International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 10 Issue: 04 | April - 2026 SJIF Rating: 8.659 ISSN: 2582-3930

DESIGN AND FABRICATION OF A HOT & AMBIENT WATER FILTER

Shreya R.Taklikar[1], Vedant Bhosale[2], Smeet Tayde[3] Chaitanya Kotkar[4] Darren Das[5] Shravan Shinde[6]

Shreya Taklikar, Mechanical Engineering, Pillai HOC College of Engg and Technology Diploma Section
Vedant Bhosale, Mechanical Engineering Pillai HOC College of Engg and Technology Diploma Section
Smeet Tayde, Mechanical Engineering Pillai HOC College of Engg and Technology Diploma Section
Chaitanya Kotkar, Mechanical Engineering Pillai HOC College of Engg and Technology Diploma Section
Darren Das, Mechanical Engineering Pillai HOC College of Engg and Technology Diploma Section
Shravan Shinde, Mechanical Engineering Pillai HOC College of Engg and Technology Diploma Section

---

Abstract: This paper presents the design and development of a stainless steel (SS)-based water filtration system capable of treating both hot and ambient water. Conventional systems are limited to ambient conditions, reducing their applicability in temperature-variable environments. The proposed system integrates sedimentation, activated carbon, and ultrafiltration (UF) to remove impurities and microorganisms effectively. The SS construction ensures durability, corrosion resistance, and hygienic operation. A heating unit with temperature control and dual storage tanks enables efficient performance across a wide temperature range. Experimental results demonstrate consistent filtration efficiency, making the system suitable for domestic, healthcare, and industrial applications.

Keywords—Stainless steel filter, hot water filtration, ultrafiltration (UF), water purification, dual-temperature system, sustainable design

1. INTRODUCTION

Access to clean drinking water is essential for human health; however, waterborne diseases remain a major global concern due to inadequate treatment infrastructure. Conventional water purification systems are typically designed for ambient conditions, limiting their effectiveness in applications requiring hot water. **This study focuses on the design and development of a stainless steel (SS)-based water filtration system capable of purifying both hot and ambient water**. The proposed system integrates sedimentation, activated carbon, and ultrafiltration (UF) technologies to ensure effective removal of impurities and microorganisms while maintaining durability, corrosion resistance, and consistent performance across a wide temperature range.

2. LITERATURE REVIEW

The development of water filtration systems has focused on improving efficiency, durability, and sustainability. Stainless steel (SS) has gained attention due to its corrosion resistance and low maintenance. Previous studies show that SS-based filters and ultrafiltration (UF) systems can effectively remove impurities and microorganisms with high efficiency [1], [2]. Research on hot water filtration has also progressed, with systems capable of operating at elevated temperatures [3]. However, limited work exists on filtration systems that can handle both hot and ambient water efficiently [4]. This study aims to address this gap by developing an SS-based filtration system suitable for a wide temperature range.

3. FUNCTIONAL BLOCK DIAGRAM

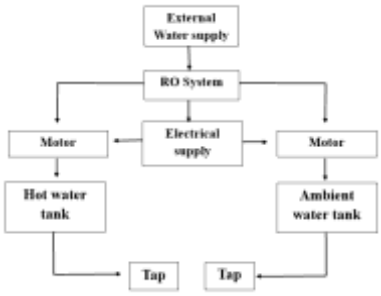

Fig . 1 Functional block Diagram

4. MATERIAL QUANTITY AND SIZE

MATERIAL	SIZE& SPECIFICATIONS	QUANTITY
1.Stainless Steel Sheet	Size: 1200x550 Thickness:1.2&2mm	1.2mm – 2 sheets 2mm – 1 sheet
2.Square Rod	Size: 25mm Thickness: 1.5	4
3. Ro System Filters	4 Filtration Process	1
4.Motor& Adapter	24v Dc	1
5.Overflow Float & Limit Switch	Fibre Plastic	3
6.Pipes	8 Meter	1
7.Taps	10 Mm	2
8.Pipe Connectors L & T Type	3mm	2
9.Drainage Wall	3mm	2
10.Heating Coil	2kw	1
11.Thermostat	30 Degree To 110 Degrees	1

Table 1.1 Material Quantity and Size

5. METHODOLOGY

The fabrication of the hot and ambient water filtration system using stainless steel sheets involves a systematic process of design, cutting, bending, and assembly. Initially, the system is designed using CAD tools to define the dimensions and layout of components. The required materials include stainless steel sheets and square rods, RO filtration units, and a motor. The manufacturing process begins with precise cutting of stainless-steel sheets using CNC laser cutting to ensure dimensional accuracy. This is followed by bending operations performed on a press die bending machine to achieve the required shapes and angles. In the assembly stage, all sheet metal panels are joined using MIG welding to form a rigid structure, ensuring proper alignment and structural integrity. The RO filtration system and other components are mounted appropriately, completing the fabrication of the system.

