Data Driven Decision Support Best Practice:

Dynamic End to End Asset Management Platform (AMT & Ellipse)

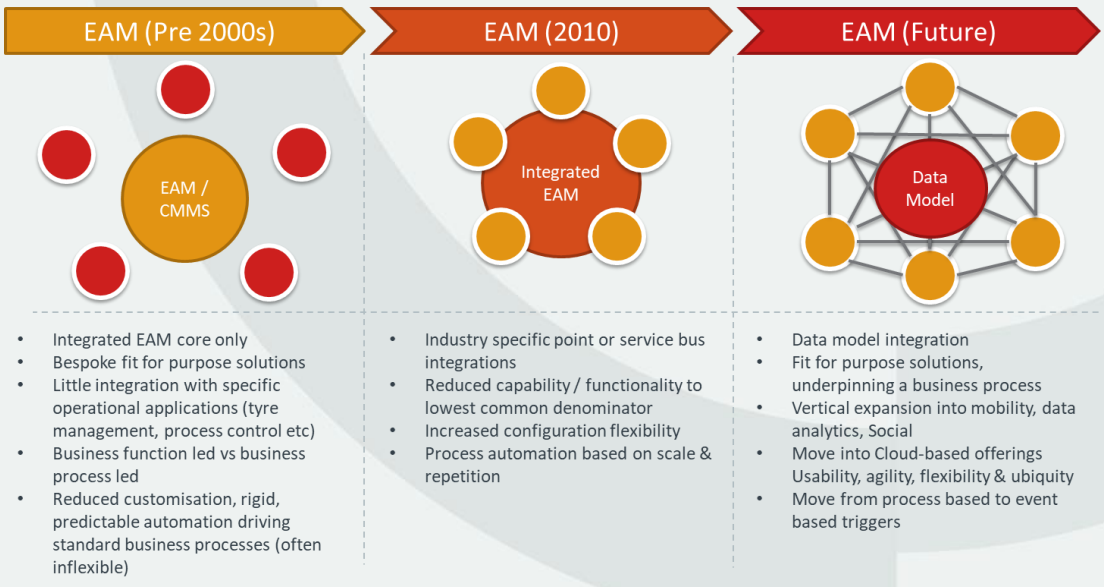
Following many years of steadily increasing commodity prices through to 2013, the mining and minerals processing industry saw a boom in activity. This has had quite a significant "tail", as in-flight capital investment continued to completion over the following 2 to 3 years, and the levels of capital investment are largely back to "at or below" long term averages. This leaves the industry in a "production era" where stakeholders (including shareholders) are looking for significant return following a period of unprecedented capital expenditure. During the boom years miners, while supporting the principle of 'sweating the assets', could afford to take a fairly conservative approach to asset management; having an asset down meant lost production but with healthy margins, it was common practice to "over maintain", hold additional equipment or "call in the armies" to maintain or maximise uptime. Now the industry is being challenged to continue to provide stakeholders with the long term returns they have come to expect or are awaiting. Asset management and maintenance strategies and the introduction of new technologies are under the spotlight with their impact on the long term to the sustainability of the business.

Over the last few years there has been significant momentum towards a "digital" asset concept, however, whilst "digital" infers the use of technology, ultimately, this is not only a technology opportunity, it is a business opportunity. It is the asset strategy & operating philosophy that requires change / innovation and technology is merely an enabler for this transformation journey.

Our strategic asset management vision focuses on 3 key objectives:

- ***Predictability*** of performance
- ***Utilisation*** of assets
- ***Effectiveness*** of decision making

Traditionally, the EAM approach was to deliver a single, central, tightly integrated CMM solution whereby there was minimum standard functionality across the different business user's requirements that resulted in a "lowest common denominator" scenario.



