The business case for life cycle cost

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Tags: maintenance and reliability

Many industrial professionals have pondered applying life cycle cost principles as a means of lowering costs and improving performance over the life of the equipment. Few have actually implemented a comprehensive and sustained process for achieving it.

Most agree that applying life cycle cost principles will improve long-term performance of the assets being developed. But, project engineers are typically measured on the project's budget and schedule, not on life cycle cost performance, thus providing a strong incentive to focus on lowest installed cost and to ignore life cycle principles, especially when using such principles results in a perceived budget overrun or schedule delay. This paper provides some thoughts on justifying the use of life cycle cost principles and, more particularly, to help you develop models for determining the "payback period" for applying these principles.

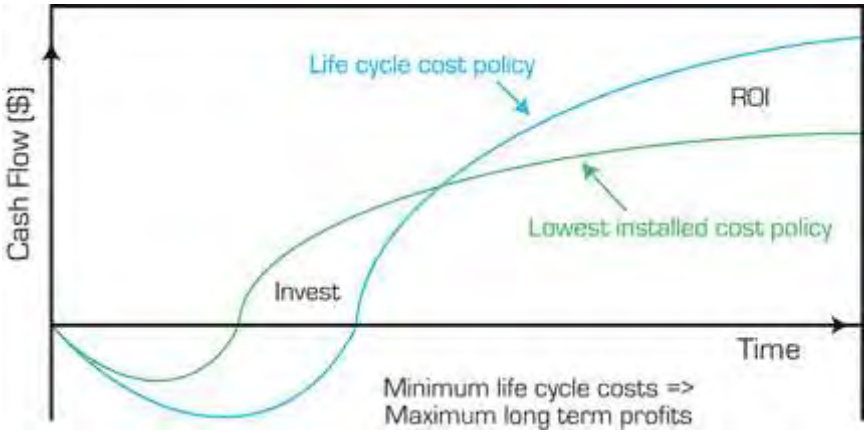

Figure 1. Life cycle cost and cash flow.

The basic concept in applying life cycle cost principles is embodied in Figure 1.

In this model, the principle applied is that if we spend a little more money and time at the front end of the project, the returns will be delayed but well worth it, since they apply over the life of the equipment. Minimum life cycle cost provides maximum long-term profits! But, how do we know what the return might be. What's the payback? It's difficult to say, thus making it less attractive for project engineers to accept and apply the use of life cycle cost principles. But, let's consider the following data from a large chemical manufacturer:

The data suggests, and many of you have likely experienced, that in the first two years after startup, maintenance costs are higher, primarily due to the need to repair and replace certain components that: A) did not meet the functional requirements of the operation, or B) experienced early life failures due to poor installation and startup problems.

In effect, an extra 3 percent of the asset's replacement value, or in this case its capital value, was spent in the first two years correcting problems that should have been addressed during the design and installation/startup effort. Note that this does not include the effects of any production losses, which likely have a substantially higher value (e.g., five times the maintenance costs), depending on the gross profit margins for the product being made.

In any event, a better design and installation effort should minimize the risk related to these problems (e.g., maintenance costs, production losses and the risk of injury; more equipment failures result in a higher risk of injury).

Further, consider the data shown in Figure 3 from another Fortune 500 manufacturer. This data illustrates the production losses that are often experienced during the first one to two years of starting up a new plant. As shown in Scenario No. 1, the plant achieved 70 percent of its design production capability during the first six months after initial startup efforts, but then took another year before achieving full production capability.

Let's assume that we could, through better design and installation/startup, capture a large portion of these losses and have the plant at full production within the first six months after initial startup efforts, as shown in Scenario No. 2.

The value of the lost production is estimated as the difference between the area under the two plots for the two time periods in each scenario (zero to six months and six to 18 months). In other words, (A3 + A4) - (A1 + A2) = 22.5 percent of one year's production capacity, as shown below:

Scenario No. 2:

A3 + A4 = ([6/12] x 100% x [1/2]) + (1 x 100) = 25% + 100% = 125%.

Scenario No. 1:

A1 + A2 = ([6/12] x 70% x [1/2]) + [(1 x 70) + ([100-70] x ½)] = 17.5% + 85% = 102.5%

In other words, in Scenario No. 1, during the first 18 months of initial production, we achieve 102.5 percent of one year's equivalent production. Moreover, if we could minimize these problems, we would achieve 125 percent of one year's equivalent production. What is this worth? Clearly, it will vary from business to business, and you should develop your own data for estimating this.

