

# Design and Fabrication of Automated Glass Curtain Cleaning Machine

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**Abstract:-** Glass cleaning makes the structure's architectural glass free from dust and dirt. The traditional way of drawing office windows cannot be applied to high rise windows with huge sections of glass. Cleaning the glass from outside requires special tools in going up and it's really unsafe. The window cleanser proposed is an unmanned device which would be controlled by using a microcontroller. This device would be safer compared to traditional styles of window cleaning in case of high glass structures that increases threat in loss of mortal life. Structure of the proposed device consists of a triangular frame and uses suction mug grounded adhesion fashion to cleave on the glass face. The movement of the frame and used suction mug grounded adhesion fashion to cleave on the glass face. The movement of the frame over the glass is done by using special apparel. The frame consists of an automated cleanser which is run by motors. The automated cleanser moves in perpendicular direction within the frame using the threaded shaft. Each independent robot system performs tasks similar as cleaning, moving, and handicap discovery according to each stage. A wireless communication system for stable communication between robots was proposed and applied for controlling the robot system. Vertical movement act on the frame. Each material used in the prototype was duly tested and calculated to carry the cargo of the whole prototype with the window-cleaning features. thus, it can be concluded that the semi-automated window washer prototype can be effectively used in the cleaning of windows for a high-rise structure

**Keywords:** Automated glass curtain cleaner machine, Window washer, design and fabrication, high-rise building ,Material handling system

## INTRODUCTION

The being demand for the development for the colorful service outfit to relieve beings from dangerous jobs and examination of high pipes and walls. Glass washing and cleaning makes the structure's architectural glass free from dust and dirt. The traditional way of drawing office windows cannot be applied to high rise windows with section of glass. The reason is because windows are extremely inaccessible. Cleaning the windows from outside requires special tools in going up and its really unsafe. This paper is grounded on a climbing system aimed to clean spectacles of high-rise structures, using suction mugs for clinging to the glass. The idea is to make a small window climbing robot with suction mugs which is suitable to move autonomously along the outside face of window with a fairly sufficient area and meantime clean and wash it. Traditionally cleaning of structure/ house windows is generally done manually by cleansers or specialized labor force. Although the window cleaning is easy from inside the room it isn't that easy from the outside. Cleaning of wide windows on altitudinous and multi-story structures is indeed more tedious and veritably

dangerous procedure. It needs either hosting machines for homemade cleaning or large, heavy and veritably precious automatic cleaning machines. As a result windows typically remain dirty or fine from outside which might obstruct the room inhabitant's view. rather our drawing machine can be attached to the outside to the face of a room window. Green technology leads to a better quality of life for humans. Humans try to ameliorate their quality of life by observing their girding terrain. drawing is a representative illustration of a process that improves the quality of life by precluding impurity and giving rise a feeling of wellbeing. Glass façade drawing robots are fast getting one of the crucial exploration motifs within the robotic field. The need is substantially attributed to numerous high-rise glass façade structures along with the advancement in the armature. Environmental enterprises, including a move to sustainable structures, is the motivating factor behind developing glass façade high-rise structures due to the seductive parcels of glass similar as translucency, plasticity, 100 recyclability, resistance to erosion, and energy effectiveness, among others. The enormous specialized advancements in the structure and construction assiduity are decreasingly transubstantiating the form of ultramodern high-rise structures.

## 1. Hydraulic System and Components

The hydraulic system is composed of the following factors which were delved and calibrated in connection with the robotization and mechanical system. The pure water and liquid cleaner used the same hydraulic system. The connection illustration for both the pure water and liquid cleaner hydraulic system. The factors used in the hydraulic system include pump, sock, solenoid faucets, snoots, coupling, T-tubefitting, liquid cleaner, and water holders. The experimenters used a sock that's able of transferring water and the liquid cleaner indeed if it's rolled. [Kim JasperCarandang2018]

.After examining every type of water sock, the experimenters decided to use a plastic rubber-type theater sock for the bay water in the pump which has a periphery of 0.5 elevation and a length of 3 measures from the vessel. For the outlet, the experimenters used a 10 mm rubber-type clear tubing sock with a length of 5 measures measuring from the solenoid stopcock. Since the pump needs a steady inflow for it to work efficiently, the inflow of water must continue indeed if the solenoid faucets are closed. To do that, a T-tube fitting was introduced. A T-tube befitting workshop in a way that when the solenoid stopcock is closed, the liquid will be transferred back to the vessel until the solenoid stopcock

opens again.

- DC motor
- AC motor
- Bearing
- Battery
- Frame
- Vacuum pump
- Screw rod Spur gear

## 2. WORKING PRINCIPLE



Fig 1: Horizontal façade cleaning machine

A glass curtain drawing machine is designed to clean the face of glass wall of high rise structures. It consists of a triangular metallic frame on which the slider is attached with nylon breakers. A drawing barrel along with skirmishes is fixed in such a way that the half periphery of the barrel protrudes outside the frame. Such an arrangement of the barrel doesn't allow the frame to touch the glass wall precluding from any damage being to the glass. [Muhammad Asyrafuddeen Bin Arriffinjee]2015

A threaded shaft is handed to give perpendicular movement to the slider. The nylon breakers help the perpendicular movement of the slider over the frame. The shaft is coupled to an AC motor which rotates the shaft at 60 revolutions per nanosecond using a Lovejoy coupling. The cleaning barrel is coupled to wiper motor which rotates the barrel at 50 revolutions per nanosecond. [Thein Than Tuna]2015 . The cleaning barrel is covered using a distance essence covering which is fastened to the slider. The covering is fitted with 4 snouts out of which 2 snout spray pure water and 2 snouts spot cleaner water. The force of pure water is done by using a pump which is attached to a separate tank fastened at the bottom of the frame. Pure water is scattered through the 2 snouts on the glass wall. Remaining 2 snouts spot cleaner water on to the skirmishes to insure effective cleaning.