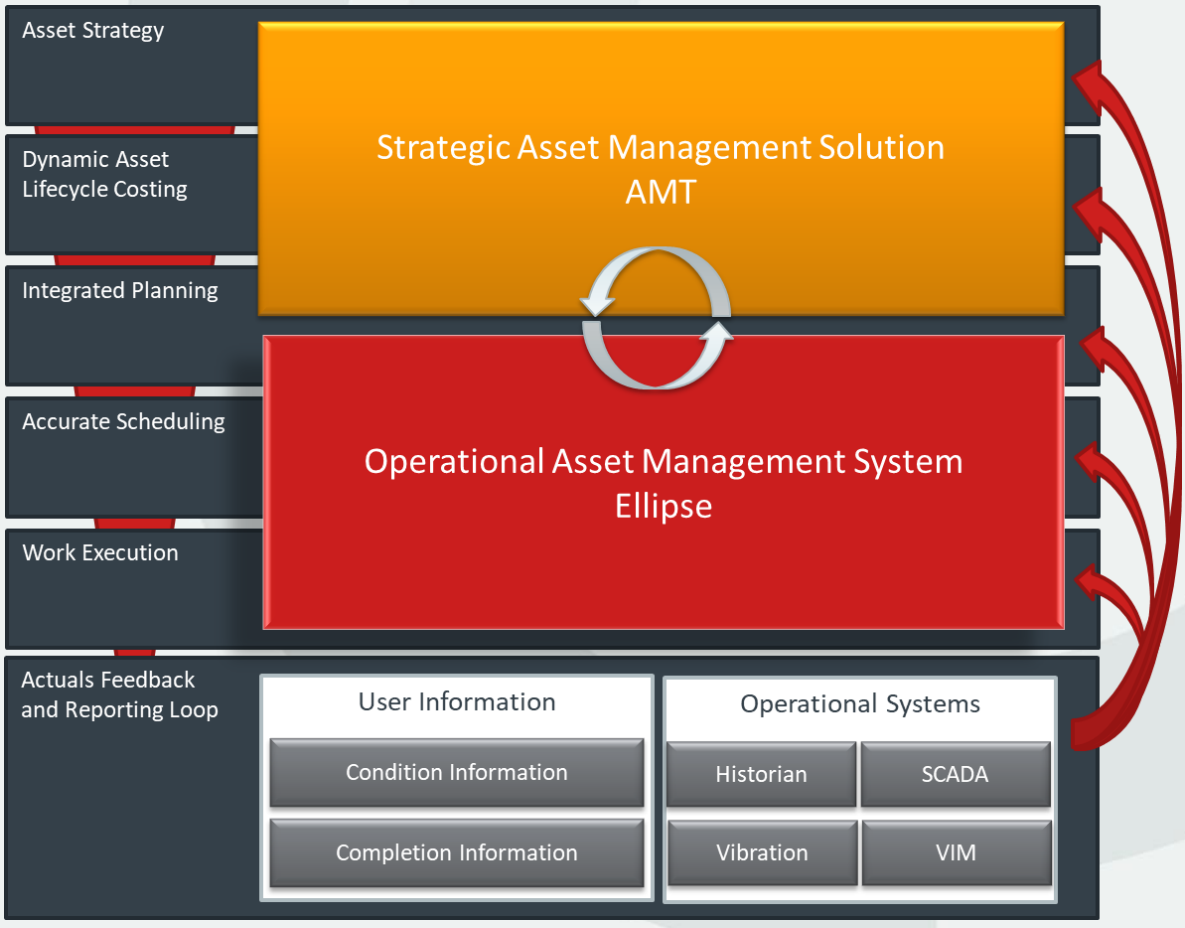
With the commoditisation of cloud, mobility and collaboration technologies we have seen a paradigm shift to the way in which assets are managed. This is driving a fit for purpose solution that provides visibility to asset managers and autonomy to asset maintainers, resulting in higher "tool time" and the automation of administrative tasks.

We believe the key to the success of delivering an integrated asset management process is data. This does not just focus on the quality, consistency and the integrity aspects of data but also the location, context and timeliness of information. The ***right data*** at the ***right time*** to the ***right decision maker***.

There are a number of asset management systems claiming to have "the only" end to end solution. In our experience each asset management solution has a specific strength that provides a highly usable, functionally rich function, module or process but almost always at the cost of another function, module or process which once again reduces the overall solution value by users having to compromise their requirements. User frustration and sub-optimal process efficiencies are consequences.

So who is leading the pack?

The recent collaboration between RPM Global and ABB to integrate AMT and Ellipse represents a significant step in delivering a highly functional, fit for purpose asset management platform for the mining industry. RPMGlobal's pedigree in mining economics, budgeting and planning coupled with ABB's physical asset management solution means that users will experience a fit for purpose asset management platform that has an underlying integrated data model.



