Using Drones to Reduce Dust and Temperatures on Residential Building Sites

Nebulizer-Retrofitted Drone Deployment at Residential Construction Sites

Rodney Handy. CPWR Small Study, 2021.

Overview

Air pollution and heat stress pose considerable hazards to construction workers. Air sampling during tasks such as plastering, concrete mixing, and masonry has revealed high levels of small particles that have been associated with decreased lung function and the development of cardiovascular, pulmonary, and respiratory illnesses. High temperatures are also a serious threat, particularly as extreme heat days become more frequent, with one study finding that workers in construction were 13 times more likely to die from heat stress than those in other industries. Recent experiments suggest that water spray may offer considerable benefits in addressing both hazards, and so this study deployed a water-misting drone at two residential construction sites in Utah. Readings were collected during 12 pilot test runs involving a 10-minute pre-flight stage, a 10-minute flight stage, and a 10-minute post-flight stage.

Key Findings

- The average Wet Bulb Globe Temperature (WBGT) values during the drone flight/misting stage were 1.7 degrees F lower than the averages than during the pre- and post-flight stages. This appears to support previous studies employing stationary nebulizers at construction sites.
- There were several times during the test runs when the WBGT values during the flight were 3 degrees F lower than either the pre-flight values or post-flight values.
- While the particulate matter concentrations were not significantly different between the pre-flight ("dirty" air) and the post-flight ("clean" air), at the beginning of the post-flight sampling the particulate concentrations were in most cases marginally lower than at the end of the pre-flight test run. In other words, some minor particulate matter cleaning appeared to result from the misting events.
- The drone's battery life was a major constraint for all runs. This was due to the significant demands from a heavy water payload (22 pounds or 10 liters initially).
- To get significant WBGT reductions and marginal air particulate cleaning at a particular residential constructions site, it will be necessary to keep drone(s) deployed almost continuously. With current battery technology, this will be challenging but plausible.

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Read the report:
https://bit.ly/3IoBx16

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