



# Impala Platinum reduces process variation by 40% with Proficy CSense

## Background

Impala Platinum's Base Metals Refinery (BMR) in Springs, South Africa, receives its raw material from the company's mining, concentrating, smelting, and converting facilities in nearby Rustenburg.

The BMR then removes as much of the base metals as possible and sends the Platinum Group Metals (PGM) concentrate to the Precious Metals Refinery (PMR) plant for further processing. The base metals are refined and sold separately to maximize the conversion of raw material into revenue.



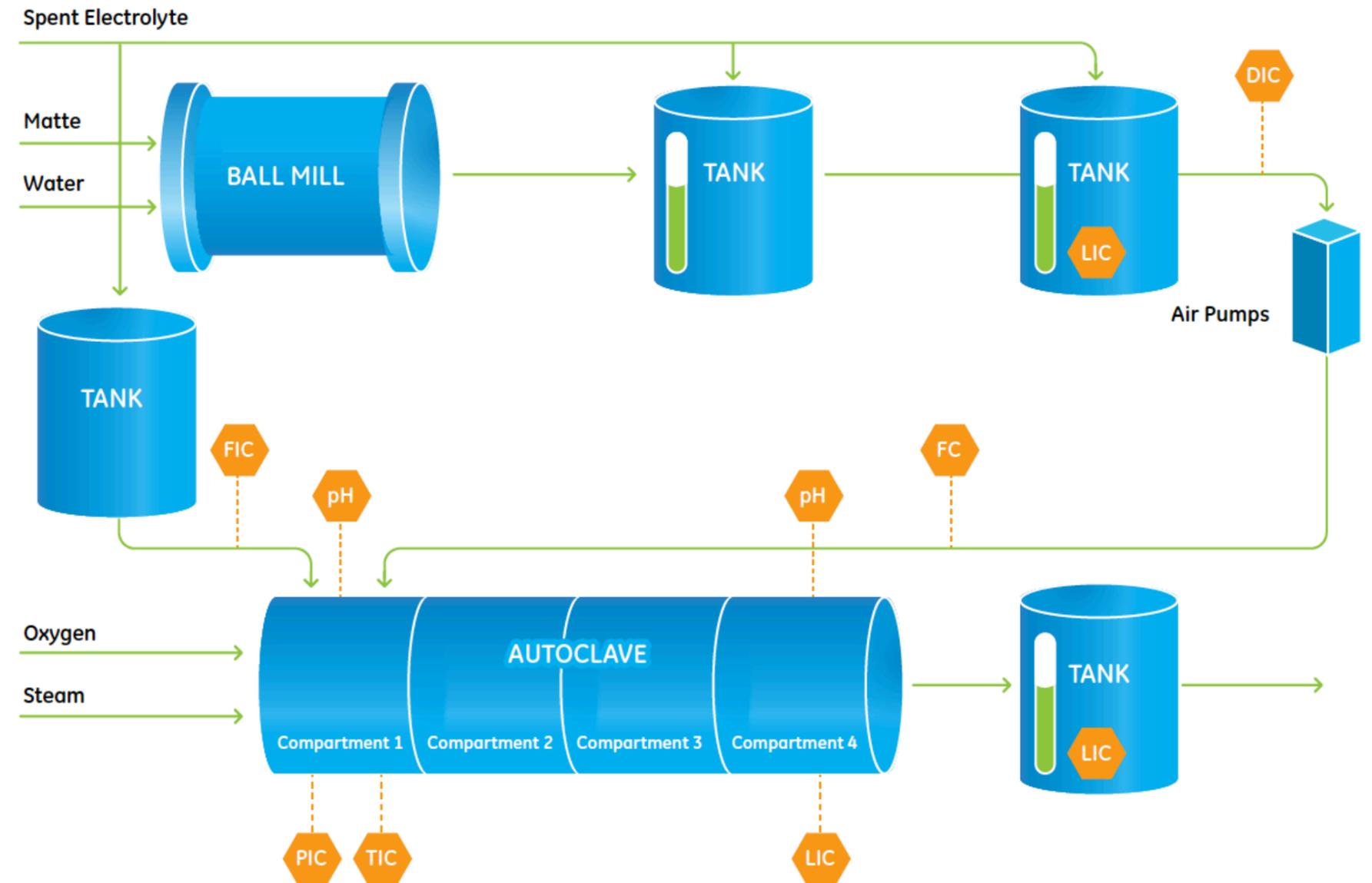
# The Challenges

Poor pH control, complex, multi-variable environment

Impala Platinum identified difficulties in controlling the pH in the first stage autoclaves, and poor pH control has a serious and negative impact on the PMR processes. It had to decrease the base metals content (thereby increasing the precious metal content in the concentrate), which could be done by controlling the pH and consequently improving the nickel and iron extraction efficiencies.

Up to this point, the pH had been controlled through a cumbersome process of manual sampling and operator intervention. Responses to changes were delayed and future values could not be predicted automatically.

As shown in Figure 1, the first stage leaching process involved operators having to deal with numerous interdependent variables (pH, temperature, levels, pressures, etc.).



