

WHITEPAPER

Why Maintenance Budgets
Matter: Alcoa's journey to
improve costs, reliability, and
knowledge transfer



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Why Maintenance Budgets Matter: Alcoa's journey to improve costs, reliability, and knowledge transfer

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Countless hours are spent creating expensive maintenance budgets, but the output is still generally very poor. Little intelligence goes into budget development when asset details and cost history are lacking, and this leaves the planners and managers guessing about future maintenance expenditures.

Guesswork undermines the credibility of the maintenance budgets as well as those who develop them, and the issues are perpetuated when the numbers roll up to the finance budget. The adage "garbage in, garbage out" is relevant here.

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"Alcoa's 29 operating locations in the primary products business are often in desolate areas where Alcoa is a major employer, if not the chief employer. If its plants are not successful, it hurts entire communities. Competitiveness, including maintenance budget control, is essential."

Clearly, making and managing budgets and controlling spending are too important to leave to chance. Ad hoc spreadsheets, homegrown software, and other

creative methods are too often used to perform these crucial business functions. Budgets must be built with intelligence and accuracy, from the assets up, using one source of data that satisfies both the maintenance and finance departments.

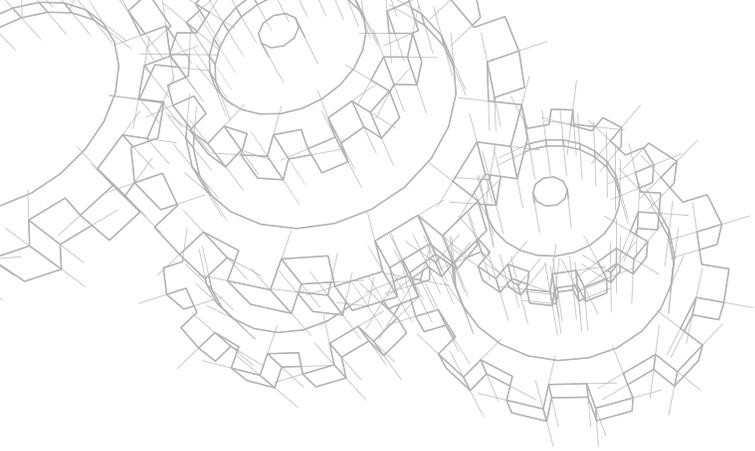
This paper sheds light on maintenance budgeting challenges, why maintenance budgets matter, strategies to improve them, and the benefits that will result. It shares Alcoa's journey to budgeting best practices.

What's Wrong with Maintenance Budgeting?



The needs and the language of the maintenance organization differ significantly from those of finance. Their expectations are also unique. Operational and asset-centric maintenance data form the basis of maintenance budgets, and it must be translated to finance's account-oriented, general ledger-centric structure downstream.

On the maintenance side, asset details that support objective budgeting include equipment criticality, maintenance history, failure data, work order details and history, and the bill of materials – all of which should be in the CMMS. None of this information is important to the finance department. The finance team needs forecasted costs summarized into the corporate chart of accounts, which is typically very different from corporate asset structures.



When maintenance budgets are not developed at the maintainable asset level, the forecast figures will be purely conjecture and high level. Likewise, when the inevitable budget adjustments are requested, there will be no basis for the decisions made.

Historically, Alcoa's budget planners guessed at what their future requirements would be without really having a fundamental understanding of the details. This made it extremely difficult to negotiate requested changes as well. Part of their problem was the sheer size of the available data pool. Alcoa's North America database, which contains manufacturing, asset management, inventory, and other key data sources, is six terabytes in size. It wasn't feasible to extract snippets of data and convert it into useful information, and there was no available tool capable of automating the process.

Timing is another concern. When the needed information is not readily available for forecasting, it becomes very difficult to create or adjust a budget within a reasonable timeframe. Decisions are rushed and unsupported by facts and data. The ability to successfully collaborate and negotiate is also constrained.

Lacking data at the individual equipment level makes it hard to identify what the real problems are from an equipment point of view. A problem that is apparent based on maintenance expenditures alone will not reveal the source of the problem. Consequently, the opportunity to reduce maintenance costs and improve reliability and output is constrained.

When the unexpected occurs, "firefighters" will tackle the breakdown at whatever cost is required to get the process back online, but if the root cause is never solved or the maintenance process is not changed, then that problem will repeat itself and the firefighting cycle will continue.