Assembly of body: All cut sheet panels are assembled together using welding to form a strong and durable body structure. The welding process ensures that the joints are firm, leak-proof, and capable of supporting the internal components of the system..

Assembly of tank : The tank is assembled on a support structure made of rods and side plates, providing stability and proper alignment. This setup ensures that the tank remains securely positioned during operation and can withstand the weight of stored water.

Assembly of Ro filter system :The RO filter system is assembled on the base of the filter unit and is securely fixed using a stand along with screw nuts. This arrangement ensures that the system remains stable, properly aligned, and easy to maintain..

Heater & thermostat :The heater is installed inside the water tank to heat the water efficiently, while the thermostat is positioned externally for easy visibility and control. The thermostat allows users to set and maintain the desired temperature of the heating coil.

Overflow float: Overflow floats are installed in both tanks to prevent water from exceeding the maximum capacity. These floats automatically regulate the water level, ensuring safe operation and avoiding spillage

Assembly of sensors: Sensors are assembled in both tanks to monitor water levels and control system operations. They help in automation by providing accurate feedback for efficient functioning and safety of the system.

6. DESIGN

Fig 2. 3D Model

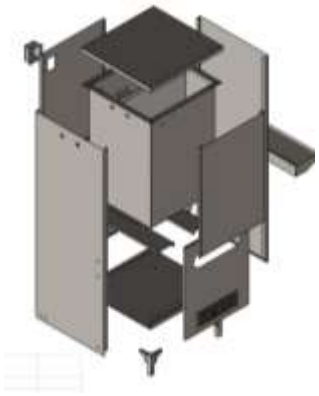

Fig 3. Exploded view of Model

The system consists of a water filtrations source, water storage hot and ambient water in tank , motor, adapter, overflow float, limit switch, pipes, taps, L & T type connectors, drainage valve, heating coil, thermostat. The diagram illustrates the unpurified water filters

from RO filtrations system to drink hot and ambient water

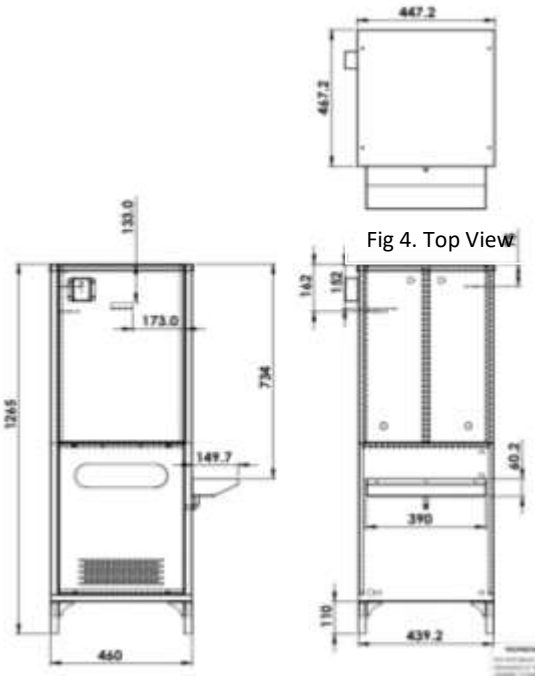

Fig 4. Top View

Fig 5. Side View Fig 6. Front View

7. CONCLUSION

The developed SS metal hot and ambient water filter has demonstrated effective performance in purifying water across a range of temperatures. The filter's combination of sedimentation, activated carbon, and ultrafiltration (UF) membrane technologies ensures removal of impurities, contaminants, and bacteria, making it suitable for various applications. The use of SS material provides durability, corrosion resistance, and ease of maintenance. Laboratory tests showed consistent water quality, meeting drinking water standards. This project offers a practical solution for providing clean drinking water in diverse environments, contributing to improved public health and well-being.

REFERENCES

1. Kumar et al. (2020). Ultrafiltration membrane filter for water treatment. Journal of Membrane Science, 604, 118-126.
2. Lee et al. (2022). Stainless steel-based water filter for hot and ambient temperature applications. Journal of Environmental Chemical Engineering, 10(3), 107-115
3. Zhang et al. (2019). Stainless steel mesh filter for water treatment. Journal of Water Process Engineering, 30, 100-108
4. Wang et al. (2018). Hot water filtration system for food processing applications. Journal of Food Engineering, 236, 109-116