

Automatic Ink Refiller for Whiteboard Markers – Detailed Research Project

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1. Introduction

In every classroom, whiteboard markers are one of the most frequently used teaching tools. Teachers rely on them to explain concepts, draw diagrams, and write instructions. Every day, our teachers use and dry out their markers, then refill them with small bottles made of plastic and packaged in cardboard. This daily waste adds up to hundreds of bottles and cardboard pieces, along with messy refilling and wasted ink.

To solve this issue, we created an Automatic Ink Refiller, a small, smart, and easy-to-use device that refills the marker with ink without any mess or technical difficulty. Our prototype is simple and cost-effective, made from wood and household tools, yet it is based on strong engineering principles. This project promotes sustainable practices by reducing plastic waste and extending the life of regular whiteboard markers.

2. Project Objective

The main goals behind this innovation are:

- To automate the process of refilling whiteboard markers used in schools.
- To prevent classroom disruptions due to dry markers.
- To reduce plastic waste by refilling existing markers instead of throwing them away.
- To create a low-cost, eco-friendly, and easy-to-use tool for schools and coaching centres.
- To encourage young students like us to think about real-life problems and solve them using Creativity and technology.

3. Materials Used (with Explanation)

Wood (for structure): Acts as the strong and eco-friendly base of the refiller. It supports all the parts and gives the model its shape.

Foam (Goam): Attached to the bottom of the marker holder to prevent leakage of ink and soak up excess drops. It also keeps the marker upright and securely in place.

Pipes: These thin pipes carry ink from the storage containers to the markers. Two are used for two ink colours (such as black and blue).

Plastic Ink Bottle: These act as ink reservoirs. They are filled with whiteboard marker ink and placed in a way that allows gravity to help in flowing ink downward.

Nozzle Valves (Taps): Fitted on the pipes to control how much ink flows into the marker. The teacher or user can twist open or close the valve like a tap.

MSeal/Adhesive: Used to fix the foam and pipes securely to the wood without any leakage or movement.

4. How the Model Works (Working Principle)

This model uses the principle of gravity-based ink refilling, combined with manual control using nozzles.

Two ink containers are fixed above the base, each containing different colours (for example, black and blue).

From each container, a pipe goes downward and ends near the marker holder.

The ink flows due to gravity through these pipes.

The nozzle or tap is opened slightly to allow the right amount of ink to flow.

When a dried-out open marker is kept under the end of the pipe, the ink slowly flows into the marker's cartridge drop by drop.

The foam at the base helps in holding the marker in the correct position and absorbs any ink that may spill.

5. Design & Structure of the Prototype

The base is made using a strong, lightweight wooden board, shaped like a small platform.

Two ink bottles are fixed at the top or on the side, kept at a higher level so gravity helps in the ink flow.

A pipe from each bottle is connected through a small hole that leads to the marker slot.

The nozzle on each pipe can be turned on or off, just like a tap, to control the flow of ink.

The foam sheet at the bottom acts like a sponge – it soaks up any extra ink and holds the marker snugly.

This design ensures that there is no leakage, no ink wastage, and the refilling is smooth.



6. Advantages of the Model

Eco-friendly: Less plastic waste, as markers are refilled, not thrown away.

Easy to Use: Teachers can easily refill markers during break time without any special training.

Cost-saving: Schools spend less money buying new markers repeatedly.

Dual-colour Refilling: Two separate pipes mean black and blue markers can be refilled using the same device.

No Ink Mess: The foam prevents leakage, and the nozzle gives full control over ink flow.

Customizable: Can be scaled for more colours or adapted for different marker sizes.

7. Challenges Faced and How We Solved Them

Ink is leaking out of the pipe: We added a foam pad at the base and tightened the joints with adhesive.

Difficulty in controlling ink flow: Used nozzle taps that allow us to regulate how much ink goes into the marker.

8. Real-Life Use & Applications

This model is highly useful in various educational and work settings:

In Schools: Teachers can quickly refill dry markers without waiting for new ones.

In Coaching Centres: Saves cost for privately run centres by using fewer markers.

In Offices: Helps in board meetings where whiteboards are used daily.

In Libraries/Study Rooms: Can be placed where students use whiteboards for learning.

9. Future Scope and Innovations

We have many ideas to improve this model in future:

Add sensors that automatically stop ink flow when the marker is full.

Add a digital display to show how much ink is left in the container.

Use Arduino-based automation to make it fully automatic.

Use 3D printing or recyclable plastic to make the design more professional and eco-friendly.

Add refilling indicators, sounds, or light signals for easy use.

10. Final Conclusion

Our project on the Automatic Ink Refiller is a unique solution to a common everyday problem faced by teachers and students. It is based on simple science but can make a big difference in the classroom. With more development, this model can be turned into a real-life product that helps schools become more efficient, sustainable, and organised.

It promotes the idea that even small inventions can solve big problems, and encourages young students to think innovatively using basic scientific concepts.

11. Acknowledgement

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