

# DRONE-BASED VERTICAL PRESSURE WASHING ANALYSIS

## OVERVIEW

This document outlines the operational efficiency of a drone equipped with a high-pressure washing attachment (180 bar), used to clean vertical surfaces (e.g., building façades). The focus is on estimating the area cleaned per battery and per hour at different heights (10 m, 20 m, 30 m), accounting for hose weight and reduced flight time.

## BASELINE ASSUMPTION

| Parameter                                 | Value                                          |
|-------------------------------------------|------------------------------------------------|
| Pressure                                  | 180 bar                                        |
| Spray width                               | 0,7 meters                                     |
| Battery Life (Base)                       | 18 minutes (1,080 s)                           |
| Surface Orientation Vertical (e.g., wall) |                                                |
| Height Impact Rule                        | 10% battery reduction per 10 m of hose carried |
| Battery Swap Time                         | 3 minutes                                      |

## CLEANING SPEED RANGE ASSUMPTION

| Speed Level               | Speed (m/s) | Description                      |
|---------------------------|-------------|----------------------------------|
| Slow                      | 0.3 m/s     | Cautious cleaning, heavy buildup |
| Moderate                  | 0.4 m/s     | Standard dirt                    |
| Fast (Original) 0.5 m/s n | 0.5 m/s     | Light dirt, optimal condition    |

## CLEANING AREA PER BATTERY

| Height | Time (s) | Area @ 0.3 m/s (m²) | Area @ 0.4 m/s (m²) | Area @ 0.5 m/s (m²) |
|--------|----------|---------------------|---------------------|---------------------|
| 0 m    | 1,080 s  | 227 m²              | 302 m²              | 378 m²              |
| 10 m   | 972 s    | 204 m²              | 272 m²              | 340 m²              |
| 20 m   | 864 s    | 181 m²              | 242 m²              | 302 m²              |
| 30 m   | 1756 s   | 159 m²              | 212 m²              | 265 m²              |



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# UPDATED CLEANING AREA PER HOUR

Cycle time = Flight Time + 3 min

Number of Cycles = 60 ÷ Cycle Time

Area/hr = Cycles/hr × Area per Battery

| Height     | Flight Time<br>(min) | Cycle Time<br>(min) | Cycles/hr | Area/hr @<br>0.3 m/s | Area/hr @<br>0.4 m/s | Area/hr @<br>0.5 m/s  |
|------------|----------------------|---------------------|-----------|----------------------|----------------------|-----------------------|
| Up to 10 m | 16.2                 | 19.2                | ~3.13     | ~639 m <sup>2</sup>  | ~851 m <sup>2</sup>  | ~1,064 m <sup>2</sup> |
| Up to 20 m | 14.4                 | 17.4                | ~3.45     | ~624 m <sup>2</sup>  | ~835 m <sup>2</sup>  | ~1,042 m <sup>2</sup> |
| Up to 30 m | 12.6                 | 15.6                | ~3.85     | ~612 m <sup>2</sup>  | ~816 m <sup>2</sup>  | ~1,020 m <sup>2</sup> |

## DISCLAIMER

The performance figures and efficiency estimates provided in this document are based on theoretical calculations and standardized assumptions. Actual cleaning performance may vary significantly due to a range of site-specific conditions and operational variables, including but not limited to:

- Operator skill and control precision
- Surface material and level of soiling
- Environmental factors such as wind, temperature, and humidity
- Hose management and water supply configuration
- Battery condition, payload weight, and drone model variations

These values should be used as general guidance only and not as guaranteed performance benchmarks. Field testing under actual operating conditions is strongly recommended to validate performance in a specific use case.

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