JIUSI D series D50R

Solar Panel Cleaning Drone

Efficient cleaning & Unmanned safety operation & Multi-scenario Application

JIUSI | Born for cleanliness

JIUSI | D50R

Current Status and Challenges of the Photovoltaic Panel Cleaning Industry

As the global energy transition accelerates, photovoltaic (PV) power generation has become a key approach for China to achieve its "dual carbon" targets. By the end of June 2024, the total installed capacity of PV power in China reached 713 million kilowatts, demonstrating a strong growth trend. In PV power generation, the photovoltaic panels are the core components; their routine cleaning and maintenance are crucial as they directly impact the system's efficiency and lifespan. According to the "Photovoltaic Power Plant Operation and Maintenance Regulations," PV panels require regular cleaning to maintain optimal performance. Clean and unobstructed panels can more effectively absorb sunlight, thereby increasing power generation efficiency and reducing energy losses caused by dust, bird droppings, and other debris. Additionally, regular cleaning helps extend the lifespan of PV panels and lowers overall operational costs.

JIUSI | D50R

Current Status and Challenges of the Photovoltaic Panel Cleaning Industry

Photovoltaic power plant construction primarily comprises two formats: centralized and decentralized systems. Considering factors such as sunlight exposure and land costs, centralized PV plants are often sited in remote, open areas such as deserts and Gobi landscapes. Conversely, distributed PV systems are usually installed on the rooftops of various buildings, especially in industrial parks and factories. While each configuration offers its own advantages, both face significant challenges related to the cleaning of PV panels. Traditional manual cleaning methods are inefficient and pose safety risks, making it difficult to meet routine operation and maintenance (O&M) requirements. On the other hand, although automated cleaning equipment such as cleaning vehicles and robots can improve efficiency, they often require frequent repositioning, struggle to adapt to different PV array layouts, and face difficulties operating at heights, resulting in overall inefficiency.

High Labor Costs

Photovoltaic power plants are often situated on building rooftops or in remote mountainous areas. They tend to be numerous and dispersed, requiring frequent cleaning, which demands significant manual labor and results in high costs.

Complex Operation and Maintenance, Low Efficiency

Due to the large area of PV stations, cleaning vehicles or robots need to transfer frequently between different sites. This not only increases equipment wear and tear but also reduces cleaning efficiency.

Significant Safety Risks

Manual cleaning at heights poses safety hazards such as falls. In certain industrial environments, there are additional risks from high-temperature, toxic exhaust gases.

Poor Equipment Adaptability

Many centralized PV stations are built in remote mountainous terrains with complex topography, including slopes and uneven surfaces. Traditional cleaning equipment often has limited effectiveness and adaptability in such challenging terrains.

JIUSI | D50R

Intelligence Drone Cleaning to Maximize Sunlight Utilization

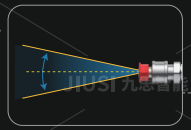
The D50R cleaning drone features a modular design with a 50L water payload and a newly engineered high-pressure spray system. It supports three cleaning modes: multi-nozzle side-by-side cleaning, dual-nozzle oscillating cleaning, and cleaning with an optional telescopic straight spray rod. The high-pressure nozzles are designed to meet diverse cleaning needs, offering a convenient, efficient aerial high-pressure cleaning solution suitable for various scenarios. It can be widely used for high-altitude cleaning of large ground-mounted PV arrays, industrial and commercial rooftop PV systems, as well as residential and household rooftop PV installations.

50L Large Capacity Water Tank

The large-capacity water tank can cover a large cleaning area in a single operation, reducing the frequency of refilling ; it also supports the use of various cleaning fluids, ensuring high efficiency in continuous operations.

High-Pressure Nozzles

High-pressure jetting delivers strong force, ideal for rinsing gaps and stubborn stains.



Full-Process Automation

Integrates cleaning with flight path planning to enable aerial cleaning operations combined with end-to-end automation, ensuring efficient and seamless workflow.

Multiple Working Modes

Compatible with a variety of cleaning mounts: 6 fixed nozzles + 2 oscillating nozzles ; optional retractable horizontal direct-spray rods.

Integrated Flight Control

Enables one-person operation of the drone combined with cleaning functions, and supports customized integration with a broader range of flying platforms for enhanced flexibility.

Multiple Scenarios - Supports stable high-altitude operations, multiple extensions, and compatibility with various types of nozzles to meet diverse cleaning needs.

