



The Mining Productivity Platform

www.stratflow.com.au

In more than 70 interventions since 2000 we have achieved output increases of 5-50%, reduced operating cost per ton by 10-30%, typically within 3-5 months.

Quick, sustainable productivity improvement

Improved leadership and empowered/engaged employees

Simplified management processes, less firefighting

Little disruption of current processes

Limited involvement by consultants

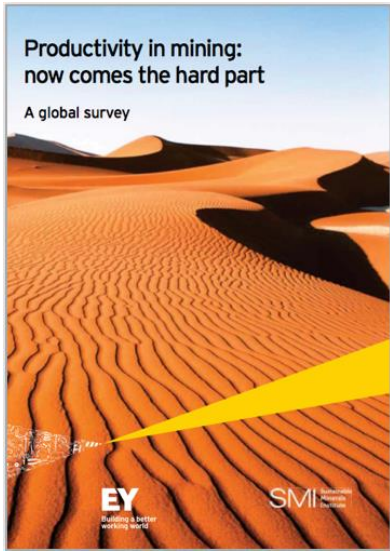
End to end solution

All is not well in the world of mining. Many mines are closing down or battling for survival as billions of dollars in mining market value have disappeared, and with them the concomitant fall in mining productivity and employee engagement. Clearly changes must be made.

The most powerful interventions focus at the level of paradigm change. Without a new paradigm we cannot change the structure and culture of our organization. We will remain shackled to the old ineffective ways of doing, and will spend inordinate amounts of energy on “doing the wrong things better”.

The Productivity Platform (PP) creates a system from where we are able to shift the prevalent *Balanced Capacity* paradigm (optimize all the parts) to one we call *Optimized Flow* (optimize only the bottlenecks).

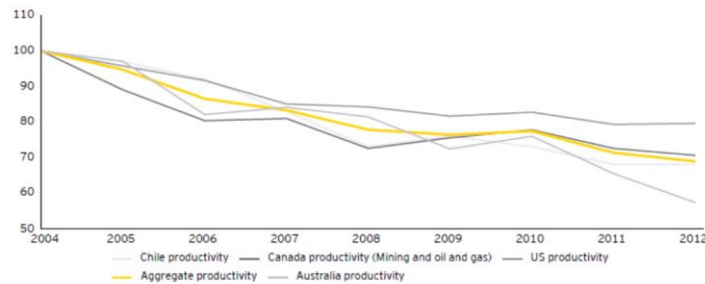
Over the last 15 years there have been more than 70 very successful PP implementations.



Why the collapse in mining?

In 2014 Ernst & Young and the Sustainable Minerals Institute released a report citing the decline in productivity in the mining sector. The report was put together after more than 60 interviews with mining executives around the world. Deloitte and McKinsey consultants have reported similar findings and concerns.

Mining labor productivity (2004=100)



Source: Country statistical data, EY



Capital productivity in Australia has fallen 45% since 2000 and labor productivity by more than 40% from 2004-2012. In comparison, labor productivity in the South African gold sector has also decreased by 35% since 2007. Why the global decline?

The main reason cited by E&Y survey participants was that many productivity initiatives to date have focused on cost cutting, which has led to modest short-term results.

Mining executives acknowledged that what needs to be done now is much more complex. They see moving beyond point solutions and adopt an end-to-end solution to transform the business. They see a need to ensure that each part of the business is optimized, not on its own but as part of a business system - the *Balanced Capacity* paradigm. What do they fail to see? This is the wrong paradigm! That's why they will see more stop-start production flow and poor productivity unless they shift the paradigm.

This paradigm is incorporated in ERP/Budgeting information systems and maintains production flow in a narrow range around the current results. While IT is critical for mine management, unintended negative

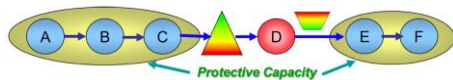


Balanced Capacity paradigm

Each resource in the production flow chain has the capacity of 10 tons per hour and is normally available for at least 80% of the time.

Most people would say that on average you can expect 8 tons per hour from the system.

