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Design, Fabrication, And Field Validation Of A Low-Cost Dual-Tool Manual Siphon Water Tank Cleaning System

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ABSTRACT

This paper presents the design, fabrication, and real-world deployment of a power-free, dual-tool manual water tank cleaning system that can be easily fabricated by households at a very low cost using locally available materials. Standard mechanical pressure washers require electricity and waste excessive water, while conventional siphons lack side-wall cleaning capabilities. The proposed system resolves these limitations using two distinct modular units: (1) a 25mm foot-valve suction head integrated with a silicone-bonded cleaning brush (commonly used for washbasin cleaning) for bottom mud evacuation via the siphon effect, and (2) a flexible side-wall scraper utilizing a 25mm PVC backbone, metal rivets, hinges, and high-absorbency cotton pads. Deployed under the brand V-TECH BS, the prototype achieved Google Business Verification with 27 verified 5-Star customer ratings across 150+ residential installations.

1. INTRODUCTION

Overhead water storage tanks in residential buildings accumulate mud at the base and organic algae on the side walls. Complete drainage leads to severe water loss. Standard siphon systems fail to clean vertical walls, while electric jets pose electrical hazards and high maintenance costs. To address these issues for everyday users, a 100% manual, low-cost, two-tool mechanical cleaning kit was developed using locally available, economical materials. This enables ordinary households to fabricate and use the system at home without requiring specialized technical skills or expensive equipment.

2. SYSTEM ARCHITECTURE & FABRICATION

A. Tool 1: Siphon Bottom Mud Suction Unit

- **Core Components:** 25mm (1-inch) non-return Foot Valve connected to a flexible outlet hose.
- **Cleaning Brush Integration:** A standard washbasin cleaning brush was custom-fitted and secured directly around the suction inlet using industrial-grade waterproof Silicone Sealant.
- **Mechanism:** When operated manually across the tank floor, the silicone-bonded brush dislodges settled sediment, which is immediately siphoned out through the 25mm foot valve.

B. Tool 2: Flexible Side-Wall Algae Scraper

- **Backbone Frame:** A 25mm wide, 1-foot long rigid PVC strip.
- **Hinged Flexibility:** Mechanical hinges were fixed onto the PVC frame using metal rivets, providing multi-axis flexibility to match tank contours.
- **Scrubbing Pad:** Absorbent cotton sheets were riveted onto the hinged frame, ensuring uniform pressure distribution along curved surfaces during manual agitation.

3. WORKING PRINCIPLE

1. **One-Way Priming:** Manual pumping creates a continuous Siphon Effect ($Q = A \times v$) through the 25mm outlet hose.
2. **Modular Operation:** Tool 1 evacuates base sludge using the integrated cleaning brush, while Tool 2 separately cleans side-wall algae without requiring electricity or high water wastage.

4. FIELD VALIDATION & PROOF OF CREDIBILITY

- **Deployments:** Over 150 residential water tanks were successfully cleaned.
- **Efficiency & Affordability:** A standard 1500-Liter overhead tank was cleaned within 20 minutes using less than 10% water volume, at a negligible material cost making it highly practical for domestic use.
- **Market Validation:** Operating under V-TECH BS, the system earned a Verified Google Business Badge with 27 verified 5-Star customer ratings.
- **Proof Links:**
 - **Live Operation Video (YouTube):** <https://youtu.be/qYhkolxYKYM>
 - **Google Business Profile (V-TECH BS):** <https://share.google/zsWU9hgfftJu1szoq>

5. CONCLUSION

The V-TECH BS dual-tool tank cleaner provides an effective, highly affordable, and power-free solution for domestic tank maintenance. Because it can be easily put together using low-cost local materials (such as standard cleaning brushes and foot valves), households can build and use it independently at home. The silicone-bonded valve brush and hinged PVC side-cleaner successfully bridge the gap between theoretical fluid siphoning and practical, economical field utility.