

Review On Automatic Green Board Cleaner

Harshal Bramhankar¹✉, Vaibhav Thawari², Mahesh Marathe³, Prathamesh Chintawar⁴,
Dinesh Burkunde⁵, Aryan Wankhade⁶

^{1,2,3,4,5,6} UG Students, Department of Mechanical Engineering, Jawaharlal Darda Institute of Engineering and Technology, Yavatmal -445001, Maharashtra, India

✉ Corresponding author email: harshalbramhankar456@gmail.com

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Abstract: The "Automatic Green Board Cleaner" is an innovative solution designed to automate the labor-intensive task of cleaning green boards, commonly used in educational institutions. This paper provides a comprehensive review of existing technologies and methodologies for automatic board cleaning, highlighting their efficiency, limitations, and practical applications. Key areas of focus include the mechanical design, control mechanisms, and energy efficiency of such systems. Additionally, this review explores the integration of advanced technologies like sensors and automation to enhance operational effectiveness. By addressing current challenges and identifying future research opportunities, this study aims to contribute to the development of more reliable and user-friendly automatic green board cleaning systems.

Keywords: Efficiency, Mechanical Design, Limitation.

1.0 Introduction:

Education is one of the most important aspects of the modern world and is often considered the currency of the 21st century. In many schools, the traditional blackboard, which uses chalk, is still a primary teaching tool.

Sonia Akhter et. al. [1] have considering the system is in use and the teacher

wants to rub the board. When the teacher switch on the supply, current is passed to the 18V adapter and then it passes through Arduino. This ARDUINO provides signal to the driver module at a specific time interval. To drive the motor a DRIVER MODULE (L293D) has been used. It receives the signal coming from the ARDUINO & change the

polarity of the motor for which the direction of the motor changes. To sense the distance and time specified by ARDUINO, a sonar sensor is used, hence the motor rotates in both clockwise & anti-clockwise direction. Due to the rotation of the shaft of the motor, the pinion connected to it also rotates which in turn the rack moves in translatory direction along the whiteboard. A brush holder is attached to the end of the rack with a nut & bolt. To clean the white board smoothly a brush of better quality has been used which is attached to the brush holder. The brush moves from the upper portion to the lower portion of the board and get rubbed due to the friction between board surface and brush.

M Agalya Devi et. al. [2], says that the time wasted during the blackboard erasing can be utilized for much better purposes like teaching or attendance. The system is to interface the mechanical aspects of the mechanical erasing system with micro controllers so as to enhance it into automation rather than manual, using PIC micro controller to interface the board erasing mechanism. DC Motor is used for the purpose of rotating the roller that is wound with the erasing material

Dhyey Ghodasara et.al. [3] have proposed, when teachers use

chalkboards during lessons, they often have to pause their teaching to clean the board, which can disrupt the flow of their presentation. This issue can be alleviated through the use of advanced technologies, which could make the process more efficient and help address the health concerns associated with chalk dust.

However, chalk is made from a mixture of substances that can be harmful to health, leading to various diseases.

To address these issues, a new machine has been designed to erase the board effortlessly. This machine not only makes the cleaning process easier but also prevents the spread of harmful chalk dust, which can cause several health problems, including:

1.1 Eye Irritation:

This condition occurs when chalk dust comes into contact with the eyes, causing them to become itchy, teary, and irritated. Prolonged exposure to chalk dust can lead to discomfort and potentially more serious eye problems.



Figure 1: Redness in Eye

1.2 Respiratory Tract Irritation:

This condition occurs when chalk dust is inhaled, leading to irritation in the breathing organs, such as the nose, throat, and lungs. Common symptoms include coughing, sneezing, and difficulty breathing. Over time, chalk dust can accumulate in the lungs, potentially causing more serious respiratory issues.