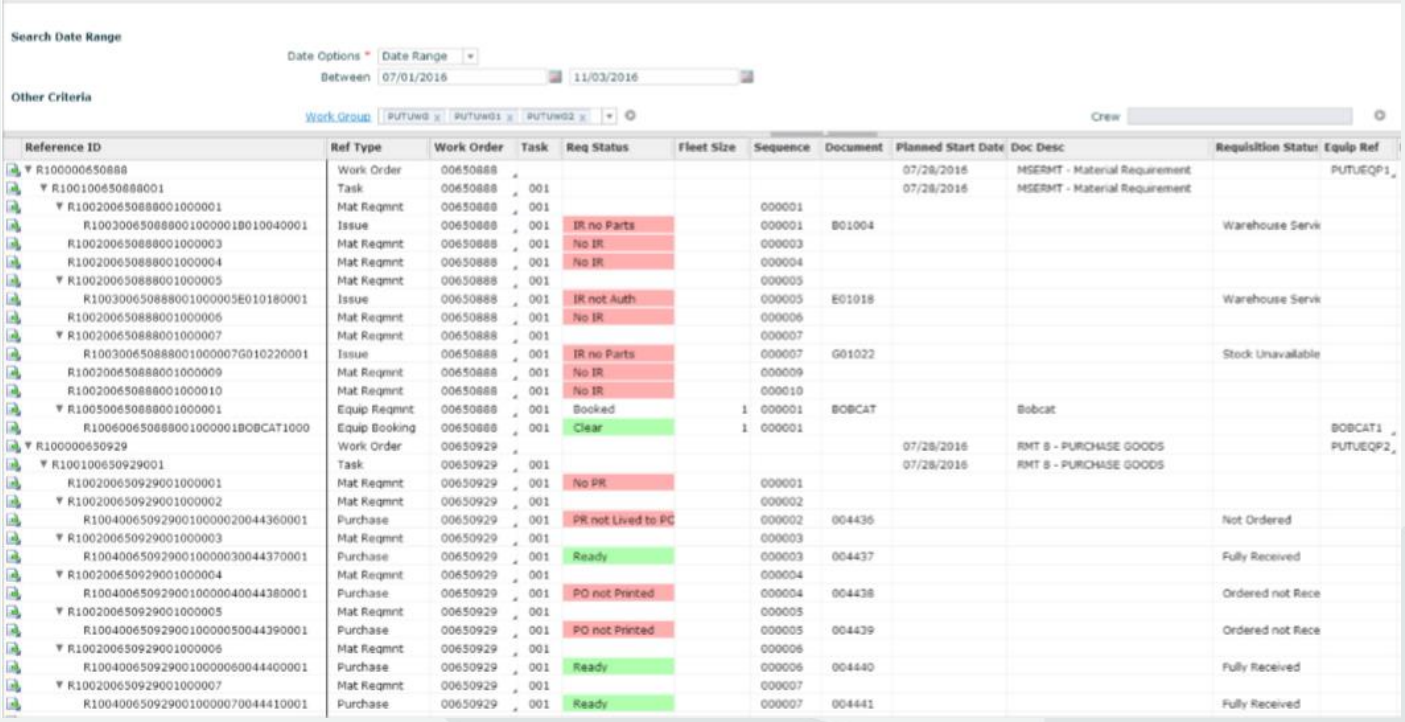
Ellipse

Ellipse has long supported the maintenance requirements of assets with its ability to group assets and drive a strategy from the group level to the individual asset. Maintenance schedule tasks can be projected into the future; there is flexibility with planning horizons from short to medium to long-term.

With standard jobs identifying parts, resources, tool/equipment requirements to complete the work, a forecast can be accomplished. It can identify resource excesses and shortfalls. A budget can be extracted and reported with some degree of relevance.

Despite being one of the best ERP's for Asset Management, any Ellipse budget or forecast tends to be rather static and requires one or more reports to be written. Undertaking 'what if' scenarios and future equipment comparison decisions is exponentially more cumbersome. Ellipse easily supports planning a single current strategy for various assets but becomes inelegant for the decision making processes that surround replacement and multiple strategy evaluations. More often than not, Ellipse Planner is used for maintenance plan preparation; however, any budget or forecasting, because it needs to include more than simply planned costs, tends to be undertaken in spreadsheets or other disconnected tools.

