Written by David R. Bell, SmartSignal, Inc. Sunday, 01 July 2001 13:04

What are the hidden costs of downtime? This article explains how to calculate them using company financial information and simple rules of thumb.

Industrial assets, from complex manufacturing plants to remote and mobile capital equipment, are subject to an asset availability ceiling. While this ceiling varies by industry, peak system availability is typically 85-95 percent. Unfortunately, the widespread acceptance of these ceilings masks the hidden—and significant—costs associated with unplanned downtime.

For typical heavy process industries, these costs can represent 1-3 percent of revenue and potentially 30-40 percent of profits annually. For large capital equipment, the costs may be 1-3 percent of asset value per year. With millions of dollars in savings at stake, the cost of unplanned downtime warrants further investigation.

Patterns in equipment availability

Industry studies show that large complex assets typically achieve 85-95 percent availability. Of greater interest is that nonavailability is split evenly between planned downtime (scheduled maintenance) and unplanned downtime (breakdowns). Because unplanned downtime is so pervasive and no clear way exists to eliminate the problem, the 2-5 percent of nonavailability is accepted as normal even though it represents a significant cost burden. The cost of downtime can be categorized as follows:

Lost revenue. The greatest impact of unplanned downtime is revenue loss. This is typically the result of demand exceeding supply. The loss of revenue due to downtime is especially egregious, because the cost is not just the loss of the typical 3-10 percent profit margin on the lost revenue. It is actually the value of the total revenue lost, less the direct avoided costs of production (generally materials or energy).

Consider this example: an airline flight is cancelled due to mechanical problems and all passengers fly on competing airlines. The only costs the airline avoids due to the cancelled flight are the fuel burned and possibly crew costs. However, no revenue was collected so this becomes a downtime cost. In this example, fuel and crew costs may be approximately 30 percent of revenue, so the cancellation results in a cost of 70 percent of the potential revenue for the flight—much higher than assuming the cost is the typical 6–7 percent airline net profit times the potential revenue. The same logic also applies to plant downtime.

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Carrying excess capacity. A typical strategy to address an asset availability barrier is carrying excess production capacity. This may entail building a plant slightly larger than necessary so product can be inventoried to cover unplanned downtime, or carrying spare units to replace those that fail. Both solutions have costs: capital to purchase that additional capacity and additional maintenance expenses associated with a larger facility.

In this model, it is assumed that excess capacity is equal to the amount of unplanned downtime, with a cost equal to that fraction of asset value. This amount then is annualized based on an expected equipment life and discount rate. To calculate maintenance costs on this excess capacity, a rule of thumb can be used. For most long-lived equipment assets, life-cycle maintenance costs are roughly equal to capital costs. In this model, the maintenance costs of excess capacity are determined by a multiple of capital costs. If maintenance costs are known, the correct multiple can be entered; however, for the following examples, it was assumed capital and maintenance costs were equal.

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