1. Maintenance is a major controllable cost

In asset-intensive industries and the commodities business in particular, maintenance accounts for as much as one-third of an organization's net controllable cost. At Alcoa, maintenance represents between 20 and 40 percent of the cost to produce a ton of product. Identifying waste, inefficiencies, and the causes of unreliability—and finding ways to prevent or control those cost items over time—makes it possible to improve overall execution and gain a competitive advantage.

Commodities businesses such as Alcoa can't control supply and demand, so they have little or no pricing power. Instead, they seek to be the low-cost producer by looking for ways to reduce controllable costs such as maintenance, labor, strategic raw materials, energy, etc. Many of these organizations, including Alcoa's most successful refineries and smelters, have been more focused on delivering stability of output at any cost rather than stability of output at an appropriate cost.

The savings potential of finding the appropriate cost is great. In a \$300 million facility with \$100 million of net controllable cost, if only 70 percent of the budget is planned work and 30 percent is reserved for the unexpected, then that's \$30 million worth of opportunity. Alcoa aims to drive its contingency reserve down to five percent or less (zero is the ideal), so that virtually all its work is well defined, well timed, and accurately budgeted.

2. Maintenance budgets drive reliability engineering

Maintenance budgeting is a foundational element to driving equipment reliability, and reliability engineering is a very practical approach to getting better reliability at a better cost. When managing costs in accordance with a budget, the variances will become evident as the work is executed. Having a window into the variances, whether positive or negative, provides a feedback loop. Poor asset performance can be analyzed so that better decisions can be made the next time, and good asset performance can be leveraged as well.

3. Maintenance budgets reflect tribal knowledge

Maintenance budgets are dependent on tribal knowledge and experience, making it essential to put in place a system that endures when the people will not. Like many companies, Alcoa is keenly interested in developing its technical talent and promoting its personnel into business leadership roles. At the same time, the workforce aging trend is accelerating the rate of departures.

Real-time access to historical asset and cost information simplifies the ability to make risk-based decisions and ask better questions of decision makers. For example, if the total budget needs to be cut, what activities should be eliminated or reduced, and what risks will be introduced? Is there another way to mitigate those risks? If we increase maintenance frequency and cost, will we save by reducing the risk of failure? Budgets formed through guesswork don't support risk-based decisions or reliability engineering. Good data is required to weigh the costs and benefits of each approach and how to prioritize the improvements.

To reduce costs while improving reliability and output, Alcoa has begun challenging its maintenance teams to rethink their maintenance decisions and ask questions such as, "Is this work really warranted, or are we over-maintaining or over-cleaning? What is our most critical equipment, and should we be paying it more attention?" Alcoa is also investing in processes and systems to help capture tribal knowledge to ensure business continuity and talent development.





Solution Vision

From Alcoa’s point of view, the maintenance budgeting opportunity lies in getting better asset and cost data from which to extract meaningful information, and making decisions that improve the stability, predictability, and consistency of the facilities. It requires changing the mindset of the maintenance community from, “I’m here to repair the equipment at any cost,” to, “I’m here to repair the equipment at the appropriate cost.”

To achieve this, asset-intensive organizations require dynamic and user friendly tools to help them create more timely and accurate budgets, manage the costs in accordance with the budgets, measure performance, and leverage greater awareness of the major controllable cost items.

Access to detailed information will convert subjective budgeting decisions into objective decisions and facilitate greater stability of output and consistency of costs. When pushback on a budget item occurs, the ability to drill down to the details will encourage a collaborative, risk-based decision, so that there will be fewer surprises and less finger pointing upon a failure.

That window to the dollars will reveal what is actually being spent and where the variances are year after year, and therefore enable continuous improvement. When there is visibility into repeat problems, solutions can be found that mitigate and avoid future failures or deliver repairs at a lower cost. In addition, analyzing the cost performance helps to determine whether something is too expensive to repair or if an alternate strategy is preferable.

Best Practice Budgeting

Building budgets from the assets up, using activity-based budgeting and activity-based costing, provides an intuitive way to develop maintenance budgets at the maintainable asset level.

Budgeting from the assets up allows for more accurate budgets based on cost trends, risks, and future plans. It enables the identification of waste and inefficiency and reveals the high cost items that affect the performance of the plant so that improvements can be made.

