both functional and non-functional that would make the machine practical, efficient, and suitable for real-world use. Our focus was on creating a cost-effective, easy-to-use machine that could consistently deliver good performance without being too complex for small vendors or beginners.

Functional Requirements

- The machine should be able to lower the plate temperature to at least **-20°C** in a short time.
- It must use a vapour compression refrigeration system for effective cooling.
- The cooling plate should have enough surface area to allow rolling of at least two to three ice cream servings at a time.
- It should be manually operated with basic electrical controls (e.g., ON/OFF switch).
- The machine should be able to run on standard 230V AC power supply.

1.1.3 Conceptual Design

The basic idea behind our design was to build a machine that could instantly freeze and roll ice cream right in front of the customer just like the popular street-style dessert stalls. At the heart of the concept is a flat, stainless steel plate that gets extremely cold using a vapour compression refrigeration system. We designed the frame to be strong but simple, using mild steel, and arranged the components (compressor, condenser, capillary, and evaporator) in a compact layout under the plate. The goal was to keep the machine affordable, easy to use, and efficient, while still delivering the exciting, hands-on experience of making fresh ice cream rolls.



1.1.4 Material Selection

Choosing the right materials was an important step in our project, as it directly affects the performance, durability, and cost of the machine. We focused on using materials that are locally available, affordable, and suitable for food-related applications.

For the cooling plate, we selected Stainless Steel (Grade 304) because it's food-safe, rust-resistant, and has good thermal conductivity, which helps the plate cool quickly and evenly. The frame of the machine was built using Mild Steel due to its strength, easy availability, and good weld ability making it ideal for supporting the weight of the refrigeration components and the plate.

We used copper tubing for the refrigerant lines because copper has excellent thermal conductivity and is widely used in refrigeration systems. For insulation, we chose thermocol and foam sheets, which help retain the cold temperature and improve energy efficiency. Standard PVC-coated electrical wires and **s**witches were used for safety and easy installation of the electrical circuit.

Overall, our material choices balanced performance, safety, and budget all while ensuring the machine is easy to build and maintain using commonly available parts.

Table 2: Bill Of Material

Sr. No.	Component	Material Used	Quantity	Approx. Cost (Rs.)
1	Compressor	Reused / Local	1	3,000
2	Condenser Coil	Copper	1	1,200
3	Capillary Tube	Copper	1	300
4	Evaporator Plate	Stainless Steel (304)	1	2,500
5	Refrigerant (R134a/R290)	Gas	1 cylinder (small)	500
6	Frame Structure	Mild Steel	1	2,000
7	Insulation Material	Thermocol, Foam	As required	300
8	Wiring and Switches	PVC-coated wires	1 set	400
9	Fan (for condenser)	Plastic/Aluminum	1	300
10	Welding and Fasteners	Electrodes, Bolts, Nuts	Set	500
11	Paint and Finishing	Enamel Paint	1 can	350
12	Labor and Miscellaneous	-	-	1,500
	Total Estimated Cost			Rs. 15,000

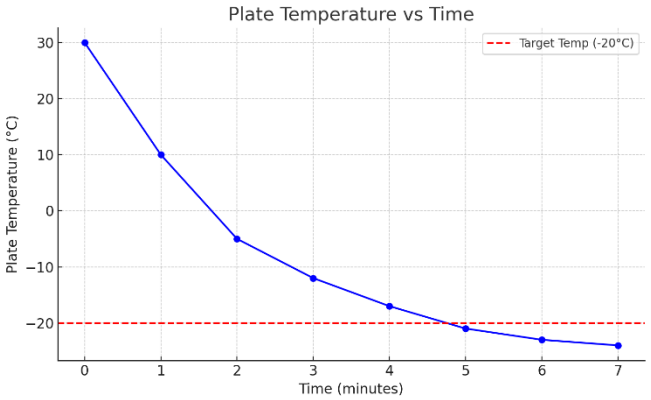
1.1.5 Fabrication

The fabrication of our ice cream roll machine involved turning our design into a working prototype using simple tools and locally available materials. We started by cutting and welding mild steel sections to form a strong frame that could hold all the components in place. Once the structure was ready, we mounted the compressor, condenser, and evaporator plate, carefully connecting them with copper tubing to complete the refrigeration circuit. The stainless steel cooling plate was then fixed on top, ensuring proper insulation underneath using thermocol and foam. Finally, we added basic electrical wiring for the fan and compressor, and applied a protective coat of paint to the frame. The entire process was hands-on and gave us a deeper understanding of assembling a real-world mechanical system within a student budget.

2.1.7 Finalization

After assembling and testing all the components, we made a few final adjustments to ensure the machine worked smoothly and efficiently. We checked for any leaks in the refrigeration lines, secured all fittings, and tested the cooling plate to make sure it could consistently reach the desired low temperatures. We also fine-tuned the insulation and made sure the electrical wiring was safe and properly connected. Once the machine successfully produced ice cream rolls during trials, we gave the frame a finishing touch with paint and labeling. At this stage, we were confident that our machine was ready for demonstration both functionally and in appearance.

1.2 PERFORMANCE ANALYSIS



ACKNOWLEDGEMENT

We would like to express our heartfelt gratitude to our project guide, Prof. R. M. Thakare, for being a constant source of guidance, encouragement, and support. His thoughtful feedback, patience, and expertise helped us stay on the right track and made a huge difference at every stage of this journey.

Our sincere thanks go to all the faculty members and staff of the Mechanical Engineering Department at PES Modern College of Engineering. Their support, access to labs, and overall positive environment gave us the space and resources we needed to bring our ideas to life.

We sincerely appreciate the help of the lab assistants and workshop staff who supported us during the fabrication process. Special thanks to our classmates and friends for their encouragement, feedback, and teamwork.

REFERENCES

1. C.P. Arora, Refrigeration and Air Conditioning, Tata McGraw-Hill Education This book helped us understand the principles behind the vapour compression refrigeration cycle and the functioning of different components.

2. R.K. Rajput, Thermal Engineering, Laxmi Publications. We referred to this for understanding heat transfer, refrigeration basics, and thermal insulation.

3. S.S. Rattan, Theory of Machines, McGraw-Hill – Used to understand mechanical component design and vibration-free structure planning.

4. Khurmi & Gupta, A Textbook of Machine Design. Referred for selecting mechanical parts and safe design parameters.