OneVoice | TCO©

TOTAL COST OF OWNERSHIP

PACKAGING AND PROCESSING MACHINE GUIDELINES FOR CPGs AND OEMs

Find out what's beneath the tip of the iceberg.

PMMI

OpX Leadership Network
Moving Operational Excellence Forward

Packaging + Processing OEM | Packaging World | Healthcare Packaging | AutomationWorld

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Editorial Introduction

"Before we can effectively evaluate total cost of ownership, we must agree upon a set of terms and meanings to steer our discussion."

- Keith Campbell

Capital investments are intended to extend or expand a stream of profits. The best capital investments will maximize, according to some agreed upon business methodology, the differential between the positive and negative cash flows resulting from that investment. These cash flows include:

- the initial negative cash flows of the investment itself;
- the ongoing negative operational cash flows required to utilize that investment;
- the future positive cash flows that occur as a benefit of the investment;
- and the eventual gain or loss on disposal or redeployment of the investment.

DOWNLOAD CHECKLIST

Editorial Introduction

Keith Campbell

PMMI Media Group
Contributing Editor

In order to properly inform our overall investment decisions, each of these cash flows must be reasonably approximated, requiring a detailed understanding of the cost of ownership throughout the lifetime of the assets. Conversely, as we minimize the total cost of ownership of the various component parts and systems that are part of a larger investment, we increase positive cash flows and improve the return on that investment.

As we seek to determine these total costs of ownership, we find ourselves working across cultures, disciplines, and industries where the words we use may sound the same but may not mean the same thing to everyone involved. I can cite examples from throughout my career where communications was impeded by a common vocabulary that was not universally understood. Before we can effectively evaluate total cost of ownership, we must agree upon a set of terms and meanings to steer our discussion.

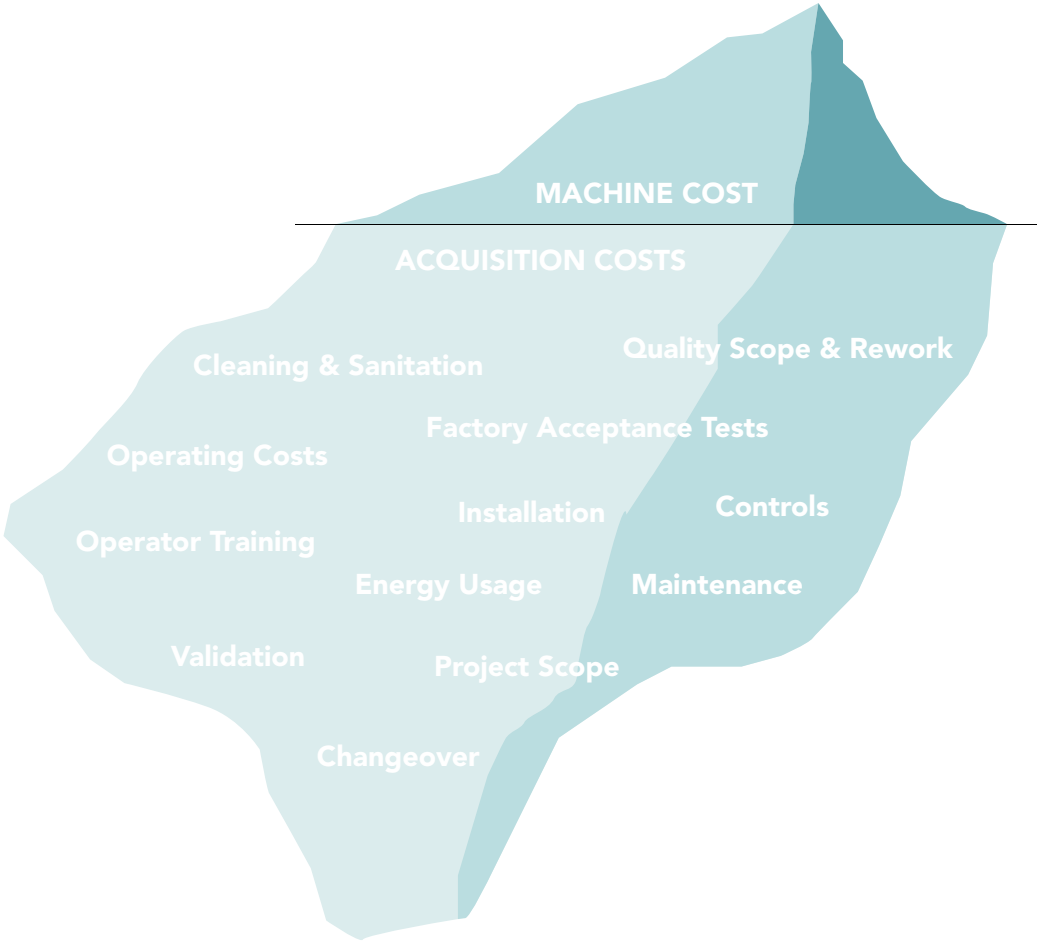
And to keep the discussion properly focused, it is useful to be guided by the experience of others who have traveled this path before us. What factors have they found most useful to be considered?