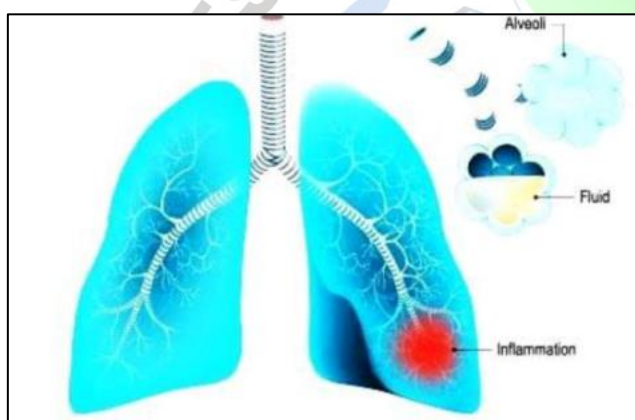


Figure 2: Inflammation in lungs

1.3 Silicosis:

This condition is caused by the presence of silica in chalk, which comes from substances like chert, flint, and diatom. When chalk dust is inhaled, silica particles can enter the lungs, causing inflammation and swelling. This leads to serious health issues such as tuberculosis, chest infections, pulmonary hypertension, arthritis, and lung cancer.

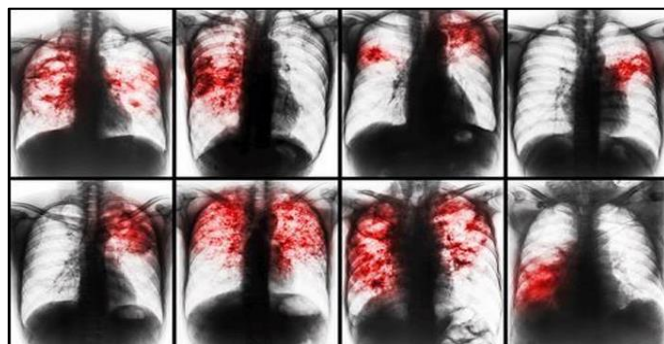


Figure 3: Impact of Silicosis

An automatic greenboard cleaner is a modern device designed to efficiently and effortlessly clean greenboards or chalkboards without the need for manual effort. The machine typically uses advanced technology, such as motorized rollers or automated brushes, to remove chalk residue from the board's surface. This eliminates the need for traditional dusters, reducing the spread of harmful chalk dust.

The automatic cleaner is often equipped with features like sensors that detect when the board needs cleaning and can operate with minimal human intervention. This not only saves time and effort for teachers and staff but also ensures a cleaner, healthier classroom environment by reducing exposure to chalk dust. It is an ideal solution for schools looking to upgrade from traditional methods to a more efficient and hygienic cleaning system.

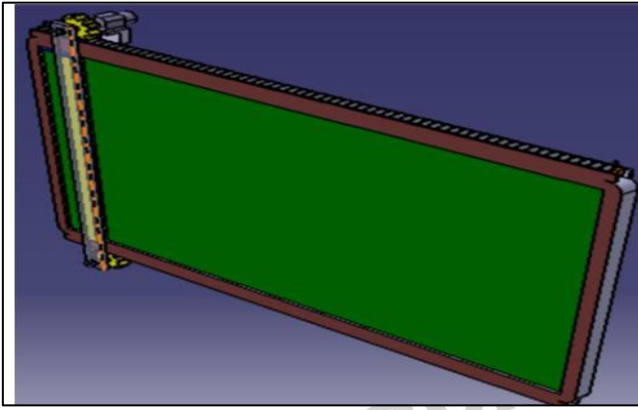


Figure 4: 3D view of the Automatic Green Board Cleaner

2.0 Literature Review:

Smith et. al. [4], In recent years, there has been growing interest in automating the process of cleaning greenboards (or chalkboards) to improve classroom efficiency, hygiene, and safety. Traditional methods of cleaning the boards with manual dusters not only pose health risks due to chalk dust but also require significant time and effort from teachers or janitorial staff. As a result, several researchers and engineers have focused on designing automatic greenboard cleaners to overcome these challenges.

Kumar et. al. [5] have been says traditional chalkboards create numerous health concerns due to the chalk dust that is released into the air during the cleaning process. Studies, such as Smith and Lillian (2018), have documented the adverse health effects, including respiratory issues, eye irritation, and long-term diseases like silicosis. Automatic cleaning systems,

which prevent the dispersion of chalk dust, offer significant health benefits. These devices use enclosed systems that trap dust particles, minimizing exposure to harmful substances. The automatic greenboard cleaner is designed to address these issues by using a sealed, dust-free mechanism, as reported by Kumar and Gupta (2019).

