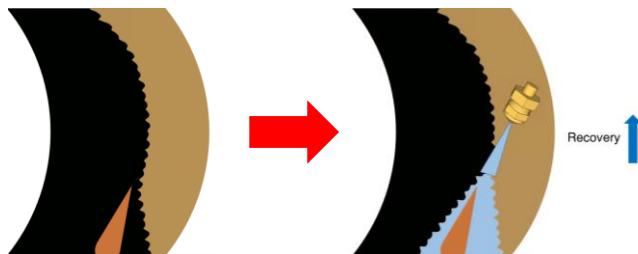
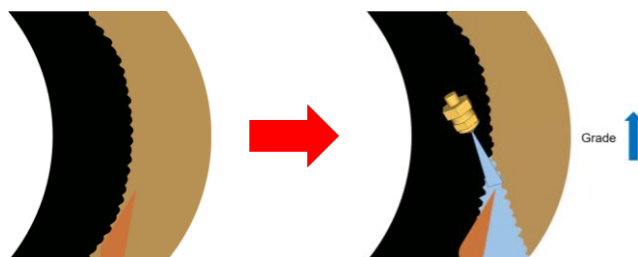


## Gravity Spiral Control - Improving grade stability and performance

Gravity spirals are regarded as a simple and robust concentration method. Spiral plants tend to have large numbers of spirals to process the feed effectively, making manual control difficult due to the number of splitters that must be moved by hand to counter disturbances. Since spiral plants typically have large throughputs, small improvements in the metallurgical performance of the plant can result in large financial returns. Historically, spiral plants have been of little interest for automation due to the harsh operating environment, as well as limitations inherent to the spiral design. A new technology developed by Mintek is however paving the way for the implementation of automation on spirals.

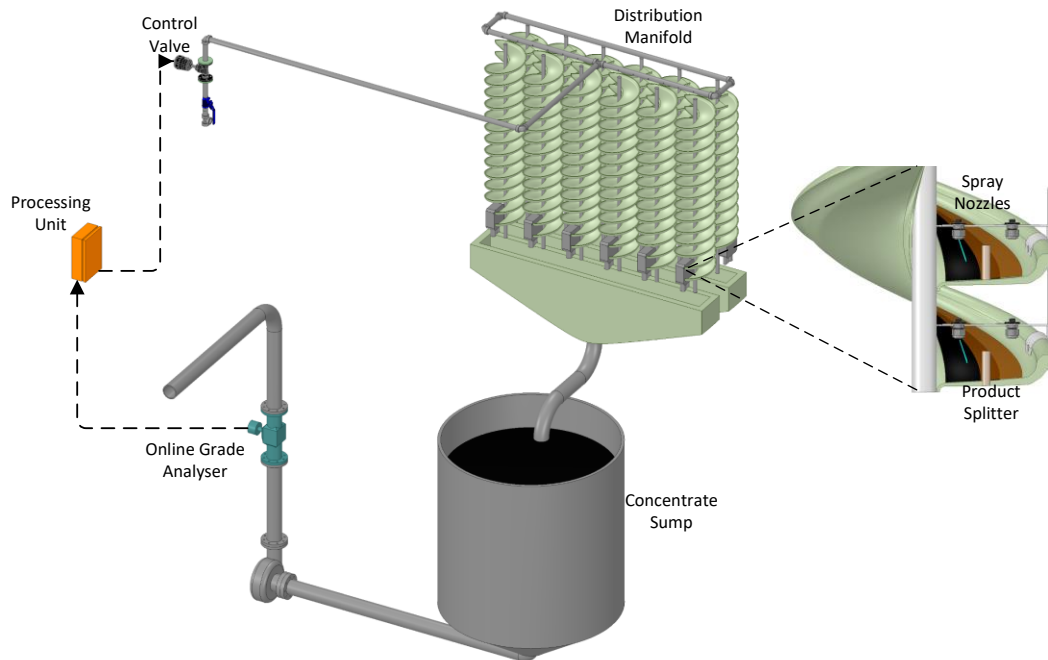


Mintek has developed an actuation method that makes use of jets of process water, to direct the material on the spiral surface towards the desired port. In the case where valuable material is being lost to the tails stream, the spray jet directs material towards the concentrate port. This results in an increase in the valuable mineral recovery to the concentrate, thereby increasing production.