However, to illustrate the potential value, let's do an example. Let's assume that you could capture all the production value in Scenario No. 2, and could reduce your initial maintenance costs so that the extra 3 percent of maintenance costs as a percent of replacement value was not incurred in the first two years after startup. Let's further suppose the following:

Initial capital cost = $100 million

Planned production value = $100 million per year

Gross profit contribution = $30 million per year

Maintenance costs = $6 million in Year 1, $5 million in Year 2 and $4 million in Year 3 (Figure 2).

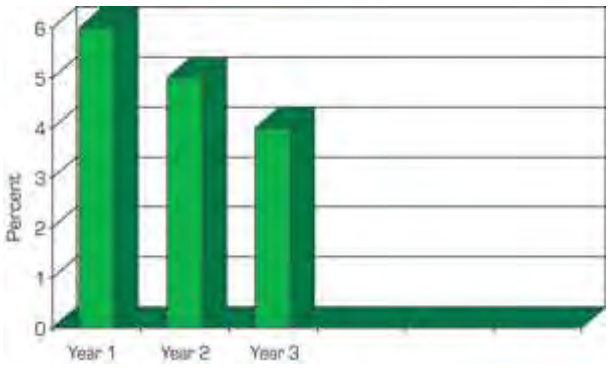

Figure 2. Maintenance cost as a percentage of asset replacement value, after startup.

So, what's the relative value of the two scenarios. In Scenario No. 1, we spend an additional $3 million on maintenance, and lose some 22.5 percent of one year of equivalent production, and its associated gross profit, or 0.225 x $30 million, or $6.75 million. The total loss is $9.75 million. So, the argument would be that if we spent another $10 million up front to address the problems we had in Scenario No. 1, and we believe we can actually achieve that, we would recover that extra investment in the first 18 months of production. And more importantly, we should have fewer problems and higher production capability over the life of the equipment. What is that worth? You be the judge.

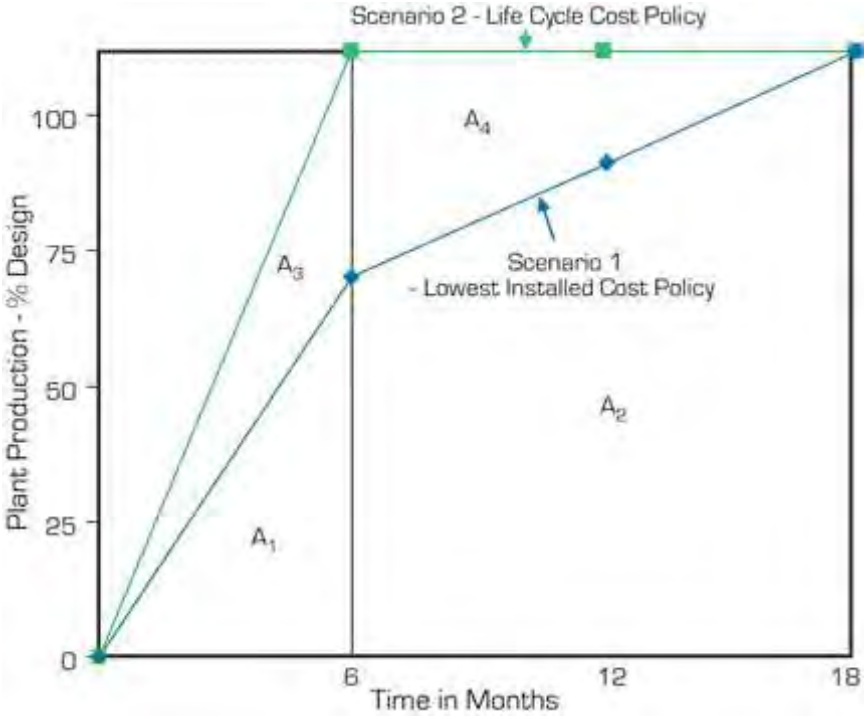

Figure 3. Startup losses - two scenarios.

SUMMARY

You should develop your company's scenarios and exercise your judgment about the value of applying life cycle cost principles. You might even construct a strategy of applying these principles to your next five major projects to determine if they, in fact, do work. Note that this might take five years or so to determine. My opinion is that the 10 percent extra initial cost on a project, given that it is spent to minimize design faults and thus minimize life cycle costs, is money well spent. It has a notional payback of 18 months and will go a long way toward addressing the risk of future losses - production, costs and injuries. Finally, an extra 10 percent on the capital budget seems reasonable for applying life cycle cost principles. In this example, you get it back in a mere 18 months!

Ron Moore is the managing partner of The RM Group and the author of "Making Common Sense Common Practice: Models for Manufacturing Excellence" (now in its third edition) and "Selecting the Right Manufacturing Improvement Tools – What Tool? When?", both from Elsevier Books, Butterworth-Heinemann imprints. He can be reached at 865-675-7647 or RonsRMGp@aol.com.