Taken together, this is what this OneVoice, Total Cost of Ownership playbook is all about. It provides a checklist of factors to be considered in determining total cost of ownership, a common vocabulary with which to create effective communications among the involved parties, and a structure for both qualitative and quantitative analysis of Total Cost of Ownership.

By utilizing this guide, you can help your company or your customer to make better and more informed investment decisions, utilizing a proven, efficient and effective process developed by your peers at PMMI.

Introduction by OpX Leadership Network

One of the most significant challenges facing consumer packaged goods manufacturers (CPGs) and original equipment manufacturers (OEMs) today is determining the initial equipment purchase price versus the long term cost of owning the equipment. The need for an industry norm for Total Cost of Ownership (TCO), specifically written for the CPG industry has become increasingly apparent to these and other stakeholders involved in the purchase/ sale of capital equipment.



Introduction by OpX

OpX Leadership Network was founded by PMMI with a mission to enable the CPG manufacturers and their suppliers to overcome those common, non-proprietary operational challenges faced by all in our industry. OpX is the "bridge from discussion to solutions" that industry can adopt. OpX does this by facilitating collaboration and the channeling the collective wisdom of over 100 CPG companies and 30 suppliers into forging useful solutions based upon proven experiences.

Total Cost of Ownership Solutions Group (TCOSG) was formed in May 2013. The team of fourteen CPGs and OEMs has a stated purpose to collaboratively develop a work product that will:

- Provide criteria of TCO for use by CPGs and OEMs: internally and externally.
- Develop recommended guidelines and checklists that would be utilized in commercial transactions.
- All major costs for acquisition, operations, and disposal/refurbishment to be included.

OneVoice | TCO©

The Total Cost of Ownership (TCO) Solutions Group, one of the many teams of subject matter experts which comprise PMMI's OpX Leadership Network, is proud to introduce you to the One Voice /TCO playbook and checklists.

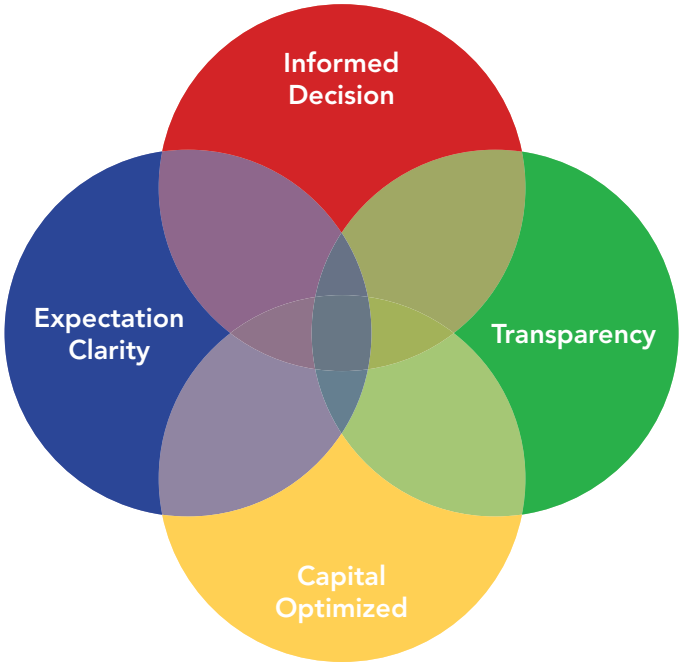
Whether your company is a Consumer Packaged Goods (CPG) manufacturer, an OEM or any provider of materials or services, you will find these documents to be an effective resource.

