Calculate the Impact of Unreliability on Sales

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While most acknowledge that unreliable operation is costly at the plant level, the impact, when projected to sales, is enormous.

Generally speaking, manufacturing personnel understand the effect unreliability has on maintenance. Unreliability requires more maintenance resources and materials to repair failed equipment as well as increased maintenance capital spending caused by the need to replace equipment that has reached the end of its useful life. Running equipment to failure causes equipment to reach the end of its useful life prematurely. What many manufacturing personnel do not understand is the effect unreliability has on sales.

Maintenance professionals find it difficult to garner support of corporate executives who do not understand maintenance. However, these same executives have a very clear understanding of profit and loss. If they understand the effect unreliability has on sales and, therefore, profit, they will be much more inclined to support a comprehensive reliability initiative. It might surprise many maintenance professionals to learn that there is a mutual benefit to be derived from reliability: reduced maintenance costs and increased sales and revenue.

To understand this relationship, we must examine the basic business model. All for-profit businesses operate under the same equation: PROFIT = SALES – COST. Equipment failures affect both sides of this equation.

"Calculate the True Cost of Unreliability," an article published in the February issue of Maintenance Technology examined the impact unreliability has on maintenance costs. In this article we will examine the effect unreliability has on sales.

A hypothetical plant will be used for purposes of calculations. You can apply these calculations to your own operations to develop an order-of-magnitude estimate of the impact unreliability has on sales and profitability.

For the calculation purposes, we will use a hypothetical plant that has a plant-replacement value (PRV) of $1 billion US, with a targeted return on capital employed (ROCE) of 30%. In other words, business stakeholders expect to realize $300 million in earnings before interest and taxes on their $1 billion investment. We will also assume that this plant operates at 70% capacity due to lack of sales.

Raise Sales Price

Sales revenue is driven by two key levers, price and volume. The higher the sales price per unit the higher the margin, the higher the sales revenue, and the greater the profit. Additionally, the more product you sell (sales volume), the higher the sales revenue and the greater the profit. So, both sales price and sales volume determine the revenue garnered by the business. Unreliability has a very profound effect on those two factors. To understand the relationship between asset reliability and sales revenue in this equation we need to examine each component in more detail.

The price of a product is largely set by whatever price the market will bear. However, the market places a premium on quality. The highest sustainable product quality can only be produced through uninterrupted manufacturing. As assets become more reliable, manufacturers are able to produce consistently higher quality product, something customers value. This isn't new. W. Edwards Deming espoused the virtues of product consistency more than a half century ago.

If a 5% price premium can be garnered from customer willingness to pay more for higher quality product, then the subsequent increase in sales revenue is calculable. Assuming the hypothetical plant had $500 million in sales during the reporting period, the increased revenue from a higher price enabled by higher-quality product would be an additional $25 million in sales revenue.

This increase in sales revenue was made simply by reducing and/or eliminating unplanned equipment failures. No additional capital was required, resulting in a direct increase in the return on capital employed and, more importantly, on profitability.

LINE ITEM: $25 million = The increase in revenue due to higher sales price for higher quality product derived from reducing and/or eliminating unreliability.

Increase Capacity

A second sales-revenue benefit derived from the elimination and/or reduction of unreliability is garnered through a lower cost per unit (CPU) of production. By operating in a failure-free mode, manufacturers are able to increase throughput. When there are fewer production interruptions caused by equipment failures, more product is made over the same period of time.

For example, if the average production rate was 80 tons per day, including time lost to equipment failures, then a natural benefit derived by reducing and/or eliminating equipment failures would be an automatic increase in capacity. If one additional hour per day of production was gained, the subsequent increase in capacity would be 4%.

A 4% increase on $525 million in annual sales revenue would be worth an additional $21 million in sales revenue. As was the case with improved product quality, this increase in capacity was derived without any additional capital investment. Companies are always striving for increased sales by whatever means, but they inevitably expect to have to invest significant capital in a new production unit or to expand an existing production unit.

LINE ITEM: $21 million = The incremental sales gained through the incremental increase in production capacity derived from reducing and/or eliminating unreliability.

Increase Sales Margin

Additionally, a 5% reduction in the cost per unit derived by spreading costs, e.g., operational and energy costs, over a larger volume of product could be significant. This is effectively an increase in the sales margin of the product being sold. Using the aforementioned $500 million in annual sales, the benefit would be 5% of $500 million, or an additional $25 million in profit.

LINE ITEM: $25 million = The increase in profit caused by an increased sales margin gained by reducing the cost per unit derived from reducing and/or eliminating unreliability.

