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Design and Development of Hand Operated Water Resistance Mechanism

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Peer Review Information	Abstract
<i>Submission: 11 Feb 2025</i> <i>Revision: 20 Mar 2025</i> <i>Acceptance: 22 April 2025</i> Keywords <i>Cloth Dryer</i> <i>Portable</i> <i>Hand Operated</i> <i>Minimum Maintenance</i>	Now days various electrical operated machines used for clothe dryer which is very costly & hamper the environment according to various parameter. To overcome such problem suggests the hand-operated clothes dryer mechanism. It is an eco-friendly, cost-effective, and energy-efficient solution for drying clothes without relying on electricity. This device is particularly useful in areas with limited access to electrical power or for individuals seeking sustainable alternatives to conventional drying methods. The mechanism typically consists of a manually operated rotary or centrifugal system, where clothes are placed in mechanism. By turning a handle or using a pedal-driven system remove excess water from the clothes. The water is expelled through the perforations, significantly reducing drying time compared to traditional air drying. Key advantages of this system include its simplicity, affordability, and ease of use. It is lightweight, portable, and requires minimal maintenance, making it ideal for households, rural areas, and emergency situations. Additionally, the device promotes environmental sustainability by reducing dependence on electric dryers, thereby lowering carbon footprints. Overall, a hand-operated clothes dryer mechanism presents an innovative and practical approach to efficient laundry drying, catering to the needs of energy-conscious users and off-grid communities.

INTRODUCTION

A hand-operated cloth dryer mechanism is a manually powered system designed to remove moisture from clothes without relying on electricity. This mechanism is

particularly useful in areas with limited access to electrical power, for eco-friendly applications, and in emergency or outdoor situations such as camping. The system typically consists of a rotary drum, wringer,

centrifugal spinner, or air-drying crank system that extracts water from clothes using mechanical force. By using hand-powered motion, such as cranking or pressing, the user can generate enough force to remove excess water efficiently. A hand-operated mechanism is a system designed to provide controlled resistance using water as the medium, typically for exercise, mechanical testing, or fluid dynamics applications. These mechanisms leverage the natural properties of water—such as viscosity and drag—to generate resistance without the need for external power sources like electricity or motors.

This type of mechanism is commonly found in rowing machines, aquatic resistance training devices, and hydraulic systems. By adjusting the speed, surface area, or flow of water, users can control the level of resistance, making it highly adaptable for various applications. The primary advantages of a hand-operated water resistance mechanism include smooth resistance levels, low environmental impact, and minimal mechanical wear compared to traditional friction-based systems. It is increasing focus on sustainability and energy conservation, hand-operated cloth dryers serve as an innovative and practical solution for households and individuals seeking an efficient, non-electric drying method.

A hand-operated cloth dryer mechanism is necessary for energy savings, cost-effectiveness, sustainability, and practicality in various situations. Whether for off-grid living, emergencies travel, or reducing electricity consumption, this simple yet efficient device provides a valuable solution for modern households and communities.

PROBLEM OF USING TRADITIONAL DRYER MACHINE

Problems in Rural Areas:

1. Electricity Issues

- Frequent power outages and voltage fluctuations affect dryer performance.
- Some rural areas lack three-phase power, which is needed for high-capacity dryers.

2. High Energy Consumption & Cost

- Dryers consume a lot of electricity, leading to higher utility bills.

- Many rural households rely on subsidized electricity, which may not cover heavy appliance usage.

3. Limited Availability of Spare Parts & Repairs

- Rural areas often lack service centers and technicians for maintenance.
- Finding replacement parts for repairs can be difficult and costly.

4. Preference for Traditional Drying Methods

- Sun drying is free and widely used, making electric dryers seem unnecessary.
- Cultural habits and lack of awareness about dryer benefits reduce adoption.

5. Weather Dependency & Environmental Impact

- Humid or rainy areas face drying challenges, making electric dryers useful.
- However, reliance on electricity (especially from fossil fuels) increases **carbon footprint**.

Problems in Urban Areas

1. Space Constraints

- Many urban homes, especially apartments, have limited laundry space.
- Venting hot air from dryers in small apartments can be a challenge.

2. High Power Consumption & Costs

- Dryers significantly increase electricity bills, which is a concern in cities with high tariffs.
- In some areas, heavy electricity usage leads to load shedding or increased strain on the power grid.

3. Noise & Heat Generation

- Dryers produce noise, which can be disturbing in small apartments.
- Heat from dryers can make small rooms uncomfortably warm, especially in hot climates.

4. Environmental Concerns

- Urban areas face higher carbon footprints, and using electric dryers instead of air drying contributes to this.
- Many cities promote energy-efficient appliances, but traditional dryers consume more power.

5. Maintenance & Repairs

- Urban residents may rely on technicians for maintenance, but service can be expensive.
- Clogged lint filters or poor maintenance can cause fire hazards in high-density buildings.