Building budgets from the activity up builds credibility. When the maintenance department understands the what, why, and associated costs, the budget becomes fact based and facilitates risk-based decisions.

Alcoa is working toward asset-level, activity-based budgeting, beginning with its most critical assets, and capturing all the “truths” in its computerized maintenance management system. Its maintenance costs are generated out of three categories:

- A. Activities performed on a pre-determined frequency, such as lubrication**
- B. Activities unique to a particular period of time, such as an overhaul every ten years**
- C. Activities that are unplanned, unbudgeted, and unforeseen, which cause variability in the budget**

By driving more detail into the first two categories and leveraging historical asset-level activity costs, it allows more room for negotiation on the third category (reserve costs).

Alcoa's Budgeting Goals

Budget for all critical asset

- ~20 percent of all assets

Establish contingency reserve target

- 5 percent or less

Establish cost targets

- \$/activity
- \$/unit of product produced

Measure asset KPIs

- \$/critical asset
- Total \$ for critical assets
- Labor \$ per asset
- Material \$ per asset

Most of the time, a repair job has been performed at least once before. The historical occurrences become the baseline for activity-based budgeting and subsequent improvements. There will sometimes be jobs that have no history, in which case the planners need the ability to use zero-based (or asset-based) budgeting to forecast from scratch based on the expected work.

Alcoa sets a target dollar per activity and a target dollar per unit of product produced at the beginning of each year and holds to it for the year. By identifying those assets that are contributing the greatest amount of cost to the plant's output, the planners can use that information to identify ways of reducing it to a nominal level.

The company measures KPIs including dollar per units produced, dollar per piece of critical equipment, and total dollars for all of the critical equipment (including the potential bottlenecks and those that affect the output, safety, or environmental aspects of the plant). Alcoa is also working to obtain far more detail around the number of hours spent, the number of labor dollars spent on a particular piece of equipment, and the amount of material dollars spent. All this data will be looked at with the budgeting and forecasting process on a daily, weekly, monthly, and annual basis, and proactive improvements will be made.



Alcoa eventually intends to apply its new budgeting processes to all assets, but initially only the critical assets (~20 percent of all assets) are being targeted. Trends will be monitored at first, but as the program matures, absolute values will be evaluated to improve problem solving.

Three Steps to Effective Zero-Based Budgeting

1. If the goal is to make a highly accurate maintenance budget, then make a copy of what was spent the prior year and don't institute any budget controls or process changes. However, if the goal is to improve operations and reduce maintenance spending, or at least manage it better, then it is necessary to build the budget from the ground up using zero-based (asset-based) budgeting. This involves making sure the maintenance system is accurate and then summing the cost of all the year's planned work. If your zero-based budget closely mirrors what was spent the prior year, it means that you have very good maintenance information, a solid preventive maintenance system, you're in control, and you know where your money is spent. If not, you'll see where effort is needed to make the maintenance organization more competitive and avoid unplanned expenses.

2. Keeping a budget current throughout the year is very difficult when the budget and maintenance systems are separate. Offline budget systems are typically preloaded at the beginning of the year and then the budget is created, but maintenance updates during the year don't normally cascade back to the offline budget system. Ideally, the budget system should be connected live to the maintenance system so that the numbers are one and the same.

3. It makes no sense to do zero-based budgeting from the ground up for 100 percent of an organization's assets. Identify the most critical assets and build a ground-up budget for them. For the rest of the assets, just copy what was spent last year.

Conclusion

Peter Drucker once said that a well-managed plant is "silent and boring." In its quest to achieve this state, Alcoa embarked on a road to reliability excellence nearly ten years ago [at the time this paper was written – Ed.]. It embraced the opportunity to lead and take the first steps on this slow but deliberate journey.

With time and experience comes knowledge and refinement, and the upgrade to maintenance budgeting best practices is a new and important phase. Alcoa reworked its processes and replaced its homegrown budgeting system with a real-time solution from VIZIYA, now part of Prometheus Group. The results are documented in a follow-up whitepaper, [Purpose-Built Budgeting Tools Save Time, Improve Accuracy, and Control Maintenance Spend](#)

Alcoa's successes and lessons learned in its efforts to drive stability of output at the best possible cost provide a model for other asset-intensive business to follow.



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