Admittedly, an argument against the aforementioned gain could be made. Just because you produce more product doesn't mean that you can sell it. But let's examine the primary means of competition in a capitalistic environment. Companies generally compete on price and/or on quality. By reducing and/or eliminating equipment failures, both of these factors are enhanced. If you have a higher quality product to offer, your competitive position is automatically strengthened. You can increase price to increase sales revenue and/or maintain the same price and increase sales volume by offering a higher quality product for the same price. The gains illustrated above appear to be

reasonable, so we'll assume that we could potentially increase sales price and sales volume, thereby deriving a dual benefit from the reduction and/or elimination of unreliability.

Reduce Maintenance

We must also consider that, with a reduction in unreliability, maintenance costs, typically the highest fixed cost in manufacturing, are substantially lowered. Maintenance costs are distributed across all production in the form of maintenance cost per unit of production. The net result of lower maintenance cost is therefore lower cost per unit of production. In a poorly performing operation, characterized by high unreliability and subsequent high maintenance cost, the benefit derived from reducing the maintenance cost per unit alone can be profound. Benchmark studies have shown that the difference between a best performer and a worst performer, relative to maintenance cost, can be exponential. In other words, a worst performer will spend exponentially more on maintenance per unit of production than a best performer.

In the process industry, the range of performance in maintenance cost as a percent of plant-replacement value (PRV) is from less than 1% for best performers to more than 15% for worst performers. For illustration purposes we will assume a 1% reduction in maintenance cost as a percent of PRV. We will assume maintenance costs were 3% of PRV, but have been reduced to 2% of PRV by implementing a robust condition-monitoring program that facilitates corrective action prior to catastrophic failure. The net increase in profit through reduced maintenance costs based on a PRV of $1 billion would be $10 million.

LINE ITEM: $10 million = The increase in profit gained by a reduction in maintenance cost derived from reducing and/or eliminating unreliability.

Extend Turnaround Frequency

Although it is not universally recognized, maintenance turnarounds are caused largely by unreliability. The primary driver for turnarounds is typically pressure-equipment inspection. But what if you used non-intrusive condition monitoring such that you eliminated the need to open equipment for visual inspection?

Far too many process plants still take annual turnarounds. In this era of advanced inspection technologies, that is inexcusable. Better-performing process plants have extended the frequency of their turnarounds out to 5 to 7 years. Let us assume that the hypothetical plant still takes annual turnarounds that cause 21 days of lost production. If the turnaround frequency was extended out to 3 years, with only a 7-hour increase in duration, a net annualized increase in production of approximately 12 days would be realized.

If we conservatively calculated the value of each day of production, based on current production rates and sales prices, twelve additional days of production would net an additional $18 million in sales revenue.

LINE ITEM: $18 million = The increased sales revenue gained from 12 additional days of production derived from reducing and/or eliminating unreliability caused by annual turnarounds.

Increase Production

The final potential gain we will examine is the 30% of production capacity that is not currently utilized, auspiciously because of a lack of sales. Claiming that no sales were lost due to unreliability is a self-fulfilling prophecy. As long as the manufacturer is not a sole source producer, additional sales were lost to competitors. If we go back to the benefits of the highest sustainable product quality and lowest sustainable unit cost of production, there would be no valid reason for not selling every unit of production. That additional 30% of production and subsequent sales is a game changer for the business. Using the original assumption of $500 million in annual sales, adding in the additional sales revenue from continuous production, and ignoring the quality premium, the net gain in sales revenue is an astounding $215 million.

LINE ITEM: $215 million = The increased sales revenue gained by running continuously, derived directly and indirectly through the reduction and/or elimination of unreliability.

There are arguably additional sales and revenue gains that can be derived through the reduction and/or elimination of unreliability. However, using the examples above we can see that a significant increase in sales and related revenue can be gained through reliable operation.

This is not an insignificant amount of sales revenue for any size organization. The business case for reliability is compelling! Although a hypothetical manufacturing site was used to illustrate the effect of unreliability on sales, the same calculations can be used to obtain an order-of-magnitude estimate of the value of lost sales due to unreliability for any plant. Plant management and corporate leaders need to understand the high cost of unreliability. All it takes is for someone to take the initiative and calculate the value for your operation. Once the true cost of unreliability has been exposed, garnering support for improved reliability should be easy! **MT**

About the Author

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Click here to download an ebook pdf containing this article and Al Poling's February 2016 article "Calculate the True Cost of Unreliability".