



WHEN TO REPLACE YOUR CENTRIFUGE



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In the life sciences, healthcare, or chemistry, an important type of equipment is the centrifuge. These precision machines, when properly operated and maintained, can last eight years or more. Although no organization is eager to spend money on replacement equipment, it will eventually become necessary.

Eventually, any centrifuge will wear out. However, the factors involved in the decision to replace that centrifuge should be considered long before the equipment suffers a failure. This process is commonly referred to as **life cycle management**. Life cycle management balances factors including the expected life span, the value the machine can bring, maintenance time and expenses necessary to maintain the device, and budget.

A lab manager should employ life cycle management as a tool to aid in evaluating when to replace equipment.

The “Life Span Only” Mistake

The expected operational lifespan of a piece of equipment is an important, but often inexact, variable. Proper life cycle management requires that the expected lifespan be **one** factor, but not the **only** factor considered.

Although a machine might run far beyond the manufacturer’s expected lifespan, for example a car remaining on the road for hundreds of thousands of miles, planning on such an atypical outcome is usually a mistake.



Treating the expected life span of a centrifuge as a guaranteed period of optimal functionality can place in jeopardy critical functions of an organization. An unexpected, but preventable, failure occurring within the expected life span can undermine operations and revenue. Such a failure in a healthcare or life sciences setting also has the potential of adversely affecting someone’s health or the orderly progression of research that might lead to the cure of a disease.

When equipment fails, repairs often make it operational again. As devices get older, repairs are needed more frequently. Eventually, repairs will become more costly, or impossible to perform for lack of parts, and replacement will be necessary.

However, if this replacement is only considered following an irreparable failure, a new unit may be back-ordered or otherwise unavailable for timely delivery and setup.

It is far better to anticipate failure by observing physical and operational indicators. For a centrifuge, bearings can wear, lid spring mechanisms can give way, and trunnions might cease to operate even with proper lubrication. One of these in isolation is cause for concern, but, taken as a whole, they are likely a sign of imminent failure.



Centrifuge Lid Spring Mechanism, a potential point of failure.

There are also standard measures such as **duty cycles**. Manufacturers rate equipment regarding how many times it can be used, known as duty cycles. Unusually heavy use, inadequate maintenance, or other challenging conditions, could put additional strain on mechanisms, causing them to wear faster. The metric of duty cycles gives a way to track and plot use against expectations.

Obsolescence and Operations

In addition to wear from normal use, another reason to replace a centrifuge is obsolescence. While a total breakdown is an objective reason for needing new equipment, obsolescence requires a judgment call that depends on the context of a particular organization.

There are two types of obsolescence for equipment. The first is an issue of maintainability. To keep an older device operational, replacement parts are necessary. In addition, someone with the expertise to provide support for a particular model is needed. The likely repair and maintenance costs over



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several years should be considered against the cost of purchasing a new unit.

The second type of obsolescence has to do with features and capabilities. Advances in materials science, mechanical design, digital controls, wireless connectivity, and refrigeration systems can make a compelling case for an upgrade. A new machine might last longer, require less maintenance, offer new operational efficiencies, demonstrate capabilities previously unavailable at a given price point, or open doors to new types of applications.

Increased capabilities and improved operating characteristics can be revolutionary for an organization. The management of operations and control of budgets often reduces to the capabilities of available tools, cost of those tools, and the benefit the tools can provide to employee productivity. Optimizing these factors can translate into opportunities, whether new types of business, consolidated operations, or reduced costs. The understanding of device life cycles, department, and organizational needs, and the finances of capital investment, staffing, and operating expenses provides perspective on the trade-offs between the cost of new equipment versus benefits that might be gained.

Build a Financial Model for Planning

Because the interplay of financial factors can be complex, the creation of an economic model can help decide whether an equipment upgrade is necessary. **The model must consider three factors:**

- quantified advantages of the new centrifuge
- implications for departmental operations
- cost/benefit analysis.

Quantified Advantages of the New Centrifuge

It is critical to quantify the benefits as much as possible to make a sensible decision. Greater capacity affects the amount of lab work that can happen per measured unit of time. The ability to connect to a network and notify technicians when a run is complete can reduce the time to execute a procedure.

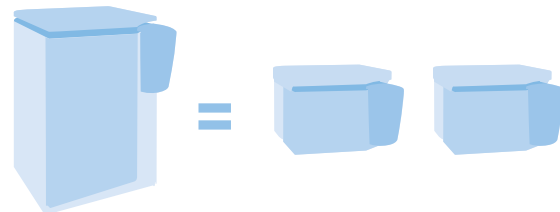
A reduction in the time each process requires allows the lab to undertake more work.

It is even possible to model benefits of the ability to perform previously unavailable types of analysis. Higher speeds or an expanded range of temperature control can open new markets, provide new customers, and expand potential revenue. The sales and marketing departments should be able to help translate these possibilities into likely additional income.

Operational Implications

A lab must also consider how a new centrifuge would fit into the context of existing equipment.

It might be that a new higher capacity device could replace more than one centrifuge. Or, a higher capacity centrifuge could be a logical replacement for a smaller unit currently in greater demand. The logical candidate for replacement might actually be newer with more remaining operational life than another centrifuge in the lab. Can one new unit effectively extend the useful life of several others?



In some circumstances a new high-capacity centrifuge might replace the processing capability of two or more units currently in use.

The decision to replace one centrifuge should take into account the use of all centrifuges. Such an analysis requires a lab-wide model of all centrifuges, including work capacity and utilization, which is the percentage of available time equipment is put into use. Only then can a lab understand its combined resources and examine how different configurations, including upgrades, would affect workflow, capabilities, and budgets.

Consider less obvious potential ramifications of changing equipment, as well. Changes in efficiency will have an impact on personnel. If fewer people can now do the same amount of work, will the organization reduce headcount or move some



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workers to other positions? There are other more mundane but still important considerations. Does a new unit require more or less energy to run? Will it fit in the space allotted for the centrifuge it will replace? What are the total costs of ownership, including maintenance contracts and projected costs of replacement parts and consumables? Will retraining of personnel on operation and maintenance be necessary?

Cost / Benefit Analysis

Performing a cost / benefit analysis requires cooperation within an organization. All the information necessary to balance budgetary and operational trade-offs is unlikely to reside with one individual. For example, new levels of revenue from additional capacity or capabilities can justify a certain amount of additional spending. But, the tax implications of capital expenditures, equipment amortization, cash flow, and financing considerations also affect the purchase. Financial personnel could likely provide revenue requirements over time for the organization to buy a new centrifuge and retire an existing one. Similarly, if greater efficiency is a benefit, what are the personnel implications? Human Resources would be instrumental in such a discussion. Finally, any new purchase contract will require legal review.

A formal approach is imperative. Through a formal analysis, a business case can be made for the decision, which will be necessary to win support from management. The case will likely need a spreadsheet model to weigh interdependent factors and allow what-if scenario planning. Again, the finance department will be an excellent resource in building a model that could then be adapted to other types of equipment, saving effort.

Work with Your Vendors

Much of the data necessary to make a decision will come from the suppliers. Manufacturers can provide information to determine available cycles and full costs, including consumables. Maintenance providers may have experience with new models and be able to estimate ongoing repair and parts costs. Both might add insight into quantifying "soft" benefits.

If replacement makes sense, vendors can also contribute to planning an orderly transition, so the new unit is in place before a last-minute breakdown.

Make use of the available help and build decision models that can be used as a tools for future replacements.

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