Modular Design

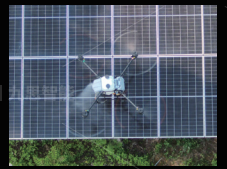
Allows selection of optimal mounts and nozzles tailored to specific tasks, fulfilling a wide range of high-altitude and complex environment cleaning needs.

High-Altitude Stable Operations

Stable control via sense-decide-act closed-loop system, adaptable to diverse height cleaning needs.

50L Large Capacity Water Tank

The large-capacity water tank covers a vast cleaning area in a single operation, reducing water refilling frequency and ensuring high efficiency during continuous work.



Multi-Liquid Compatibility

Flexibly compatible with various types of cleaning fluids, a single device can meet the cleaning needs of different scenarios, delivering high efficiency and practicality.

Safety - Enabling unmanned aerial work, dual RTK,Dual Radars (Front Obstacle Avoidance & Downward Terrain Following).

Replaces Manual Aerial Work

Enables remote operation to perform complex aerial cleaning tasks, eliminating safety risks associated with manual aerial work.

Dual RTK Configuration

Built-in dual-redundancy RTK module with high-precision positioning capability delivers real-time centimeter-level positioning data, significantly improving operational accuracy.

Intelligent Obstacle Avoidance System

Equipped with a front obstacle avoidance radar and a downward terrain-following radar, it senses surrounding obstacle information in real time for safer flight.

JIUSI | D50R

Core Advantages of Intelligent Drone-Based Photovoltaic Cleaning

D50R is a high-tech solution integrating multiple intelligent technologies such as drone flight control, cleaning systems, and intelligent path planning. By setting flight parameters, the drone can autonomously take off, perform cleaning tasks, and return for charging and water replenishment, truly achieving "fully automatic" photovoltaic cleaning operations.

Unmanned Aerial Work

By simply presetting the parameters, the drone can automatically complete the entire process of takeoff → cruising → cleaning → return flight → manual charging and water refilling → preparation for the next operation. This significantly reduces labor input and management complexity.

Efficient Coverage with Stronger Cleaning Capability

Single equipment can work 8 hours a day, cleaning 690 square meters per hour and up to 5,520 square meters of photovoltaic modules daily. It is suitable for various scenarios such as centralized, distributed, large-scale, and complex terrain environments, far exceeding manual efficiency.

Water and Energy Saving, Green and Environmentally Friendly

Equipped with a high-pressure nozzle or low-pressure efficient water pump system, it saves more than 50% water compared with traditional manual cleaning, making it suitable for water-scarce areas.

Contactless Safety, Protecting Component Lifespan

No need to step on the panel surface or use heavy equipment, causing no mechanical pressure or scratches to the components, effectively avoiding secondary damages such as scratches, cracks, and delamination.

Multi-Scenario Modular Design, Adaptable to Different Mounting

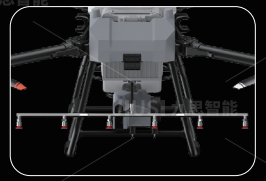
The D50R cleaning drone features a modular design and can be adapted to three different cleaning mounts, equipped with fixed and oscillating nozzles. An optional retractable direct spray rod, combined with a high-pressure nozzle design, meets diverse cleaning needs. It provides the industry with a convenient, efficient, and multi-scenario applicable aerial high-pressure cleaning operation solution, and can be widely used in high-altitude cleaning scenarios such as large-scale ground power station photovoltaic panels, commercial and industrial rooftop photovoltaics, and household/residential rooftop photovoltaics.

➢ Swing-type spray nozzle

The spray nozzle has a swing amplitude of 45°, which significantly improves operation efficiency and cleaning intensity. The swing speed can be adjusted on the remote control according to the dirt level of different cleaning surfaces.

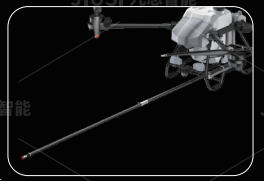
➢ Fixed sprinkler

The fixed sprinkler is equipped with 6 high-pressure nozzles, and different nozzles can be replaced according to the needs of different scenarios to meet the requirements of multiple scenarios.



➢ Retractable spray rod

This carbon-fiber direct-injection rod is telescopic (max length 3m), supports multi-nozzle switching, is lightweight and easy to assemble, and is ideal for cleaning high-altitude remote surfaces like road signs and light boxes.