Conversely, in the case where gangue material is being recovered in the concentrate product, the spray jet directs material towards the tails port, resulting in an increase in concentrate grade, thereby protecting the product quality. Using this method of moving material between the concentrate and tails port eliminates the need to continuously move the product splitter, with only bulk, long-term adjustments of the splitter positions being necessary.

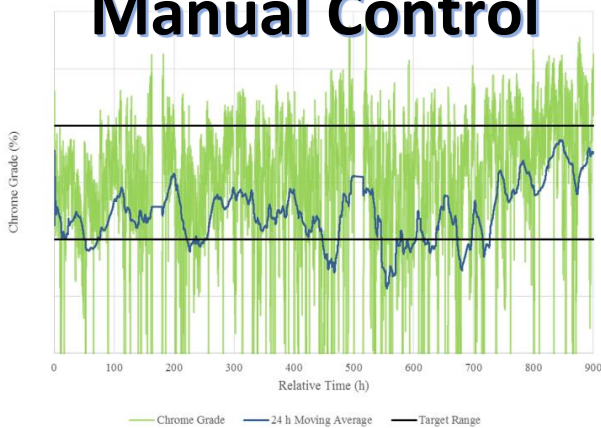
The developed nozzle assembly mounts onto the bottom part of the spiral at the product splitter, or at one of the auxiliary splitters along the spiral length. The nozzles are fully retro-fittable to existing spirals, with no need for modifying the spiral structure. This actuation mechanism can be used in combination with either a band position measurement from an optical system, which Mintek is in the process of developing (watch this space...) or with measurements from an online grade analyser.



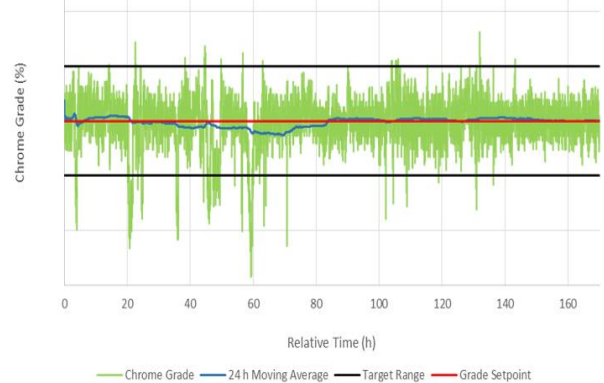
Test work was conducted at a platinum producer where an online grade analyser is installed on the spiral concentrate line. The control and actuation system was installed and tested on one of the recleaner banks which accounts for about 75 % of the final concentrate mass pull.

Using a variable pressure control valve to finely manipulate the control action on the spirals, the control system was able to reduce the variability in the product chrome grade by 85 %.

## Manual Control



## New Auto Control



This improved concentrate grade stability afforded to the plant by the control system allows them to target a concentrate grade closer to the lower limit of the product specification, with a significantly lower risk of producing sub-standard product. In the test case example, lowering the concentrate grade target by 0.5 % results in approximately 1 % increase in chrome recovery. At a production rate of 40 tons per hour, and with the current chrome price at \$160 per ton, this amounts to an increase in revenue in excess of R1.5m (\$100,000) per month. This means that the cost of a control system can be paid back in a matter of days.

*This white paper has been brought to you by Mintek. Feel free to pose any questions you might have to the author at [adrianr@mintek.co.za](mailto:adrianr@mintek.co.za). For more information on the Mintek Process Control group, [click here](#).*