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WHITE PAPER

Dynamic Life Cycle Costing for Mining Operations

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AMT®



Introduction

Enterprise accounting and maintenance systems are transactional systems. They focus on specific jobs and not the asset life cycle. Without a life cycle approach to asset management, value adding functions like first principles maintenance budgeting, strategy optimisation, component risk analysis, long term resource planning, economic life optimisation are not possible. AMT adds value to your existing enterprise system by providing a life cycle cost methodology around your assets.

What is Life Cycle Costing?

Life Cycle Costing (LCC) predicts the total costs, resources, utilisation and productivity for an asset over its entire life cycle. It is an excellent tool for assessing alternatives which has made it very common in the procurement of large assets.

LCC also provides a rational framework to model equipment operation, taking account of all pertinent cash flows for the life of the machine. It allows management to take a holistic view of physical assets, considering the full impact of the operating environment. The LCC model can also be easily extended to evaluate not only the cost of operating equipment, but also the number and type of parts required as well as the hours of labour and expected equipment performance. A simple LCC cash flow model is shown below.

Cost Element	Period					Total
	1	2	3	4	5	
Equipment Purchase	1,000,000					1,000,000
Operator	50,000	50,000	50,000	50,000	50,000	250,000
Parts & Materials	50,000	20,000	180,000	50,000	200,000	500,000
Labour	12,000	7,000	35,000	21,000	42,000	117,000
Fuel	75,000	75,000	75,000	75,000	75,000	375,000
Lubricants	8,000	8,000	8,000	8,000	8,000	40,000
Disposal					(100,000)	(100,000)
Total	1,195,000	160,000	348,000	204,000	275,000	2,182,000

The total cost of owning and operating the equipment is the sum of the individual cost elements. Life cycle cost analysis is often referred to as a 'first principles' cost analysis tool. It involves understanding the detail of the individual cost elements and building these up to the ultimate life cycle cost. Each of the cost



elements can then be broken down further. For example, the Equipment Purchase consists of the capital price, transport to site, commissioning and local options. The Parts & Materials elements are made up of the cost associated with all of the maintenance tasks required to keep the equipment operating at its design capacity.

	Period					Total
Parts & Materials	1	2	3	4	5	
Engine Change Out			100,000			**100,000**
PM Service	20,000	20,000	20,000	20,000	20,000	**100,000**
Frame Repairs	30,000		30,000	30,000	30,000	**120,000**
Wheel Bearings			20,000		20,000	**40,000**
Wiring Repairs			10,000		10,000	**20,000**
Drive System Overhaul					120,000	**120,000**
Total	**50,000**	**20,000**	**180,000**	**50,000**	**200,000**	**500,000**

For example, the Engine Change Out shown in the model above is scheduled to occur in period three. This is driven by an estimated life for the engine of 12,000 hours and an expected utilisation of the equipment of 5,000 hours per year. If the estimated life of the engine, or the utilisation of the equipment, changes, the model may provide a different result.

The benefits of this model for comparing like alternatives can be readily seen. If you also understand the productivity of the equipment, the analysis can quickly be used to compare different sizes of machines for the purposes of equipment selection and benchmarking.

Once built, the model can be easily extended to evaluate not only the cost of operating equipment, but also the number and type of parts required as well as the hours of labour and expected equipment performance.

How Can LCC be Applied to Mining Operations?

Life Cycle Cost models can be readily applied when assessing alternatives as a one off exercise, but how do you use this once the equipment begins operating? A common drawback of most life cycle models is that they are static. This means that the inputs are correct at the start of the equipment's life, but deviate from this ideal model as the equipment begins to operate. The timing and cost of actual maintenance activities will always deviate from the model and so it quickly becomes out of date.



To ensure the model remains current, each maintenance activity needs to be tracked and updated in the model. However, the process of updating the models is often cumbersome and time consuming and hence is not done on a regular basis. The information needed to drive the updates is locked in transactional ERP systems and not filed in a structured way making it difficult to extract. The model is then not current and its value is diminished.

