



Lonmin increases smelter throughput
by 10% while improving recovery



When platinum prices were at an all-time high, Lonmin wanted to maximize efficiency and unlock any hidden capacity in its process. GE previously helped the Lonmin concentrating section to solve some tough challenges, so GE was called in again to help with a bottleneck in the smelter area. This would prove to be the start of a new partnership in which GE would help Lonmin with its continuous-improvement journey through optimization and operational transparency.

Lonmin is the third-largest producer of PGM (Platinum Group Metals) in the world. The company's operations are located in the Bushveld Complex near Rustenberg in South Africa.



↑ 10%

increase in throughput in the filter and drying section

↓ 25%

decrease in variation in feed into the slag mill

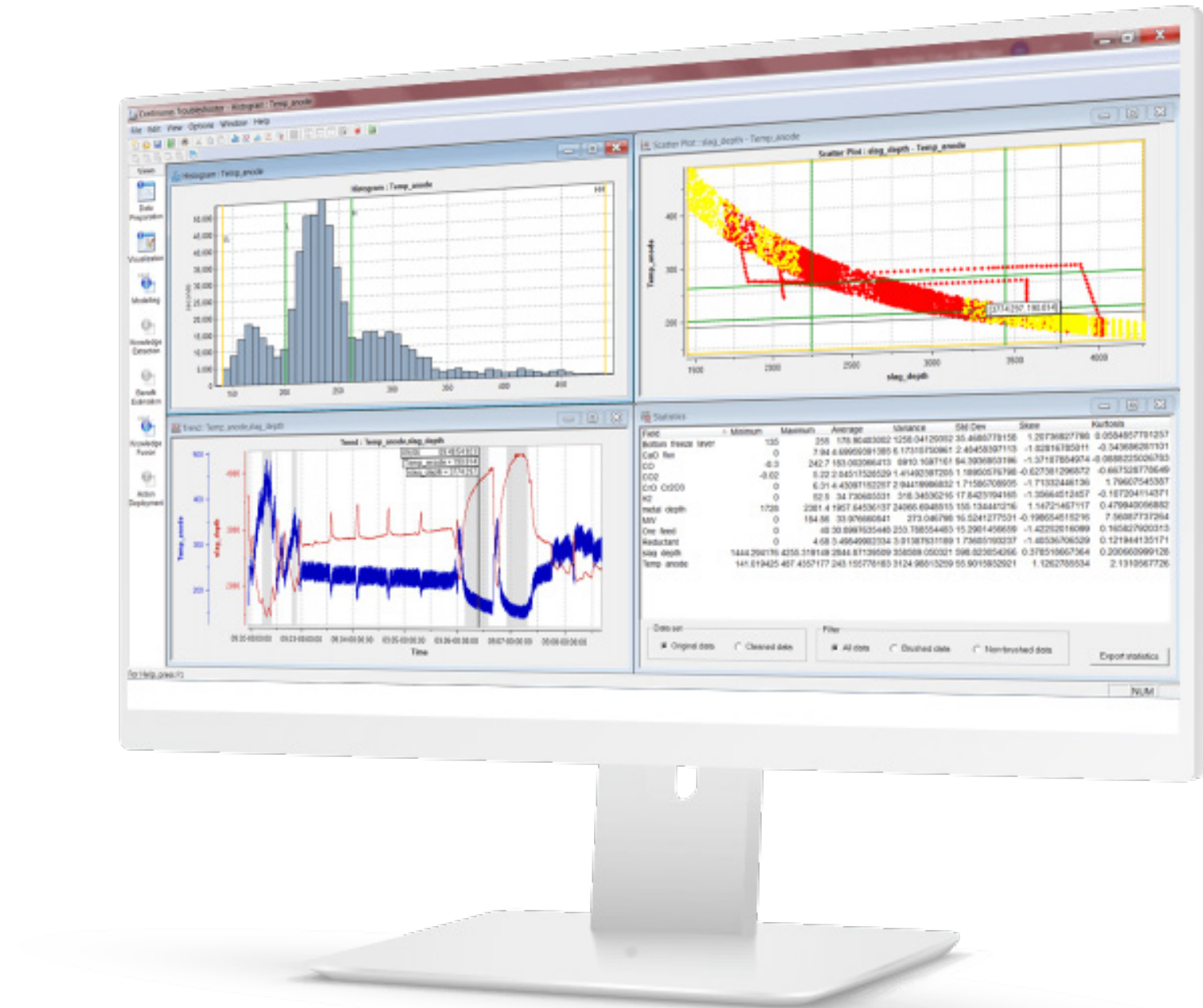
↓ 45%

decrease in variation in cyclone feed pressure

Solution Overview

The mine performance solution using GE Digital's Proficy CSense analytics software was initially implemented at the filter and drying section of the Lonmin smelter operation to help remove bottlenecks and increase efficiency. Results were so positive that the solution was expanded to include several other sections in the smelter, and it was further expanded to include monitoring of the control systems.