POSSIBLE SOLUTIONS FOR BOTH AREAS

1. Use of Solar-Powered Dryers

- Installing solar dryers can be a cost-effective and sustainable alternative.
- Hybrid systems (solar + electric) can work where power is unreliable.

2. Energy-Efficient Dryers

- Using dryers with inverter technology or heat pump technology reduces power consumption.
- Government subsidies or incentives for energy-efficient appliances can help affordability.

3. Improving Rural Electrification

- Strengthening rural electricity infrastructure (such as voltage stabilizers) can help.
- Community-based drying facilities powered by renewable energy could be introduced.

4. Awareness & Training

- Conducting awareness programs on proper dryer use and maintenance.
- Setting up local repair and service centers to ensure availability of spare parts.

5. Promote Energy-Efficient Dryers

6. Encourage Hybrid Drying

- combining solar drying with electric dryers

7. Use Community Drying Centers

in rural areas to reduce individual ownership costs.

8. Develop Compact & Vent less Dryers

for urban apartments.

9. Raise Awareness on Proper Maintenance

to extend dryer lifespan and improve efficiency.

ANALYSIS OF WATER DRYER TIME

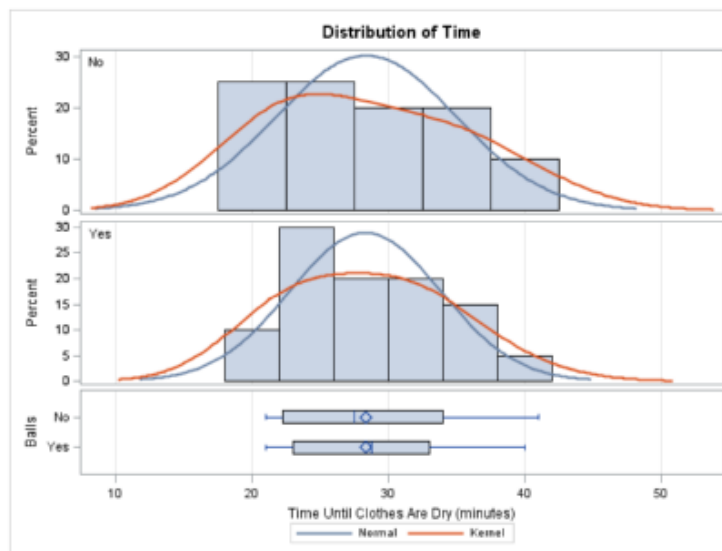


Fig (1). Water dryer time

WORKING HAND OPERATED CLOTH DRYER MACHINE

A hand-operated clothes dryer machine is a manually powered device used to remove excess water from clothes after washing. It is an eco-friendly, cost-effective, and electricity-free alternative to traditional electric dryers, making it ideal for rural areas, off-grid homes, and areas with unreliable power supply. Uses a crank handle or foot pedal to twisting mechanism applied, forcing water out through centrifugal force. Using these

mechanism we can easily put the cloth between hooks of the mechanism, after that using less effort easily twist the cloth using hand or foot. These mechanism easily provide the cloth of 60-70% in dry condition. These working similarly to a salad spinner but for clothes. These mechanism is made from hollow metal equipment so it is easily portable and suitable for small home, apartment also

FEATURES OF HAND-OPERATED CLOTHES DRYER MACHINES

1. Manual Spinning Mechanism
2. Lightweight & Portable
3. Removes water efficiently, reducing drying time.
4. No Electricity Required
5. Limited Drying Capacity

ADVANTAGES OF HAND-OPERATED DRYERS

1. **Saves Energy** – No electricity needed
2. **Eco-Friendly** – Reduces carbon footprint.
3. **Affordable** – Lower cost than electric dryers.
4. **Easy to Maintain** – No complex parts, minimal repairs needed.
5. **Faster than Air Drying** – Removes excess water, speeding up sun drying.

CHALLENGES & LIMITATIONS

1. **Manual Effort Needed** – Requires physical strength to operate.
2. **Limited Load Capacity** – Cannot dry large loads at once.
3. **Not 100% Dry** – Only removes excess water; clothes still need air drying.
4. **Availability Issues** – Fewer models available in the market compared to electric dryers.

CONCLUSION

Hand-operated clothes dryers offer a simple, eco-friendly, and cost-effective solution for drying clothes, especially in areas with limited electricity access. They work by using manual spinning mechanisms to remove excess water, making them a great alternative to electric dryers. While these machines are energy-efficient, affordable, and easy to maintain, they require manual effort and have a limited drying capacity. They do not fully dry clothes but significantly reduce drying time, making air-drying faster and more efficient. Overall, hand-operated dryers are ideal for rural households, off-grid living, and eco-conscious users, providing a sustainable and practical solution for laundry drying. With improvements in design and availability, they can become an essential household tool, promoting energy conservation and self-sufficiency.

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