SMRP UNEARTHING PRACTICAL OUTCOMES FOR MILLERS

SRA has recently partnered with millers and research providers to deliver the Small Milling Research Project (SMRP) investment scheme.

The scheme is an opportunity to invest in lower-cost, short-term, industry-identified and preferably industry-led research.

The investment is included in SRA's current total investment in SRA's Key Focus Area (KFA) of Milling Efficiency and Technology.

The following is a summary of the first round of projects that have been completed through the scheme.

PROJECT NAME: ACTIVATED SLUDGE PLANTS – OPTIMISING OPERATIONS AND TECHNOLOGY

RESEARCH PROVIDERS: WILMAR SUGAR AUSTRALIA AND HUNTER H20

Treating and managing wastewater is a critical issue for the milling sector of the Australian sugarcane industry. Mills operate under strict requirements for discharging water, and there is a range of processes and technology deployed across the industry to ensure sugar mills meet their requirements.

At four Australian sugar mills, Activated Sludge Plants (ASPs) are used as part of the process of managing wastewater, although many other mills use systems that store effluent in ponds for passive treatment.

Through this project, Wilmar Sugar Australia worked with Hunter H20 to analyse ASP loading from the Macknade Mill and the quality of water within the plant, along with final effluent quality as it was being discharged.

A series of tests was performed to identify a suitable flocculant (and coagulant) for treating mill wastewater. Flocculant dosing over short periods (several hours) was implemented to determine the effect on final effluent quality.

Their focus was mainly on turbidity as a primary indicator which could be monitored online and verified by external laboratory analysis of suspended solids and biochemical oxygen demand. The study showed that significant improvements in final effluent quality could still be achieved when the activated sludge plant was running without effective primary anaerobic treatment and relying almost solely on mechanical aeration.

Hunter H2O identified that there is the potential for improved treatment performance through better control of dissolved oxygen, pH, nutrient application rates and sludge age. It was also identified that a number of trace elements may enhance the operation of activated sludge plants, and could be explored in future research.

The research team identified that flocculant and coagulant dosing systems provide potential enhancement to ASP operations.

Although relatively few sites operate activated sludge plants, there are still many plants with alternate effluent treatment systems in operation or sites that simply generate and store effluent in ponds for passive treatment. For those sites with other forms of treatment, the project provided insight into the suitability of post-treatment with flocculants. It also provided information for those sites that may need to review some aspects of their operating strategies or install more sophisticated water treatment systems to positively treat their effluent or recycled water.

PROJECT NAME: IMPACT OF BLEEDING NOXIOUS GASES ON EVAPORATOR CONDENSATE QUALITY AT RACECOURSE MILL

RESEARCH PROVIDER: MACKAY SUGAR LIMITED

Several steam efficient Australian factories experience significant problems with corrosion at the evaporator station. Part of the problem is due to management of incondensable gases and acidic condensates which results in the severe corrosion of pipes, valves and tubes. There can also be poor heat transfer at the evaporators. If not controlled, overall factory performance decreases. Leaking pipes also pose significant burn hazards to factory personnel. The main operational issue is the premature failure of these major items of plant.

Having experienced this problem at Racecourse Mill, Mackay Sugar and the research team investigated, at full scale, the influence on condensate pH from passing incondensable (NOX) gases though two pathways in an evaporator set comprising Robert type evaporator vessels. These were, namely, from calandria to next effect calandria and the path from each calandria to the evaporator condenser. This study also investigated, at full scale, the feeding of small quantities of caustic soda into primary juice to mitigate pH changes of both condensate and juice in the evaporators.

The research found that sugar mills configured for cogeneration and steam efficiency with Robert type evaporators have increased residence times of juice at higher temperatures than factories that are steam inefficient. Increased sugar degradation occurs in these steam efficient factories leading to the formation of increased levels of acidic compounds in the juice and in the vapour. The study has highlighted the problem of increased sugar losses leading to increased corrosion and poor performance of evaporator stations.

PROJECT NAME: UNDERSTANDING THE CAUSES OF HIGH COLOUR SUGAR

RESEARCH PROVIDERS: WILMAR SUGAR AUSTRALIA AND QUEENSLAND UNIVERSITY OF TECHNOLOGY

This project sought to better understand the relationship between cane quality and sugar colour, particularly in relation to extraneous matter. The project was a collaboration between Wilmar Sugar and the Queensland University of Technology, with investigations occurring at three mills during the 2018 season.

The key message from this project is that the colour of affined sugar can vary substantially during the season and increase to levels that are problematic for refiners.

It is likely that mills are unaware that this may be occurring from time to time.

As boiling practices are basically consistent through the season for each mill, the change in the partitioning of the impurities is attributed to changes in specific (unknown) impurities in the cane supply. It is not known whether these changes are in the composition or concentration of the impurities but most likely the changes are associated with the extraneous matter in the cane supply.

It was also shown that variations in boiling practices can also contribute to the higher partitioning of colour into the crystals and affect the ease of removal of colour from raw sugar during washing of shipment sugar in the batch fugals.

The final report from this project is confidential to the Australian sugarcane industry. To discuss the final report, please contact the SRA Research Funding Unit on fundingunit@sugarresearch.com.au or 07 3331 3333.

PROJECT NAME: EVALUATION OF THE NELTEC COLOUR Q FOR MEASURING THE PURITY OF MAGMA FROM C CENTRIFUGALS

RESEARCH PROVIDERS: ISIS CENTRAL SUGAR MILL, QUT, AND NELTEC

In Australian sugar mills, one person typically manages the high grade fugalling, sugar drying and low grade (C) fugalling stations. The C fugals are managed least effectively as there is no process instrumentation to monitor on-line C sugar purity or final molasses purity. Conditions can change rapidly in the C fugals without the operator being aware and poor performance can persist for several hours. Tight control of the C sugar purity is important to avoid high sucrose losses to final molasses or an excessive recycle of impurities in the C sugar to the pan stage.

For the 2017 season Isis Mill purchased a Neltec ColourQ 1700CC transducer, which had been recently released on the market to measure the colour, for measurement of the total C sugar magma production of the station. The transducer proved effective for the operators to pragmatically achieve tighter control of the purity of the C sugar magma.

For the 2018 season Isis Mill purchased a ColourQ 1700CC transducer to monitor the colour of the C sugar on the screen within their large capacity fugal.

Through this project, the research team conducted extensive testing of the transducer mounted on the fugal and the use of the transducer to assist operators achieve tighter control of the magma purity was conducted. The experiences with the use of the transducer on the magma screw for monitoring the purity of the total C magma production from the station were also assessed.

The main determination from the project is that the colour transducer can be used successfully to automatically control the purity of the C sugar produced by individual massecuite fugals. In undertaking this control the magnitude of the sucrose loss to final molasses is also controlled indirectly. Thus, by use of the colour transducer for automatic control of the process variables (e.g.water addition rate, motor load) to maintain a consistent output of C sugar at the target purity,tighter control of impurities recycled to the pan stage and sucrose losses in final molasses can be achieved. ■

For more information on these projects, visit the SRA elibrary via *sugarresearch.com.au* or contact the SRA Research Funding Unit via *fundingunit@sugarresearch.com.au* or 07 3331 3333.