As a next step, Lonmin plans to utilize the predictive analytic capabilities of Proficy CSense to increase uptime and decrease maintenance costs on its fans and blowers.



Filter and drying section

The first section where the Proficy CSense solution was implemented was the filter and drying process.

At the time, concentrate could not be dried fast enough to meet demand from the furnaces.

Operators struggled to juggle the multiple interacting process variables. Excessive process instability due to varying filter cake feed and moisture content in the feed, as well as frequent trips were encountered, increasing the wear-and tear on the equipment. A holistic process control and optimization approach was needed that could not be provided by normal regulatory control.

After GE implemented the process optimization solution on this circuit, [throughput increased by more than 10%, consistently reaching maximum design capacity.](#)

Temperatures stabilized and costly trips were eliminated. Even in recent times with depressed metal prices, when throughput is not the main priority, Lonmin continuously uses the solution to ensure that equipment damage and costly inefficiencies do not occur.

Slag concentrator

Another problem area in the smelter was the slag plant, where material from the furnaces are concentrated and recycled back into the process.

Design limitations in this circuit caused major instabilities in the milling section, which impacted the whole concentrator.

Spillages were frequent events, which further wasted production time.

GE's Proficy CSense stabilized the in-mill density and float feed rate and ensured optimal cyclone operation. A performance evaluation post-implementation showed a 25% decrease in variation in the feed and a 45% decrease in

variation in the cyclone feed pressure. Overflows are now a thing of the past.

The overall impact on the stability of the concentrator ultimately led to greater recovery, which is up 1.5%.

Although other factors also played a role, the process-optimization module was a major contributor. Every percent extra recovery in the smelter area has a direct impact on Lonmin's bottom line—saving millions of dollars in metal that would otherwise have been lost.

Off-gas handling plant

The third area where process optimization was applied was the gas cleaning plant, where the offgas from the furnaces and converters is treated.

[At this stage, Lonmin had some issues with sulfur dioxide emissions, which exceeded the allowable limit.](#)

The process dynamics were complicated, and there was large variability in the sulfur dioxide concentrations in the feed that the conventional controllers could not handle. This caused large disturbances in the process, which led to high emissions.

[The advanced controller stabilized the pH control in the absorber](#), which brought the emissions back into range. The GE process experts also made some recommendations during the investigation phase that improved overall stability of the plant.

Process monitoring

Lonmin's smelter also uses the monitoring tools and services to optimize the performance of its base-layer (PID) control. The automation manager and his staff can immediately see where the control inefficiencies lie and apply resources where it matters most. They are managing the process proactively, receiving early warnings of changing process and asset conditions. GE process experts also have weekly calls with Lonmin control experts, augmenting the team onsite with GE expertise developed by monitoring a multitude of plants and processes.

[The Lonmin plant has seen unprecedented stability in the years since monitoring began.](#)

“Without the GE solution, we would incur additional cost for inefficiencies and we will definitely have equipment damage due to our inability to control the process in the same way as an analytically-driven system.”

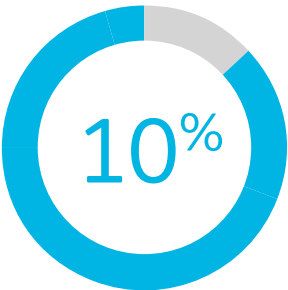
— **Percy French**

Automation Manager, Smelter, Lonmin

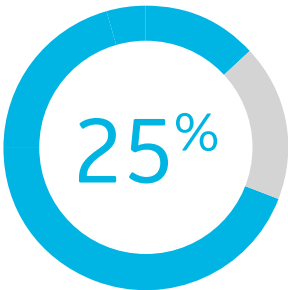


Success on many levels

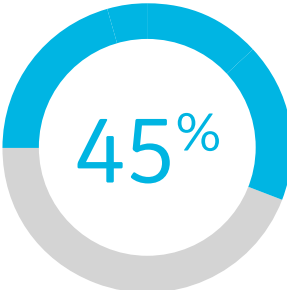
Although there were some normal change-management challenges with the real-time optimization modules, the software now is an integral part of the Lonmin smelter operation, with operators being heavily reliant on the solution to run the process optimally. The solution has been able to provide significant value throughout the Lonmin smelter:



increase in throughput in the filter and drying section



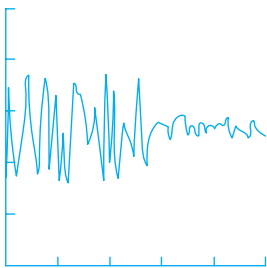
decrease in variation in feed in the slag mill



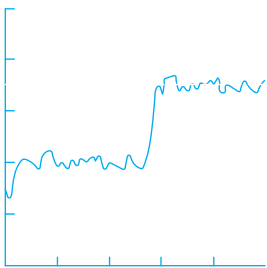
decrease in variation in cyclone feed pressure



