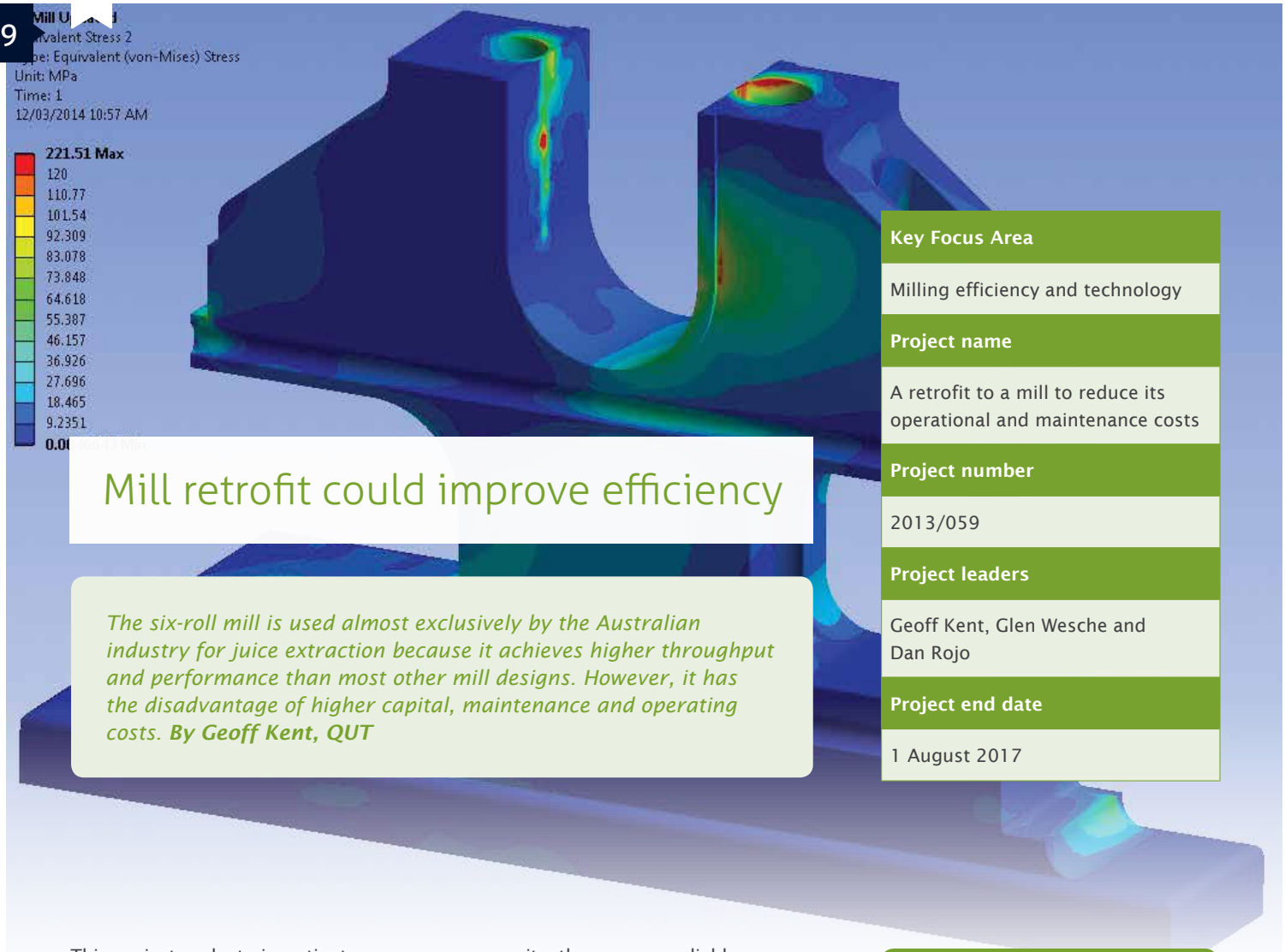

Mill retrofit could improve efficiency

The six-roll mill is used almost exclusively by the Australian industry for juice extraction because it achieves higher throughput and performance than most other mill designs. However, it has the disadvantage of higher capital, maintenance and operating costs. ***By Geoff Kent, QUT***

Key Focus Area
Milling efficiency and technology
Project name
A retrofit to a mill to reduce its operational and maintenance costs
Project number
2013/059
Project leaders
Geoff Kent, Glen Wesche and Dan Rojo
Project end date
1 August 2017

This project seeks to investigate a low cost modification to the six-roll mill to reduce its maintenance and operating costs by removing the delivery roll and trash plate while maintaining or improving performance at the same rate by implementing Bundaberg Walkers two-roll mill (BHEM) technology.

The BHEM design has achieved very good performance at low throughput and has maintained good performance at higher throughput with feeder rolls. This project utilises an existing pressure feeder as feeder rolls and the existing top and feed rolls as the two BHEM rolls.

The SRA-funded project is a collaboration between Queensland University of Technology, Bundaberg Walkers Engineering Ltd and Sunshine Sugar Pty Ltd. The design concept will be trialled at Sunshine Sugar's Harwood Mill.

While existing milling theories are sufficient to be confident that the modified mill design will achieve lower maintenance and operating costs and will maintain capacity, there are no reliable theories to predict the resulting mill performance. This project will measure the performance of the prototype mill at Harwood.

Another significant issue is the transfer of bagasse after the mill. Without the delivery roll, the bagasse exits the mill at a lower location and in a downwards instead of upwards direction. A low cost methodology is required to ensure the bagasse is transferred to the next intermediate carrier.

To date, the project has focussed on addressing the risks of the prototype mill to Harwood's crushing operations.

A finite element analysis was undertaken to ensure that the stress in the roll shell in the new configuration was not excessive.

A second finite element analysis of the mill cheeks was undertaken to ensure the modified loading was capable of being supported by the existing cheeks.

Aim: a low capital cost method of reducing ongoing maintenance and operating costs.

A laboratory experiment was undertaken to examine chute design parameters for conveying the bagasse to the next intermediate carrier.

The results of the investigations to date have been utilised in preparing a capital budget and funding request to Sunshine Sugar to provide the necessary funding to modify the Harwood mill to the proposed design.

The modifications to the Harwood mill will be made, pending final funding approval, so that the design can be tested in 2016 crushing season.

Above: Stresses calculated in finite element analysis of mill cheeks.