Sahib Singh Dhanjal et.al. [6], The author proposed a study and designed a project using a serial manipulator for the cleaning of chalkboards. The serial manipulator in this model is designed to be portable and reasonably priced, addressing the issue of expensive, fixed dusters typically attached to the board or the wall. This approach provides a more affordable and flexible solution for cleaning chalkboards, offering the benefits of automation without the high costs of traditional, stationary cleaning devices.

Mr. Tumpala Uma Santhosh et. al. [7] proposed a model of a board cleaning device that uses a DC geared motor along with a switch, guideways and wheels. In his model, he connected a gearbox with the motor shaft to another gear. These gears movement rotated the wheel axel. Simultaneously the superior and inferior wheels start revolving. Thus, the duster cleans the board automatically in a minimum period.

Dr. S. Poornachandra et. al. [8] proposed an improved system to address the drawbacks of earlier board cleaners that relied on a belt-pulley mechanism. This design features a compact, high-speed motor that rotates a plate holding the duster for efficient and smooth cleaning, controlled by a PIC microcontroller for automation. Additionally, the system incorporates an eco-friendly approach by collecting, bleaching, and recycling chalk dust to produce new chalk pieces, combining efficiency with sustainability.

Hithashree C1 et. al. [9] says that the main purpose of this chalkboard duster is to provide an attachment in the form of a power-determined erasing system for blackboards that can be placed into action by placing a switch. The requisite hardware components are as follows,

1. Chalkboard (Green or White)
2. Aluminium track
3. Nylon balls
4. DC geared motor
5. Duster
6. Wheels
7. ARDUINO

The cleaning unit consists of the aluminium track, track wheels, green or whiteboard, duster material etc. Track and wheel system consists of nylon balls which move inside the aluminium track which is "C" shaped. Duster

material is an important part of the project to clean the board. The green board is enclosed within an aluminium track and wheel arrangement for cleaning with the help of the DC motors. With the help of cable wire, the motors drive the wheel that begins to wound as the motor rotates and draws the wheel that is connected to another end of the cable. On the aluminium track holding the connecting strip with the duster connected to it by bearing arrangement, it transforms the rotary motion wheel into linear motion. The roller or the wheel rotates at high torque which is produced by the use of a geared motor. This ensures a null gap between the board and the erasing apparatus.

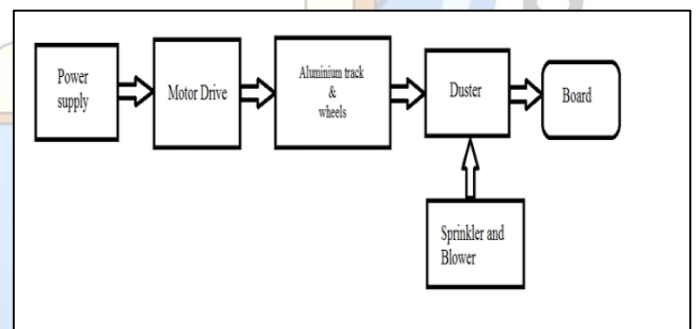


Figure 5: Block diagram of the proposed model

3.0 Conclusion:

In previous versions of the automatic board cleaner, the primary limitation was its movement being restricted to a single horizontal direction, i.e., linear motion. This design flaw prevented the system from applying sufficient

pressure on the green board, resulting in incomplete or ineffective cleaning.

A key innovation in this project is the integration of simultaneous linear and reciprocating motion, achieved through a combination of linear rails, roller bearings, and a connecting rod mechanism. This dual-motion approach ensures that the cleaner not only moves horizontally across the board but also executes a reciprocating motion that enhances the cleaning process by covering every inch of the board surface more thoroughly.

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¹²³⁴Students, VVCE, Mysore, India.

⁵Associate professor, VVCE, Mysore, India. International Journal of Innovative Research in Applied Sciences and Engineering (IJIRASE) Volume 4, Issue 3, DOI: 10.29027/IJIRASE.v4.i3.2020.695-698, September 2020.

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