FINAL REPORT EXECUTIVE SUMMARY

For Public Release

Part 1 - Summary Details

Please use your TAB key to complete Parts 1 & 2.

CRDC Project Number: UM1801

Project Title: **Development of next generation evaporation mitigation technology with increased resistance to wind**

Project Commencement Date: 1/09/2017

Project Completion Date: 31/08/2018

CRDC Research Program: 2 Industry

Part 2 – Contact Details

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Part 4 – Final Report Executive Summary

Provide a one page Summary of your research that is not commercial in confidence, and that can be published on the World Wide Web. Explain the main outcomes of the research and provide contact details for more information. It is important that the Executive Summary highlights concisely the key outputs from the project and, when they are adopted, what this will mean to the cotton industry.

Evaporation of water from open storages is a national problem impacting water security. This is particularly a problem for farmers where evaporation losses are estimated to be above 1,320 GL/year. Cotton industry research shows that these evaporation losses contribute significantly to the amount of water consumed by farmers, estimated between 20-40 %. Monolayer technology has been explored as an alternative to mechanical structures which are limited to small storages (<10 ha) due to their high capital and maintenance costs. Ultra-thin monolayers spread out across the water forming a thin layer which reduces evaporative losses. They have little to no capital costs, can be used only when needed, and can be used on storages of all shapes and sizes, as well as irrigation channels. They are therefore a potentially cost-effective method of reducing this evaporative loss. However, current commercial products have low performance, are readily disrupted by wind and need to be frequently reapplied.

The research team at The University of Melbourne (UniMelb) has previously developed new technology for monolayers to reduce evaporation losses. Testing in the laboratory and small-scale field trials demonstrated savings of up to 40-60% could be obtained under favourable conditions. However, larger scale trials on cotton farm dams identified that there is a critical wind speed threshold for monolayer performance. On storages of ~10 hectares this threshold was identified as 3 m/s: below this threshold the monolayer could achieve evaporation savings of up to 20%. Above this threshold the monolayer failed. This project aimed to understand the mechanism behind the failure of the monolayer at elevated wind speeds and investigate methods to increase the ability of the monolayer to maintain performance at higher wind speeds.

The project has developed a new approach to reduce the impact of wind which causes wind shear and waves, reducing the performance of the monolayer. The new approach was designed and their impacts on monolayer performance were tested.

A series of trials was conducted in a 15 m wind/wave facility in the Michell Hydrodynamics Laboratory at the University of Melbourne. These trials used mechanically produced waves to investigate the separate effects of wind and waves on monolayer behaviour and as such lead to an improved understanding of the monolayer failure mechanism. This information was then used to develop strategies to improve monolayer performance, with prototypes of the new approach tested in the wind/wave facility. It was demonstrated that the negative impact of wind and waves could be reduced, leading to the potential for improved monolayer performance.

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