

(This page) Ross Threlfall, Steve Staunton and Michelle Larsen in front of the Micro NIR instruments attached to the number five mill at Tully. (Over page) Data on display as captured by the Micro NIR, measuring moisture, pol and fibre every seven seconds.

NEW OPPORTUNITIES OPENING UP FOR NIR



Recent advances in near infra-red (NIR) instruments and technology are creating new opportunities for Australian sugar mills.

One of these next generation NIR instruments – called a Micro NIR – fits into the palm of your hand and costs about one third of the price of its predecessor instruments.

This advance in instrumentation has prompted the Australian industry to investigate the possibilities for NIR analysis in new areas of sugar mills beyond the established applications such as cane payment.

The use of on-line NIR systems, including with support from SRA to analyse and interpret the data, is well-established in a number of Australian mills, with the technology demonstrating value by providing reliable data in real time. It also allows industry to collect data in situations where traditional methods are difficult or hazardous.

In a step forward, smaller instruments have the potential to fit into new areas of the mill, and their lower capital cost puts the technology within a more realistic cost bracket for other applications.

It is something that Tully Sugar Limited (TSL) have been keen to further understand. With the help of SRA, they have been testing two Micro NIR instruments attached to the Tully mill in recent seasons.

One of these instruments has a strong research focus and is being used to provide real-time feedback on mill-mud, via an SRA-funded research project.

The other instrument is attached to Tully's number five mill and provides real-time and online feedback of bagasse, building on previous research where SRA worked with much-larger instruments to assess bagasse at the Mulgrave Mill.

"The real advance now is the instrumentation," SRA's Steve Staunton said. "With the Micro NIR being so compact, it opens up new opportunities. The older systems were also difficult to install and there were challenges around sample presentation and validation.

"With this instrument we are getting information of a similar quality, and it can be done for an investment in the machine of about \$30,000."

SRA provides expertise and support to ensure efficient use of the Micro NIR, and also ensures the data generated by the instrument is accurate and understandable.



TSL Operations Engineer, Ross Threlfall, said TSL was interested in the Micro NIR to see where it could enhance milling efficiency and consistency.

With the bagasse, for example, they were previously only measuring moisture content via moisture meter, whereas now the Micro NIR is providing moisture, pol and fibre every seven seconds.

"Currently bagasse quality analysis is performed by the laboratory, from samples taken over an eight hour shift. These results are only available on a daily basis," Mr Threlfall said. "With online monitoring, control or mill adjustments can be made sooner rather than later to optimise milling extraction.

"Our boiler operators are able to confirm and potentially take action earlier, in response to high moisture bagasse being received at boilers.

"It also gives us the ability to take action such as adjusting the maceration settings, or trying things like cool maceration. We have trialled different maceration settings this year, and we are still learning what we can do with the instrument."

The instrument has been attached directly to the exit chute of the mill and requires cooling due to the temperature of the bagasse (about 85 degrees Celsius or more). This is one of many issues that SRA has worked with TSL on during this season, to better understand how to best use the instrument in the tough environment of a sugar mill. There has also been a huge effort and collaboration with the TSL information technology team and engineering team.

In the future, the Micro NIR and supporting programming may also be able to gather valuable data on the full milling train to help minimise sugar loss through the mill, especially when used in conjunction with their existing NIR instrument looking at cane at the number one mill.

As they continue to look for new ways to use the data, Mr Threlfall said the Micro NIR would also allow TSL to calculate the calorific value of bagasse, which could then be correlated back to cane variety information. This could be useful for cogeneration by targeting particular bagasse for storage for use in the off-season.

SRA Key Focus Area Leader for Milling Efficiency and Technology, Mr Steve Staunton, said the instrument could capture a wealth of information, but the key was using this data in a way to create a benefit.

"A good approach is to go for the low hanging fruit," he said. "With the bagasse, TSL are using it to help ensure consistency for the boilers, as we know that consistency is really important for mill performance.

"Optimising rather than maximising maceration would deliver advantages."

However, there are other opportunities that are also being considered. One of the "fruits" higher up the tree has seen SRA work with TSL engineers and boilermakers to attach a Micro NIR to the mud hopper to determine the nutrient content of the mud.

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Mr Staunton said they had worked across the 2019 season to reach a point where they could gather 12-13,000 scans per day of mud moving through the hopper and then analyse these scans to understand the mud's nutrient content.

"We are aiming for a point where we can relate those scans to individual trucks that are leaving the mill," Mr Staunton said.

"Mud is a valuable nutrient source for the industry and this research project recognises that quantifying the nutrients in mud may be a key factor in maintaining its availability in the future."

Mr Staunton said the project was also doing laboratory work to determine the total extractable N in the mud, which will be valuable for growers to ensure they were following the SIX EASY STEPS nutrient management guidelines, and neither under-fertilising nor over-fertilising.

This data offers advantages to both growers and millers, and may be useful for the industry to continue to demonstrate its strong adherence to best management practices.

The research has also discovered that it could be possible to understand sucrose losses leaving the mill via the mud.

"If we can provide this information in real time, we can then look at better controlling the conditions that contribute to sucrose loss," Mr Staunton said.

Michelle Larsen with TSL said that the Micro NIR was creating new fields of research and allowing the mill to capture and use more data.

"The instrument has attracted a lot of interest within departments here at Tully Sugar and we think it is going to be very beneficial. It is exciting where it could go," she said. ■

(Left) Michelle Larsen and Steve Staunton at the mud hopper.

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