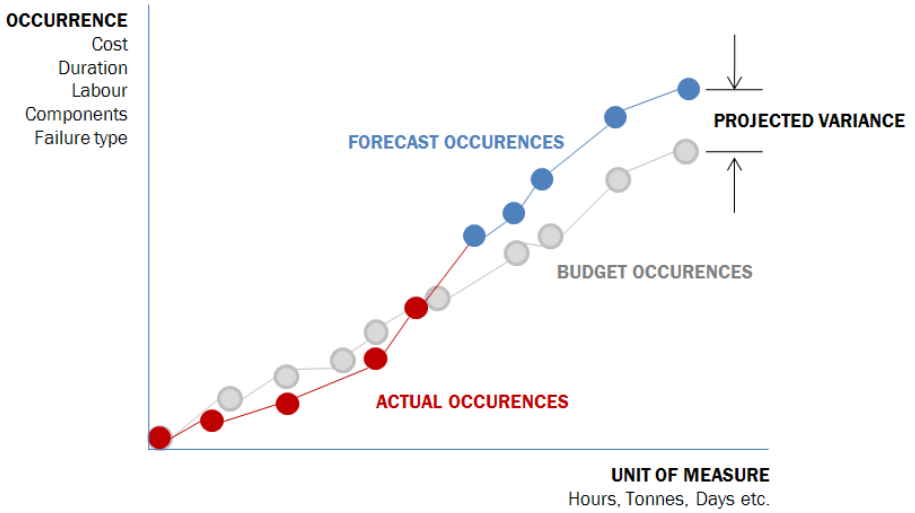
However, what if the LCC model could be continually updated as maintenance is performed? What if the component timing and costs could be automatically linked to the ERP work order or purchase order relating to each particular maintenance task? This would provide a *real time* life cycle cost model. It would enable equipment managers to see and understand the impact of their decisions on the life cycle cost of the asset. It would allow the maintenance organisation to see the forward resource forecast for parts, labour and materials. It would allow finance to understand in real time the first principles maintenance budget for the next month, year, five years and beyond.

1. AMT; DYNAMIC LIFE CYCLE COSTING

AMT maintains a *dynamic* life cycle cost model for each item of equipment. It unlocks the benefits of having this information live and available using inputs from your existing ERP. It puts a structure around work order costs and allows you to drill down and understand the major cost drivers and their impact on the life cycle cost. Most importantly it allows you to be *proactive* about asset management, control maintenance costs, reduce unplanned down time and understand the drivers of equipment performance.

The continuously updated life cycle cost models for all major equipment in your fleet allows you to understand the future position or *Projected Cost Variance* (PCV) between your budget and expected performance at some point in the future.





Once the dynamic life cycle cost models have been established for your equipment, a number of key equipment management processes are easily available. These processes all rely on life cycle costing and as such, ERP systems cannot provide this functionality. The most important ones are detailed below.

2. RISK MANAGEMENT

AMT actively identifies risks within the thousands of equipment and components under management and highlight those risks to the manager. By understanding the future impact of these risks, managers can make decisions that have a positive effect on the life cycle cost of the equipment, saving your operation money.

3. MAINTENANCE STRATEGY OPTIMISATION

The life cycle maintenance strategy is continually reviewed to provide the lowest cost per tonne or hour for equipment. Managers can test alternate maintenance strategies and immediately see the impact of changing the strategy.

4. RESOURCE FORECASTING

The forward requirement for components, parts, labour and resources based on the long term maintenance plan are always known. This drives inventory efficiencies and reduces dead stock.



5. ECONOMIC LIFE DETERMINATION

The method to determine the most economic disposal point for assets is based upon understanding the life cycle position of the equipment. AMT uses a proven method to dynamically determine the best disposal point for all assets at any point in time. Millions of dollars of asset value can be realised by understanding the best disposal point.

6. EQUIPMENT BENCHMARKING

Analyse and benchmark equipment across the entire company using methods such as Cost per Hour, Cost per Tonne, Discounted Cash Flow and Discounted Cost per Tonne. Use this knowledge to drive maintenance improvement across operations.

7. BUDGETING & FORECASTING

Continually see a 'real' zero based maintenance budgeting showing costs, availability, resources and productivity. Add overhead costs to get a full departmental budget that can be exported to your corporate budgeting system.

Next Steps

Contact iSolutions to request more information or arrange an online demonstration of the AMT Software

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