Applied Drone Technology: Polytunnel Film Cleaning and Treatment

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Agriculture plastics on polytunnels (polytunnel film) have been used to enhance crop production by optimising growing conditions such as warmer temperatures, higher humidity, enhanced light levels and protection from wet weather events.

The use of polytunnels in berry production has increased significantly in recent years, driven by the need for improved fruit quality and greater production consistency. With this shift comes a corresponding rise in plastic use, prompting a critical question for the industry: how can we enhance the durability and service life of the plastic materials to minimise environmental impact and reduce waste?

Mould, microbial growth, and surface soiling are key factors that reduce light transmittance through polytunnel films, impairing photosynthetic efficiency and accelerating film degradation through discolouration and staining. Given the critical role of light in protected cropping systems, such deterioration often results in early disposal and without the option of viable recycling pathways, the plastic all ends up in landfill. In response, recent strategies have emerged to extend the plastic lifespan, including the integration of anti-fungal agents into the raw film materials and the adoption of regular treatment and cleaning protocols.

The use of drone technology in greenhouse and polytunnel maintenance is rapidly expanding across Australia's agricultural sector, offering a safer, more efficient, and cost-effective alternative to conventional cleaning methods. Traditionally, the maintenance of plastic and glass roofing structures has relied on labour-intensive processes involving ladders, scaffolding, or elevated platforms—methods that carry significant safety risks and operational inefficiencies. Drones provide a compelling solution by enabling remote, targeted cleaning that minimises labour demands and reduces occupational hazards.

Equipped with high-pressure water jets or specialised cleaning systems, drones can rapidly and uniformly clean large surface areas, including hard-to-reach sections of hothouses and tunnels. Their precision allows for targeted spot-cleaning of areas with localised algae or dirt accumulation, reducing unnecessary resource use. Advanced drone systems may also integrate imaging technologies and sensors to assess surface cleanliness, enabling data-informed maintenance decisions before and after treatment.

Incorporating AI and automated navigation capabilities, some drones can adapt in real time—modulating spray pressure or switching between cleaning tools based on surface conditions. These efficiencies contribute to extending the functional lifespan of polytunnel films by preventing light-blocking contamination and delaying degradation.

Environmental benefits are also notable. The precision of drone application reduces water and chemical use, and the predominance of electric-powered units helps lower the carbon footprint compared to fuel-based machinery.

Agricultural enterprises across Australia are beginning to adopt these technologies at scale, with several companies developing systems tailored to local conditions—for example, solutions to mitigate dust accumulation in dry climates or algae growth in high-humidity zones. As the technology matures, drones are set to play an increasingly integral role in protected cropping systems, supporting sustainable and economically viable farm management practices.

At the forefront of this technology is Daniel Sheahan from Applied Drone Technology. We got him to clean and treat the plastics of our research tunnels at Wollongbar recently and sat down with him after to have a chat about 'all things drone' in horticulture.

Tell us a little about yourself and Applied Drone Technology (ADT)?

My name is Daniel Sheahan, and I am the Director and Chief Remote Pilot of Applied Drone Technology (ADT). I have always been captivated by flight. After purchasing my first drone, it quickly became clear that this was more than just a hobby. Immersing myself in the world of remote aviation, I recognised the vast potential drone technology offers across a range of industries. This passion led to the creation of Applied Drone Technology in 2018, a fully certified, licensed, and insured RPAS/UAS/UAVservice provider based in South-East Queensland.

Since 2019, ADT has been at the forefront of aerial whitewashing, mould prevention, and cleaning treatments for protected cropping, specifically greenhouses and glasshouses. Our proven track record of delivering cost and time savings for large commercial nurseries in South-East Queensland and Northern NSW highlights the value of our very specialised services.

As a 'supply and apply' provider of greenhouse whitewash coatings, we continue to lead in maintaining protected cropping facilities. Recently featured in Soilless Australia magazine, ADT's services are revolutionising facility maintenance in the protected cropping sector.

What drone services do you provide?

We specialise in a wide variety of aerial services, from agriculture (including aerial spraying, seeding, baiting and painting) to large-scale inspection and mapping projects for energy providers. We have extensive Civil Aviation Safety Authority (CASA) licensing across various drone weight classes, allowing us to meet the diverse needs of our clients.

We place great emphasis on understanding our customers' goals to deliver a tailored and professional service. We have a trusted network of skilled operators and have established successful partnerships with major facility management companies, working within complex and restricted environments such as correctional facilities, rail, retail, and government sites.

What does drone plastic treatment entail? Can you take us through the process?

Before we even attend site, an internal pre-flight approval process takes place for each location to comply with CASA regulations. Each site is checked for suitable airspace, and a general risk assessment is completed using available satellite imagery. After each job has been deemed suitable for drone operations, we complete a walk around at each facility looking for obstacles and any points of interest before any flying begins.

One of the most important parts of any autonomous drone flying is the mapping portion. Mapping can be completed in a variety of ways; however the common objective is to record the boundary points of the area to be sprayed, this creates an autonomous flight map that the drone operates within.

With the map created the flight parameters are entered in (height, speed, application rate, droplet size, swath or row width), and the drone is now ready to fly. We then need to mix the product to be sprayed onto the roofs, whether it is paint or a reflective coating, paint remover or a biocide to treat mould, moss, lichen or any organic growth.

Our drone trailers carry 1000L of fresh water and a 160L batching plant. Our current drones can carry 40L of liquid which means we get 4 tanks from a batch of mixed product. Each 40L tank is sprayed and emptied within 5-8 minutes then the drone autonomously returns to its home point and lands where the crew immediately swap out the batteries and refill the drone tanks. Within 60 seconds the drone is back in the air, and it returns to the point of the roof where it previously ran out of liquid and continues spraying. This process is repeated for every flight until the map is complete. We can comfortably cover 50,000m^2 (5ha) of roofs per day with one drone.

The ADT drone in action at the NSW DPIRD research facility site at Wollongbar, NSW. Photo credit: Gaius Leong

The drone features on board intelligence which enables it to map the area to be treated and then deliver the treatment with precision. Photo credit: Applied Drone Technology

After talking with several large berry growers on the East coast of Australia, it is understood that the expected life cycle of the plastic roofs is around 5-7 years with no existing efforts or methods of prolonging the lifecycle. This is generally due to the plastic itself degrading and the loss of light penetration due to organic matter growth build up on the roofs.

While the full extent to which polytunnel plastics can be preserved through cleaning and treatment remains under investigation, early application of suitable biocidal agents appears to offer significant benefits. When applied to new films, biocides can substantially inhibit the establishment of organic contaminants such as mould, moss, lichen, and algae—key contributors to surface degradation and reduced light transmittance.

Most commercial biocidal treatments provide an effective protection window of 12 to 18 months. With ongoing, scheduled applications throughout the typical 5–7-year service life of polytunnel films, there is strong potential to maintain film clarity and function well beyond the standard lifespan. This suggests that, with the right management protocols, the effective longevity of agricultural plastics could be extended considerably—possibly indefinitely—delaying replacement and reducing environmental impact.

Extending the lifespan of polytunnel plastics is not the sole benefit of aerial cleaning treatments. By regularly removing organic build-up, these treatments help maintain higher and more consistent levels of light transmittance throughout the life of the film. This enhanced light stability supports more uniform growing conditions, which can contribute to improved crop consistency and greater predictability in yield outcomes.

If you'd like to see the drone in action, watch our short video guide at bit.ly/Drone-Clean or scan the QR code

Stay tuned for a potential demonstration and follow-up article later this year, showcasing polytunnel film treatment on the Mid North Coast and the impact it may have on film performance.

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