The need was clear: there has been a lack of clarity in TCO resulting in unmet expectations for too many stakeholders when engaging in the commercial transactions for capital equipment.

The solution: to provide guidelines and checklists, developed by industry subject matter experts (see nearby list of contributors), for the broad adoption and use throughout the CPG industry.

The power of the OneVoice/TCO is to encourage the dialogue and collaboration among all stakeholders during your commercial transaction so everyone's expectations are met. You will undoubtedly see with much greater clarity your Acquisition and Operating Costs.

What are the next steps? Download the checklists for and begin using them today. PMMI's OpX Leadership Network has made this and all its work products available to the industry for free.disposal/



Sponsors

Facilitated by PMMI, the OpX Leadership Network is a dynamic community of manufacturing, engineering and operations professionals dedicated to operational excellence. Through open dialogue between CPG manufacturers and OEMs, the OpX Leadership Network provides an exceptional forum where the best minds come together to identify and solve common operational challenges, and apply best practices and innovative solutions to the real-world context of manufacturing.

PMMI, The Association for Packaging and Processing Technologies, is a trade association representing more than 700 companies that provide a full range of processing and packaging machinery, materials, components and containers. PMMI actively brings buyers and sellers together through initiatives such as packexpo.com, educational programs and world-class events, connecting participants in the processing and packaging supply chain with their customers around the world. PMMI produces the PACK EXPO portfolio of trade shows and owns the PMMI Media Group. Learn more at PMMI.org and Packexpo.com and pmmimediagroup.com.

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B&R Industrial Automation Corp. is pleased to sponsor the vital work of OpX Leadership Network's TCO Solutions Group. B&R and its Global Packaging Group are active participants in complementary PMMI, OMAC Packaging Workgroup and OPC Foundation initiatives. The OpX TCO and FAT guidelines dovetail with the OMAC PackSpec URS. OMAC PackML/ISA TR88, openSAFETY and OPC UA provide international standards useful for implementing OEE. Together, B&R believes, we can increase packaging & processing productivity more than through any single initiative.

Total Cost of Ownership Solutions Group

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and special thanks to the over 50 companies that provided input as Peer Reviewers

DOWNLOAD CHECKLIST

Download a pdf of the Total Cost of Ownership Checklist anywhere you see this icon throughout this document.

Project Scope Declaration

Before you embark on your TCO Checklists for Acquisition Cost and Operation Cost, the CPG and the OEM must agree upon a scope. The CPG provides the following to the OEM for their understanding of project objectives and expectations. This information should be consistent with the Request for Proposal or Quote.

Define:

- Product(s) to be produced (description, volumes, etc.)
- Process description
- Risk assessment of project
- Work environment (description of facility, workforce, etc.)
- Standards (company, 3-A, GMA guidelines, etc.)
- Regulatory Requirements (FDA, USDA, OSHA, Environmental, etc.)

I. ACQUISITION COSTS TO CONSIDER

Download the checklist and follow along to be sure you leave no stone unturned in accounting for capital input related to equipment acquisition. The following pages discuss what's on the checklist, describe why it must be considered, and provide resources that can help you better calculate TCO.

Equipment Design and Application

Consider all equipment design and application costs. Manufacturing environments, functionality and flexibility of equipment require that the material and design of equipment needs to be fit for purpose. Additional labor for sanitation purposes may be required.