Correct answer is 2,6 tons
 $(.8 \times .8 \times .8 \times .8 \times .8 \times .8) = .264$



Optimized Flow paradigm

Production buffers are inserted around the Wash & Dry process to absorb variation and stabilize production flow.

consequences have emerged. The built-in Balanced Capacity paradigm has now become a straitjacket. In addition, this belief creates huge conflicts between local operators and centralized overseers. The solution has become the problem.

What is different about PP

The mine production process is inherently variable and displays high interdependency. Local managers are expected to operate and budget on the Balanced Capacity paradigm.

In the sand mining illustration, we cannot expect more than an average of 2,640 tons per hour from the above system. For instance, if the first loader breaks down for 3 hours, the system as a whole will produce zero for those 3 hours. This is for a chain with only 6 interdependent resources; most of our chains in mining have many, many more interdependent resources.

The PP intervention replaces the Balanced Capacity mindset with what we call the Optimized Flow Paradigm. It is based on the Theory of Constraints (TOC) developed by Dr. Eli Goldratt. The laws of science tell us that optimized flow will occur when we identify the resource with the least capacity (not the demand placed on it) and optimize its up-time.

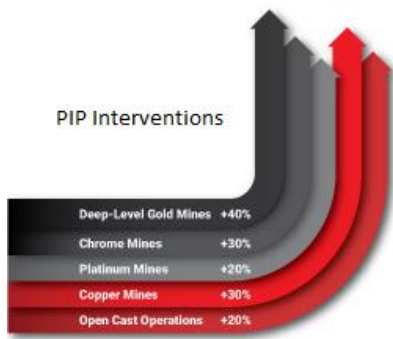
Besides applying the laws of physics, a PP intervention actively engages employees. More often than not, front-line workers know and can pinpoint the source of resource constraints. By developing a shared end-to-end vision, aligning their functions, and deploying horizontal coordination close to the action, they have a way to reduce their impact as constraints and increase their value.

At the daily PP flow meeting, colour-coded displays make the production flow visible. The principles of flow and dialogue enable managers and employees to identify the critical leverage points and focus improvement efforts there.

The success of the new paradigm becomes obvious, the new way of doing becomes part of the culture, very different from the typical change intervention. We create “superflow in a spirit of calmness.”

North Pit											
Waste						Ore			Delivered to Stockpiles		
Process	Waste	Ore	Waste	Ore	Waste	Waste	Ore	Waste	Ore	Waste	Ore
Crusher	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
Screen	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
Wash & Dry	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
Load	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
Transport	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
Product	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000

Daily attention on the status of production buffers improve predictability and drastically reduce the number of critical indicators.



Local managers are major benefactors of the transformed work environment. They are able to shift from stressful firefighting to proactively pursuing the next resource to optimize or investing time researching technological innovations.

Some exceptional results

Albert Einstein is quoted as saying, “We cannot solve our problems at the level of thinking that caused them in the first place.”

Clients who have chosen to implement the Productivity Platform have witnessed significant production increases.

- ✓ Underground narrow reef platinum mine shaft x: 35% increase in output within one month
- ✓ Underground gold mine shaft no 4# (+60%)
- ✓ Underground gold mine shaft no 7# (+55%)
- ✓ Underground gold mine shaft no 5# (+50%)
- ✓ Open cast platinum mine (+45%)
- ✓ Open cast chrome mine (+30%)
- ✓ Open cast iron ore mine, producing 20% above design output for more than three years.
- ✓ Yearly ore production for 2014 increased by 82% to 1.1m tons, total tons mined went up 20% (from 27.5 to 33m tons). The return on consulting fees (ROI) was 7180% (73:1). At the end of this year, the mine beat its larger sister mines and took the prizes for the best grade and process control, best production improvement and best safety performance.
- ✓ Kimberlite processed in 2014 increased to 2.9 million tons, 38% more than the 2.1 million tons for 2013. The three month payment backlog had were wiped out; the mine was profitable once more. Subsequently the owners extended the life of the mine to 2037.



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About Stratflow Australia

Hendrik and Arrie have been working together since 2009 in using Systems Thinking(TOC) and principles of Dialogic Organisational Development to achieve breakthrough results. In 2013 they decided to partner in delivering TOC Production Flow to the mining industry in Southern Africa. As a consequence of this association, they achieved exceptional results and subsequently developed the Productivity Platform for mining. They are now offering the Productivity Platform in Australia.