Managing the workforce rosters, inventory and procurement processes and tools and equipment needed for job execution, Ellipse understands and manages the viability of completing the schedule. With processes to support roster overrides, manage material conflicts as well as tool/equipment conflicts, Ellipse undertakes the scheduling and execution of the work. Understanding of the compliance to schedule delivers the necessary feedback to the accuracy of the schedule process; rework or additional work determines the effectiveness of the planning process.



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R100100650888001	Task	00650888	001					07/28/2016	MSERMT - Material Requirement		
R100200650888001000001	Mat Reqmnt	00650888	001			000001					
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AMT

AMT, with its accurate lifecycle position and maintenance strategy optimisation, provides a complimentary and connected solution to support reliability engineers and planners.

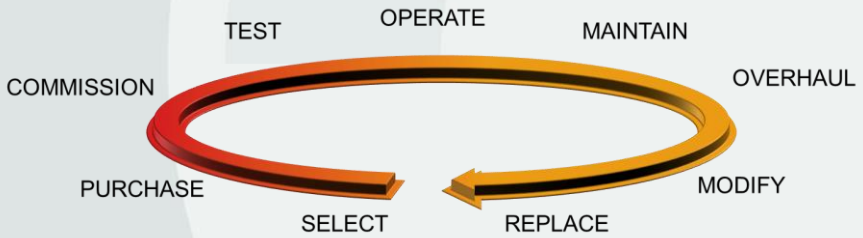
Implemented in over 300 mine sites worldwide, AMT is used by major OEMs as well as mining companies. At the core of AMT is the DLCC (dynamic lifecycle cost) engine; RPMGlobal is the only vendor to offer such capability.

Supporting both real and modelling assets, AMT lifecycle costing helps mining organisations to:

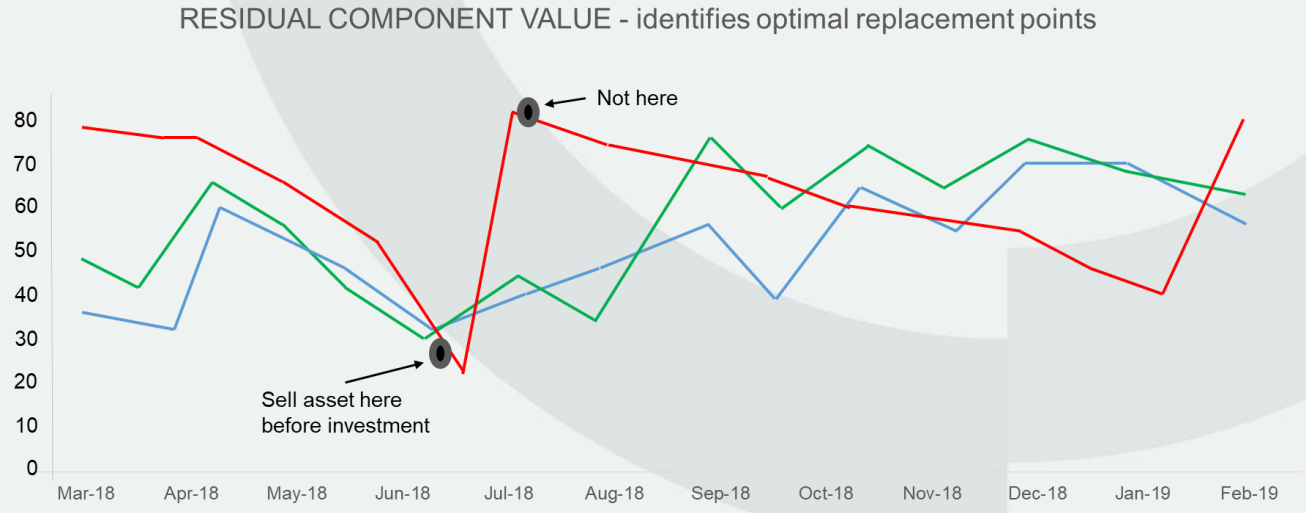
- Prioritise which individual maintenance plans to accept
- Test the accuracy of maintenance assumptions
- Monitor individual maintenance plan progress
- Measure the accuracy of the overall maintenance plan
- Understand if the 'overall collated maintenance plan' is reasonable

Modelling assets are distinct from real assets providing the capability for new and modified fleet evaluations. With AMT's real and modelled assets defined, their strategies drive the planning process and the associated planned, unplanned and unassigned costs are visible over the lifecycle. Where multiple models may be required for slight departures to design or maintenance strategy, manual calculations and spreadsheets for a reliability engineering approach can be extremely time-consuming, and provide the opportunity for errors. Repeatability of the analysis process and its traceability are important as minor errors in reliability analysis can lead to excess downtime, excess spare parts and excessive lifecycle costs.

