MONEY *to* BURN?

BY DICK HERMAN

In the 2005 Steven Spielberg remake of the H. G. Wells classic "War of the Worlds" Ray Ferrier (played by Tom Cruise) is a working class guy who struggles with life's day-to-day issues. Without warning the unthinkable happens: terrifying alien "tripods" spring up from deep underground where they have been hiding for decades to threaten Ray and his world with extinction.

Though today's packaging executive is unlikely to face Spielberg's monsters, there may be perils and surprises waiting to appear and bring devastation to production goals and profitability. Additional costs that were in hiding at installation can threaten an entire packaging operation. Total Cost of Ownership (TCO) is one of the packaging professional's most potent tools to uncover those surprises before they happen.

TCO is explained as a methodology for understanding the combined effects of first-time costs of equipment acquisition (whether leased or purchased) and the ongoing (or lifecycle) costs associated with operating the equipment throughout its useful lifetime. For most packaging processes, ongoing equipment or line operating costs (including labor and downtime or "lost opportunity" costs) often far exceed the initial costs of equipment acquisition during the lifetime of operation.

TCO can help you to: compare the costs of adding a new machine or automated production capability; compare future costs of a newer machine to replace a less-capable existing unit; select from among similar types of equipment (or lines) from multiple vendors; and compare different types of machines or different processes to understand the costs and benefits of one versus another.

Though it is often confused with "payback" or "return-on-investment" analysis, TCO is used to calculate total annual costs and average per-unit production costs. Either present value or discounted cash flow analysis techniques will work with TCO, as long as either analysis uses a consistent "time value of money."

When the discussion of total costs comes up there are definitely two worlds: one whose inhabitants bandy the term about and another world where businesses have really mastered the technique.

Without a proper understanding of Total Cost of Ownership (TCO), hidden costs can attack a packaging operation's bottom line and torch any potential profits.


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"Based on my forty years in this business, everyone talks about TCO, but few really look at it in any true detail," says John Sparra, president of Sparra Packaging Machinery, a case packer in Thorndale, Pa. "A great deal of the value-add that we and other reputable packaging specialists provide is in the pre-configuration and analysis of the right solutions for the whole packaging line, not simply one machine."

KEY ASSUMPTIONS – ADDED CAPACITY & PRODUCTION

Assumption	Note	Present Value	1	2	9	10	TOTAL
Cost of Money			8%	8%	8%	8%	
Fixed Overhead (OH)	3% escalation		(100,000)	(103,000)	(126,677)	(130,477)	**(1,146,388)**
PV of Overhead	"today's dollars"	(755,013)					
New Gross Capacity: (hrs)	hours in a year		8760	8760	8760	8760	
New Gross Capacity: (units)	hours times line rate		23652000	23652000	23652000	23652000	
Less: Sched TO (hrs)	by labor contract		(2,502)	(2,502)	(2,502)	(2,502)	
Less: Sched Mtc (hrs)	mtc during time-off		-	-	-	-	
Less: Unsched Mtc (hrs)	historical MTBF		(120)	(120)	(240)	(280)	
Less: Changeover (hrs)	per schedule		(550)	(550)	(550)	(550)	
Net Capacity Available (hrs)	D - (FGHI)		5,588	5,588	5,468	5,428	
Capacity Utilized (percent)	K/D		64%	64%	62%	62%	
Net Production (units)	LxE		15087600	15087600	14763600	14655600	
Net Production (dollars)	M times $/unit		**$196,139**	**$196,139**	**$191,927**	**$190,523**	**$1,941,557**
TOTAL Production	**"today's dollars"**	**$1,305,237**					

It comes as no surprise: the demon is definitely in the details.

"Seventy to eighty percent of our loyal customers come to us based upon word-of-mouth when they are looking for their first machine; after that they never look back," says one longtime machinery executive who spoke on the condition of anonymity. "Most of the time the only issues ever discussed are the speed, 'can it handle this package, material viscosity and these sizes,' the initial acquisition cost and the cost and availability of replacement parts," he adds.

WHY NOW?

An almost overwhelming number of vendor and systems choices now confront today's packaging line executive: manual, semi-automated or fully automated; PC or PLC; rotary or inline filler; or offshore manufacturer or domestic supplier?