A wiper is concentrated to the covering which is actuated by a DC motor, controlled by the microcontroller. The wimp switch is fixed to the frame and two attractions are placed at applicable positions on the slider. As the slider approaches the upper/ lower limit of the threaded shaft, the wimp shaft gets actuated

by the presence of the glamorous field. This will shoot a signal to the microcontroller which reverses the direction of the slider. drawing of the face is done in two passes. In the first pass the slider moves from bottom to top of the threaded shaft. At this time the snouts spot the cleaner water result on the glass face. In the alternate pass the slider moves from top to the bottom of the threaded shaft. The suction mugs are pushed forward towards the glass by a DC motor and the clinging is done by another motor with the help of wedges

The micro switch limits the movement of the suction mugs similar that when the suction mugs touch the glass wall, the switch gets actuated and sends a signal to the toggle switch to stop the suction mug movement.

[Mohan Rajesh Elarab,2016]

## 3. SPECIFICATIONS

### Specification of Battery

- 12V battery
- Specific energy 33[1]-42Wh/kg
- Energy density 60-110 Wh/L
- Specific power 180 W/kg
- Charge/discharge efficiency 50-95%
- Energy/consumer-price 7 (sld) to 18(fld) Wh/US\$
- Self-discharge rate 3-20%/month
- Cycle durability 500-800 cycles
- Nominal cell voltage 2.1 V
- Charge temperature interval Min. -35°C, max.45°C

### Micro DC Motor

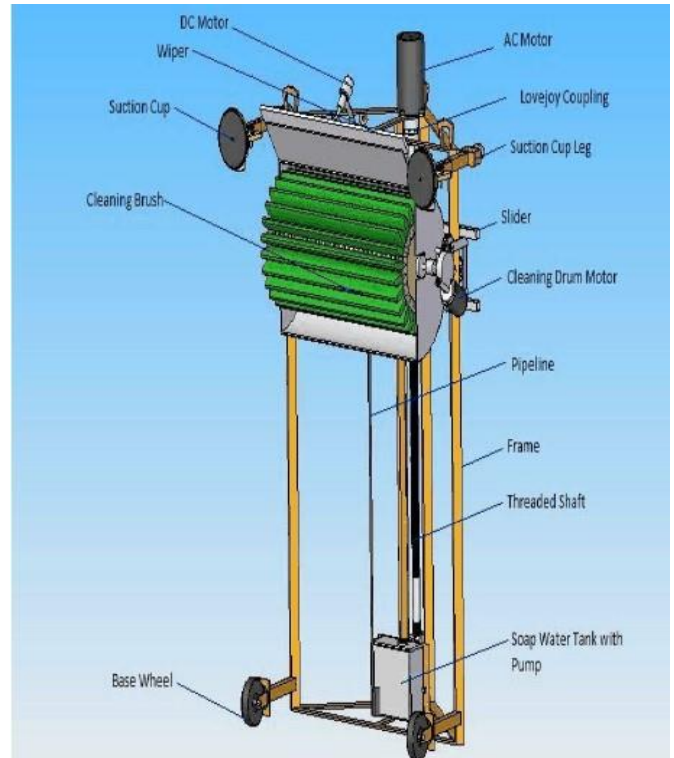


Fig 2: Automatic Glass Curtain Cleaner mechanism

1. For car or truck or bus or other Auto windows
2. With gear box

Item: CE Approved Wiped Motor Model: SF-578VA  
Voltage: 12V/24V Power: 50W  
Speed: 30rpm/50rpm  
Torque: 20N.M  
Weight= 1.3 kg

#### 4. CONCLUSION :

This contemporary design helps to overcome the limitations of the existing technologies and surpass them in terms of robot capability, modularity and payload. By integrating on the modular design the wall climbing robot are expected to attain superior intelligence to other small robots in similar caliber. The study introduced the façade cleaning system for buildings equipped with the built-in guiderail-applied curtain walls, and proposed the integrated control system for cleaning motion. To ensure the integrated control of this system, the system was connected via two wireless communication systems, and each robot system was incorporated into single integrated façade cleaning robot system by sending diverse commands.

The model that is present in the report above can be optimized as much as possible. The recommended additions are:

- The chassis can be built on a PVC polymer. This will reduce the overall weight of the system.
- The suction part can be automated using
- The suction part can be automated using
- Programmable Logic Control for the sequence of operation
- The setup can be fully automated without manual interventions
- The dusted can be collected using vacuum removal
- Image processing technique can be implied to analyse the surface cleaning efficiency using a high quality on board camera

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