**Figure 1:**

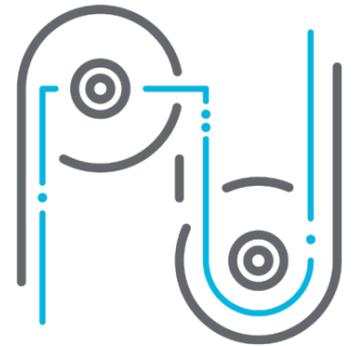
An overview of the process

The processing of platinum is a complex and costly affair. The quality of the upstream process known as Base Metal Refining (BMR) can have serious financial consequences on the profitability of the downstream Precious Metals Refining (PMR) process.

With operators having to juggle all these variables, it was easy for temperature and pH profiles, for example, to go beyond their set limits. This affected Impala's ability to remove as much as possible of the nickel from the solids, and it degraded the quality of all products downstream.

Another important metal to remove (leach) in this process was iron, which had to be kept in solution. To do that, active pH control needed to be applied to the autoclave. Iron should be discarded with the nickel solution otherwise it would contaminate the PGM solids, which would impact downstream processes negatively and can even lead to costly reworking of the concentrate.

In addition, ore grade is gradually dropping and there are large variations in concentrations in the matte supplied by the smelter. All of this contributes to an environment where manual process optimization is extremely challenging.



**BASE METALS REFINERY**  
(dissolution of nickel, copper and cobalt)

# The Solution

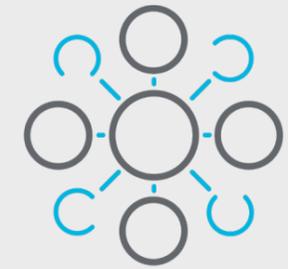
## Advanced pH controller provides real-time optimization

Impala Platinum turned to GE to help address its challenges. Over a period of six weeks, GE installed its Proficy CSense solution, providing Impala BMR with control and optimization of its nickel-leaching process. The software relieved operators of many decisions that were previously difficult given the complex, variable, and real-time nature of the processes in their charge.

---

### ***An advanced controller based on a hybrid of analytics technology and fundamental principles was implemented to provide:***

- *Stabilization of the pH to improve the leaching efficiency of iron and nickel. This provides a better quality of PGM concentrate for PMR and other processes.*
  - *On-line and real-time pH sampling. This provides the degree of control required to help optimize the process. Another consideration was that pH cannot be measured inside the autoclave, so a special sampling pot was designed by GE to address this sampling problem.*
  - *Simplification of the control approach by manipulating acid addition to compensate for pulp density and product feed rate changes, as well as changes in pH measurements, while taking into account that high-pressure acid leach has complex reaction dynamics.*
- 



“Some systems are just too complex and have too many variables for operators to run optimally. That’s when we need the help of predictive solutions that can deal with the complexities of our unique problems.”

— **Tim Spandiel,**  
**Impala BMR Manager**





“Although these numbers may seem small, they are extremely significant to the financial benefit of all our refining processes.”

— Tim Spandiel,  
Impala BMR Manager



## GE's Proficy CSense solution helps to increase process efficiency

Since the solution was implemented, it has greatly reduced the level of impurities in the product from the BMR, thus increasing the concentration of PGMs. This ultimately leads to more platinum being extracted in the PMR downstream.

Sello Semosa, Impala's BMR Manager, said that operators have embraced the solution, which has led to increased productivity. She explained, “With Proficy CSense, I know I have a dedicated solution that is running real time with no disruptions. It has freed up time for me and my staff, and time is important in terms of production.” Enabling effective information sharing across the company, the solution automatically provides performance reports. This enables management to have a near real-time view of the efficiency of the BMR nickel leaching process on which so many other processes rely.

### Solution results:

**40%**  
**improvement**

in pH stability whereby  
variation was reduced  
from 1.2 to 0.7

**0.5%**  
**increase**

in nickel extraction  
efficiency

**3.3%**  
**increase**

in iron extraction  
efficiency

**1.4%**  
**increase**

increase in the PGM  
grade (concentration)

### Other benefits included:

- Reduction in pH peaks in the autoclave, which can lead to certain elements becoming very difficult to leach. These elements go right through the process and end up contaminating the PGM solids, with the result that the entire batch has to be recycled through a lengthy and costly processing pipeline.
- Acceptance of the system by operating staff
- Stable process control in spite of variations
- Indirectly limits environmental emissions



## About GE

GE (NYSE: GE) is the world's Digital Industrial Company, transforming industry with software-defined machines and solutions that are connected, responsive and predictive. GE is organized around a global exchange of knowledge, the "GE Store," through which each business shares and accesses the same technology, markets, structure and intellect. Each invention further fuels innovation and application across our industrial sectors. With people, services, technology and scale, GE delivers better outcomes for customers by speaking the language of industry.

## Contact Information

[www.ge.com/digital](http://www.ge.com/digital)

©2020 General Electric. All rights reserved. \*Trademark of General Electric. All other brands or names are property of their respective holders. Specifications are subject to change without notice. 05 2020