Fortunately, the trends in the industry today are driving relentlessly towards reliability, accuracy, speed, simple changeover and operation, package innovation, just-in-time batch runs and package size flexibility.

Packagers want to capitalize on market opportunities (think new packaging, sizes or something new and unique for your customer). Alternatively, perhaps the goal is to achieve lower costs per unit, higher throughput and certainly less scheduled downtime. Large organizations and independent co-packers alike must understand these issues and the impact of new and different equipment alternatives upon productivity, required labor skills, product flexibility and lost-opportunity costs.

BY THE NUMBERS

Doing a TCO analysis can be as straightforward as preparing a one-page spreadsheet. For multiple lines, a more complex product mix, multiple production forecasts and a great many "what-ifs" the effort will become more complex. Keep in mind that any forecast of the future can benefit from at least an optimistic, pessimistic or most likely three-view scenario. No production manager needs to be told how sensitive costs are to production volume, but it helps to run the numbers to quantify.

The table above shows several assumptions for expanding capacity by adding a new machine or small line. The assumptions run from year one through year ten, although the table only shows years one, two, nine and ten. The chart also calculates a "present value" of the total production contract and expenses.

There are three things to note about the assumptions in this table:

1. An estimate of "the cost of money," is used to calculate the present value (or value in today's dollars) of added expenditures and the benefit of receiving money for added output.

2. This example must calculate the present value of total overhead, because the new line will either cause those costs (sales, inventory, supervision, facility, etc.) to go up, or have some of those costs "allocated" to it.

3. Most of the rest of the assumptions calculate the total or gross capacity of the new equipment placed into service, and then deduct hours for time-off, scheduled maintenance, changeover and cleaning, unscheduled maintenance, etc. based upon either proposed schedule data or historical analysis of things like "mean-time-between-failure." This component of the analysis is truly where the bulk of time should be invested.

The second half of the spreadsheet—shown on page 114—uses the assumptions made above to calculate Total Cost of Ownership.

In this hypothetical example a machine or a small line is proposed at an initial "acquisition cost" of $150,000 to handle the added production. Observe that the "first costs" and "life-cycle costs" are clearly itemized. This analysis may differ, depending upon the cost breakouts each particular line is ▶

able to derive. [For instance, if different production areas are separately metered, energy costs might be broken out of overhead costs.]

Using the "present value" analysis of Total Costs of Ownership, it should be apparent that the largest components of TCO are not simply the initial equipment acquisition costs, but items like downtime-lost production opportunity, direct labor, downtime-direct labor costs and overhead.

Once an initial analysis scenario is constructed, estimates can be modified to conduct "what-if" analysis to see, for example, what happens if additional training or better scheduling reduces downtime.

As previously mentioned, a more complete TCO will create three scenarios in the production forecast—best, worst and most-likely—to compare how the costs of operations fluctuate with capacity for the machine or line in question.

ARE LOST PRODUCTION OPPORTUNITY COSTS REAL?

Clearly, if the organization has more customer demand for product than capacity to make it, any 'downtime'—scheduled or not—costs an organization in lost sales, possible lost new business and sometimes even the loss of a customer altogether. In these instances the 'lost production opportunity' costs are all too real, and can be calculated quite readily.

But what if a company doesn't have additional or incremental opportunities to produce more products? What if the production output already just meets customer demand? This falls into the less exact area that economists call "operating at the margin." If there are no more opportunities to produce additional product inventory for sale, there are no "lost opportunity costs."

In the real world, the goal is obviously to try to never "buy more machine" than is needed. One of the advantages of taking a lifecycle (or longer) view is that if excess capacity is revealed, attempts can be made to find production demand to meet the excess.

TOO TROUBLESOME?

What if an organization isn't large enough to have an army of cost accountants?

"One of the issues this industry has to come to grips with is that like autos, airplanes, even home appliances—the equipment technology is rapidly advancing," cautions Dennis Bertolucci, senior industrial designer for Simplex Fillers, Napa, Calif. "New designs are becoming more 'systematized' and 'interoperable,' more automated and often much more expensive to maintain. Even though fewer people are necessary to operate the line, they must have better skills and more experience."

In other words, a faster line that isn't perfected is also going to get into trouble faster. Automation and flexibility can come at the cost of money and time.