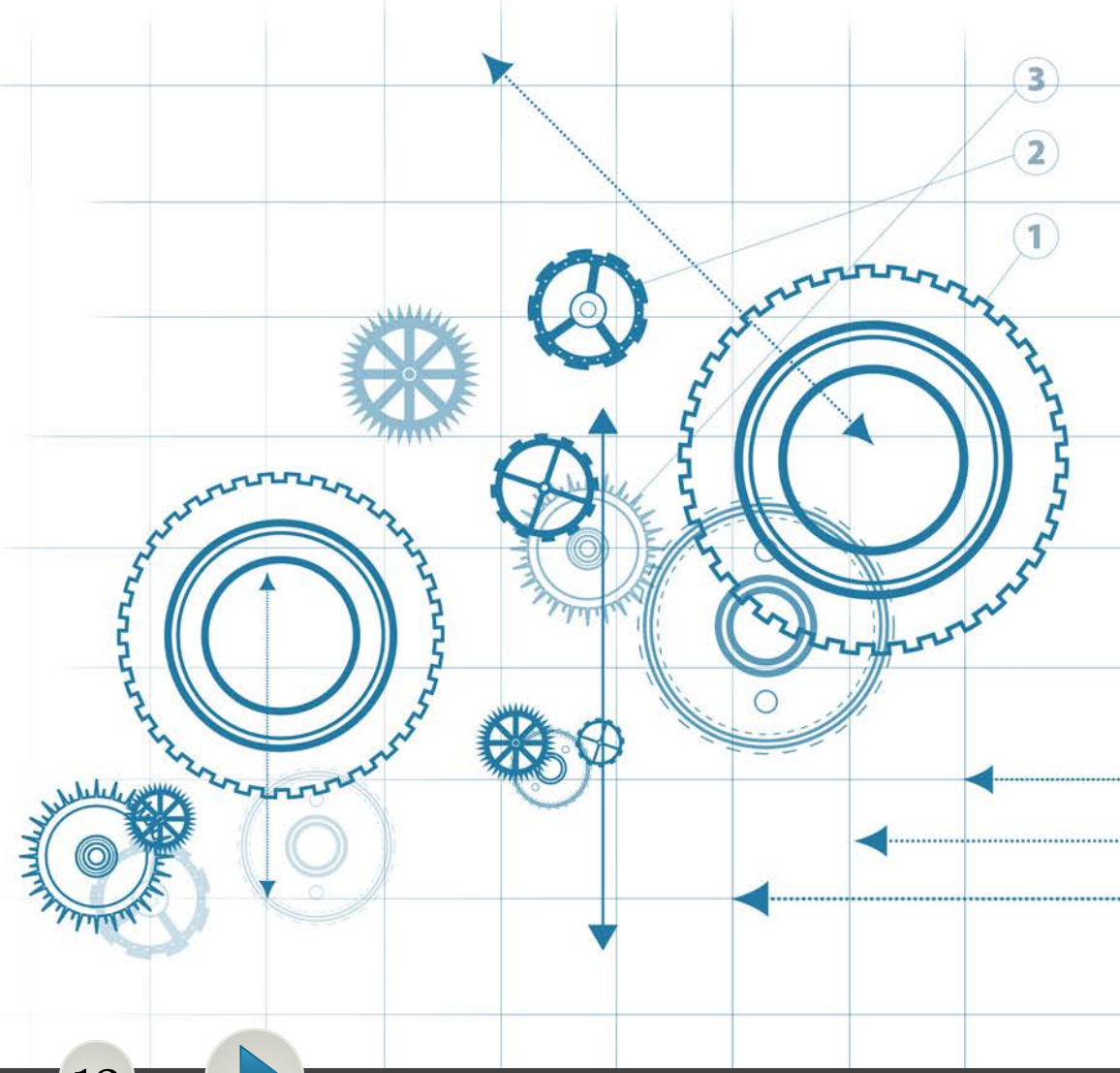
- Engineering costs
- Health, safety & environmental requirements
- Specific controls
- Changeover options

Engineering Costs

Consider all external (to the CPG) engineering costs when it comes to equipment design. Additional costs for engineering provided to support the project may include:

- Pre-engineering
- Facility factors
- Support
- All engineering not included in the OEM package

Note: The CPG determines the internal engineeering cost requirements not included in the OEM equipment purchase



Health, Safety & Environmental Requirements

Make sure to keep health, safety and environmental considerations at top of mind when assessing equipment design and application acqusition costs.