* This function is exclusive to optional accessories. The accessory kit includes: telescopic spray rod main body * 1, foam nozzle * 1, spray nozzles * 4 (0°016, 15°016, 25°016, 45°016).

JIUSI | D50R

UAV vs traditional manual high-altitude operations

The solution based on the Jiusi UAV high-altitude cleaning system has significant advantages over traditional manual work in terms of safety, efficiency and cost: according to third-party statistics, regular cleaning of photovoltaic panels can increase power generation efficiency by 5%-30%, fully automatic cleaning can save more than 40% of the total operation and maintenance costs, with a short ROI payback period. It is an indispensable intelligent facility for modern photovoltaic projects.

Indicator	D50R UAV Aerial Cleaning System	Traditional manual operation mode
Cost	Fully automated with minimal human intervention	Multi-worker operation + high-intensity labor
Intelligence	Long equipment lifespan and intelligent maintenance	High-pressure water guns, ladders, etc. are vulnerable
Efficiency ratio	Scheduled cleaning cycles ensure high efficiency	Low cleaning frequency
Revenue comparison	Reduce hotspots and increase power generation revenue	Power generation loss - Continuous impact of pollution
Safety	Non-contact operation with flight safety guarantee	Manual work at heights and danger of stepping on panels

JIUSI | D50R

Case - Photovoltaic cleaning at a certain place in Huizhou

Under the influence of high temperature and humidity, there are algae and biological attachments on the surface of photovoltaic panels. As photovoltaic panels are installed above fish ponds and other water areas, manual cleaning needs to be carried out on the water surface, and the water surface environment is complex, posing a risk of drowning. The unmanned aerial vehicle (UAV) solution for cleaning photovoltaic panels on water has significant advantages: By using UAVs, it is highly efficient and flexible, capable of quickly covering large areas of photovoltaic panels without the need for manual water operations, thereby reducing safety risks. Precise cleaning ensures the power generation efficiency of photovoltaic panels and saves labor costs. Provide innovative, efficient and safe solutions for the cleaning of photovoltaic panels on water.

Challenges and Pain Points

Risk of electric shock/drowning during operation
Manual water cleaning poses drowning risks due to complex water environments.

Complex terrain
In South China, photovoltaic (PV) panels are typically installed above water areas such as fish ponds.

High labor cost
A team of over 10 people will clean for one day, with a daily wage of 300-500 RMB per person.

Impact of weather factors
Frequent mold and dirt caused by rainy weather lead to long cleaning time and difficulty in rapid deployment.

01 Drone high-altitude cleaning: No need for personnel to work at heights, eliminating safety risks of high-altitude operations.

02 Cost savings: Greatly cuts labor and maintenance costs, saving substantial funds long-term.

03 Safe & stable operation: Dual RTK ensures real-time cm-level positioning for reliability.

04 Cleaning efficiency: 690m^2/h rate shortens large-scale PV cleaning time and boosts productivity.

05 Rapid effective cleaning: High-pressure washing with multi-liquid support ensures instant results.

Application scenarios


Large-scale ground photovoltaic power plant


Commercial & industrial rooftop PV


Distributed photovoltaic cleaning


Residential rooftop PV


Aquaculture - PV complementary

street sign/free-standing billboard

Product Parameters

Model	D50R
Dimensions	1920mm*1720mm*820mm (Arms deployed, propellers folded) 3190mm*2970mm*820mm(Arms deployed, propellers extended) 1350mm*720mm*820mm(Arms folded, propellers folded)
Maximum wheelbase	2300 mm
Maximum Water Spray Flow Rate	11 L/min
Water tank capacity	50 L
Maximum hover time (fully loaded)	7 min
Maximum hover time (unloaded)	22 min
Daily sorties	5 Sorties per hour

Product Parameters

Per flight (cleaning time)	5 min
Cleaning area per minute	34.5 m^2
Cleaning area per flight	138 m^2
Cleaning area per hour	690 m^2
Battery	18S 30000mAh
Maximum horizontal flight speed	15 m/s
Working temperature	-10°C - 40°C
Working humidity	0-90%
Maximum wind speed withstandable	12 m/s
Charging time required	Slow charging: 30 min, fast charging: 12 min
Maximum takeoff weight supported	105kg

JIUSI

32F, Qiancheng Commercial Center, No.5 Haicheng Road, Mabu Community, Xixiang Street, Bao'an District, Shenzhen

marketing@jsirobot.com

www.jsirobot.com

Scan To Follow