"In this business, you've really got to weigh added features, increased speeds, more flexibility and the type of materials you have against how long it will take to amortize the costs of a new machine or line," Bertolucci says. "What can make things difficult is that you must also consider key metrics like mean-time-between-failure (MTBF), setup, operating and changeover skills along with the complexity and availability of replacement parts."

Adding to the mix are different vendor specs, the inter-operability of different components from different specialty vendors to make up a 'line' and the total system interactions as the new line is placed into an operating status.

Tom McFeely, sales manger for Euless, Texas-based Lakey Packaging puts things in perspective using fillers as an example.

"For many cases the speed, volume of production and footprint make rotary fillers the only way to go," he says. ▶

TCO CALCULATION

TCO Calculation	Note	Value	1	2	9	10	Total
First Costs							
Equipment Acquisition	initial cash outlay	(150,000)					
New Equipment Finance	(none)	-	-	-	-	-	
Equipment Net Salvage	residual less ship	10,422				22,500	
Startup & Engineering	line setup	(9,000)					
Initial Provisioning	new fixturing	(6,000)					
LifeCycle Costs							(678,961
Floorspace Allocation 10%	10% times C	(75,501)					
			10	10	14	15	(81,475)
Operator Labor (3 shifts)	4.5% escalation	(443,950)	(55,880)	(58,395)	(77,760)	(80,665)	(17,000)
Schedule Mtc & Clean	4.5% escalation	(53,274)	(6,706)	(7,007)	(9,331)	(9,680)	(13,700)
Training	in-house yrs 4 out	(12,991)	(6,000)	(2,000)	(1,000)	(1,000)	(73,000)
Insurance & Taxes	contract	(9,193)	(1,370)	(1,370)	(1,370)	(1,370)	-
Spare Parts	estimate @mfr's list	(48,984)	(7,300)	(7,300)	(7,300)	(7,300)	(4,481)
Depreciation (non-cash)	assume no tax benefit	-	-	-	-	-	
Material Spoil	test runs	(3,012)	(453)	(453)	(443)	(440)	(453,281
Downtime (Lost Oppt'y)	40% of (FGHI)	(303,181)	(44,535)	(44,535)	(46,220)	(46,781)	)
OT Labor Costs	estimate historical	(31,076)	(3,912)	(4,088)	(5,443)	(5,647)	(47,527)
TOTAL Cost of Ownership	**"today's dollars"**	$(1,135,739)					
Net Profit	**"today's dollars"**	**$169,498**					

"However, there are occasions when I have to remind the customer that a jump to rotary entails thousands more in capital costs and integration, costs for training operators, more expensive parts and sometimes a much lengthier downtime to change heads. In some cases a multiple-head inline solution might be the more practical alternative, even given future growth projections."

When in doubt or when trying to improve an organization's TCO, don't be afraid to employ the KISS (keep it simple) principle.

"Doing a valid TCO analysis doesn't mean giving up on your day job," says Martin Sikula owner of contract packager Canberra Corp., Toledo, Ohio. "Expanding a line or buying a new machine typically arises for one of several reasons," he says. "More throughput; a new customer has an unusual requirement; you need to modernize a line to handle more sizes, smaller runs—it can be anything. The engineer or the guy with knowledge about the customer's requirement is more important to you than the cost accountant is when it comes time to do the study. "

Bertolucci cites the "80-20 rule" as a good guideline to follow.

"Spend 80 percent of your time understanding the 20 percent of requirements that are most critical," he says. "Customer requirements for the future can be difficult at best to predict. The type of product, volume and size(s) you'll need to run, both today and in the future can change dramatically. If the product is new, do a little extra homework. Is there a supplier you trust who can steer you to someone else with a similar application?"

DON'T PUT IT ON THE SHELF!

The real benefit of TCO and your baseline assumptions for the analysis is that they become a reference point for checking how things are developing for the future. Customer contracts and production runs change while assumptions about labor, escalation and cost will continue to bob up and down with all of the other apples in the barrel.

Companies need to examine the justification for their last new line purchased and then replace today's numbers for the 'out years' and see what happens.

The data might be surprising. At a minimum, if good records of maintenance, changeover times, etc. exist, they can be used for much more realistic assumptions to plug in the next time more capacity needs to be added, an end-of-life machine needs replacing or entire packaging processes need re-engineering, perhaps with automated capabilities. PMT

Dick Herman is a northern California-based writer and business strategist who specializes in technology and manufacturing.