- Safety risk assessment
- Regulatory requirements

The CPG will provide the specific health, safety & environmental requirements.

Specific Controls

Look to the OMAC (Organization for Machine Automation and Control) to account for specific control requirements with equipment desing and application.

- Control logic and programming platform
- Interoperability with multiple products

The OEM will provide the standard, while the CPG will provide requirements for specific controls

Appendix: for more information and resources on OMAC from the pages, of *Packaging World*, see page 71

Changeover Options

Customization to CPG requirements when it comes to changeovers is an essential factor in determining equipment design and applications costs as part of machine acquisition.

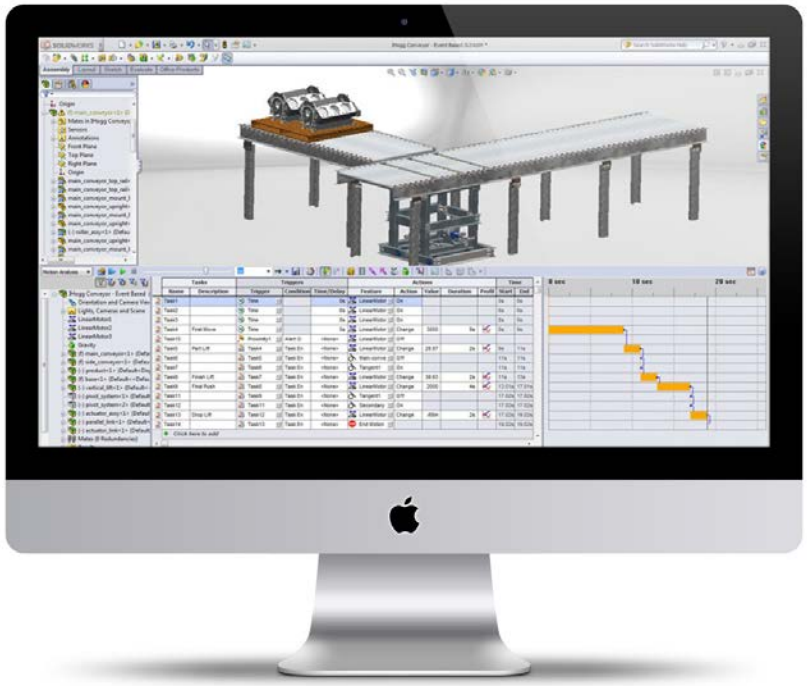
The CPG provides expected rates and needs, while the OEM provides design capabilities

Appendix: for more information and resources on changeovers from the pages, of *Packaging World*, see page 71

Project Requirements

Consider the full scope of project requirements. Be sure to agree upon the project-related considerations enumerated below, and account for the cost implications

- General requirements
- Permit/certification costs
- Operations and maintenance documentation
- Spares/component lift/regular wear part/lubricants
- Factory acceptance tests (FATs)
- Site acceptance tests
- Shipping and responsibility



General Requirements Permit/Certification Costs

Factor in site-specific information. What sets your facility apart? If there's anything remotely unique about the site that may not be factored elsewhere, be sure to factor it here.

- Facility Design requirements (hygienic zoning and cleaning regimen)
- Integration with the other contractors and trades
- Site Safety considerations

And don't forget the permits. Depending upon the municipality, building permits, environmental permits, and other certifications might be required.