Equipment replacement decisions may appear, on the surface, to be a fairly black and white proposition but there are many hidden costs and operational considerations that impact the tangible return on investment.



AMT supports the capability to track the residual value of each component to optimise replacement and refurbishment decisions.



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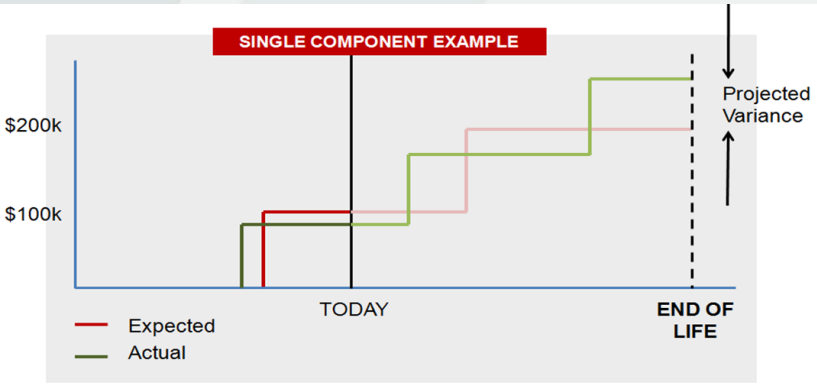
Accurate and timely recommendations, and variations thereof, need to manage the competing levers of time, cost and performance. This is where AMT distinguishes itself from an ERP allowing the development of multiple models, and the performance of advanced calculations simultaneously. AMT allows multiple models to be run quickly, ensuring one source of truth being accessed by multiple parties and focussed on deeper dives into issues. Reliability engineers then focus their efforts on the issues and their resolution versus number crunching.

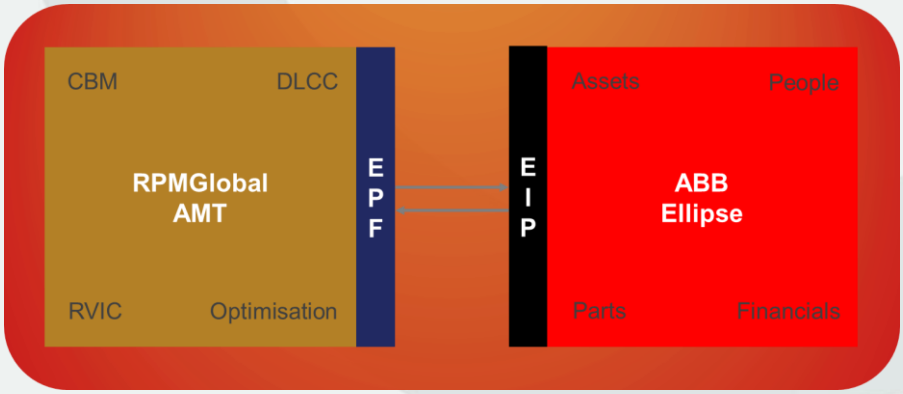
With direct links to the maintenance plan, AMT seamlessly integrates to formulate the budget and any ongoing forecasts.

Conclusion

By adopting a holistic approach to asset management which incorporates dynamic life-cycle costing processes, businesses are able to effectively make long term strategic decisions to repair, replace or dispose, whilst minimising the time to react. The example below depicts the economic impact for the entire lifecycle of a component due to a variation to plan on a single component. A small under-budget variance now becomes a significant budget overspend as time progresses and the number and timing of component change-outs take effect.



The seamless solution offered by the partnership between ABB and RPMGlobal offers the mining community a solution from the connected digital mine and back office support functions to the boardroom. The silos of production, maintenance and finance are broken down delivering the next level of cost management; decisions can be reviewed and analysed efficiently.



COSOL believes that by simplifying the decision-making process and executing works with an integrated resource plan can potentially unlock millions of dollars of value in today's mining organisations in both cost avoidance and direct savings.