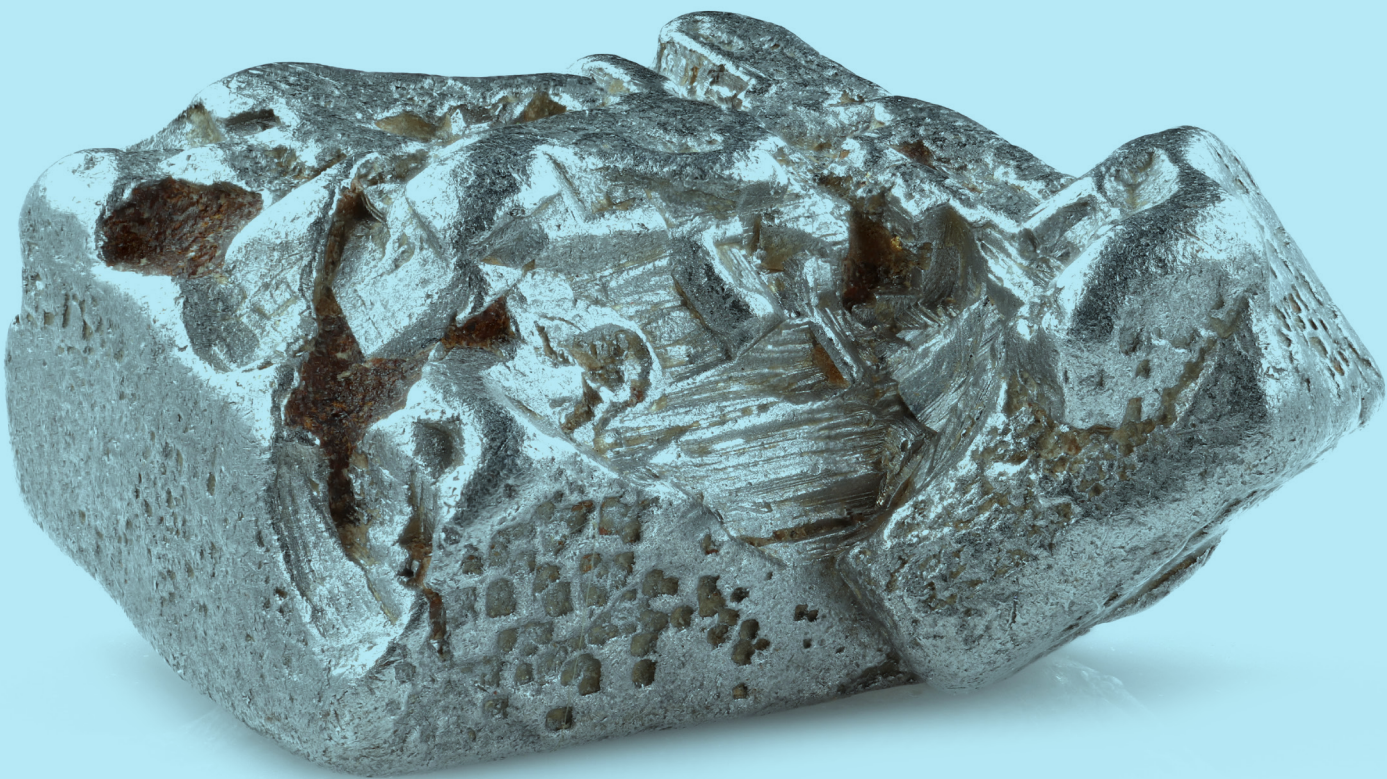
Geater recovery in the slag plant



Stabilization of pH control in the absorber in the gas cleaning plant



Optimization of performance of baselayer (PID) control

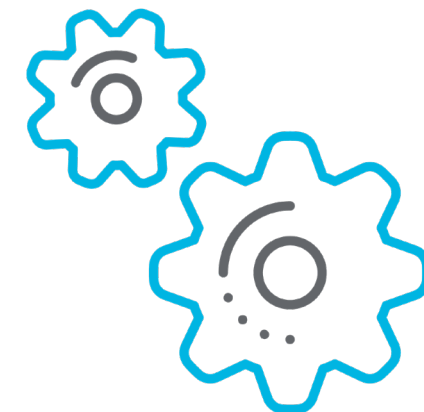


Plans for continued improvement

According to Percy French, Automation Manager at the smelter at Lonmin, Proficy CSense has helped him to “highlight more and more potential areas for improvement.” As a next step, he plans to implement the predictive monitoring capability of the solution on some of the smelter’s critical equipment, including fans and blowers, to help reduce failures and prioritize maintenance.

“The software is running and the people are used to it, it’s very difficult to manage without it.”

— **Percy French**
Automation Manager, Smelter, Lonmin





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