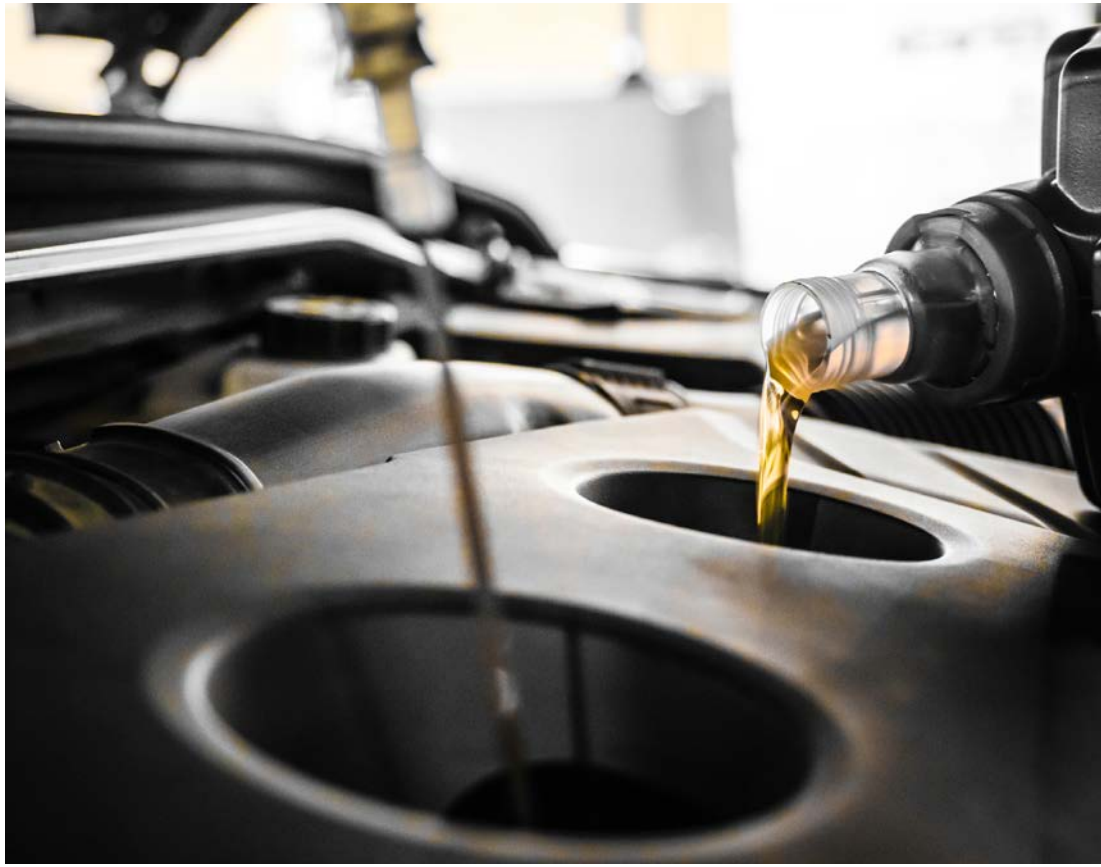
- Municipality
- Building permits
- Environmental considerations

Operations and Maintenance Documentation

Don't forget the operations and maintenance docs, either. Documentation, usually in the for of complete operating and maintenance manuals, are necessary for operating and maintaining the asset. Items that should be included but not limited to:

- Preventative maintenance
- Lube schedule
- Bill of Materials
- Theory of operation
- Trouble Shooting Guide

Information should be supplied electronically (both as a pdf and on the machine) or by hardcopy upon request.



Spares/Component Lift/ Regular Wear Parts/Lubricants

Be ready for basic upkeep with spares, lubricants, etc. Be sure to discuss and procure a detailed list of equipment parts (including lubricants), plus their life expectancies and any special tools required.

"It's key for us to look at life expectancy; of course it would impact the TCO if you had a component that lasted one year instead of five years. So, if you are having a component that has to be replaced every year, that could really significantly impact that cost of the equipment."

TCO team, Webinar

Factory Acceptance Tests Site Acceptance Tests

Factory acceptance tests (FATs) a key consideration.

- Material and product costs
- Setup costs at the OEM
- Time and travel

Site acceptance testing (SATs). Be certain to account for and document all criteria for costs associated with final site acceptance.

- Confirmed FAT punchlist items completed
- Final acceptance of equipment
- Documentation provided by OEM

Appendix: for more information and resources on FATs and SATs from the pages, of *Packaging World*, see page 71

"Within the factory acceptance test, we feel like it is important to consider what materials and products do you need to really test the piece of equipment? What are going to be the set up costs to do this factory acceptance test? Another cost that could really add up would be the time and travel expenses."

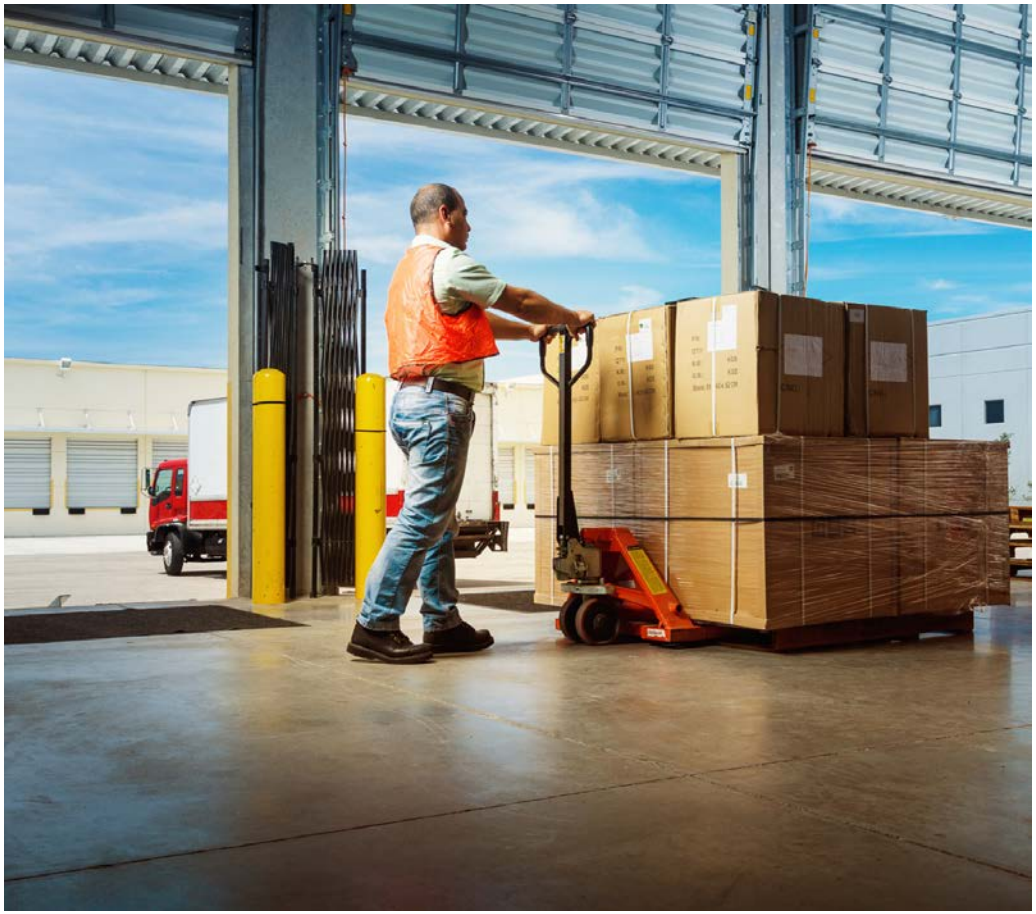
Toby Strickland
Snyder's Lance

Shipping and Responsibility

Factor in shipping and responsibility costs. The cost of freight, be it truck, air, or barge, must be considered. Don't forget Free On Board (FOB) Delivery costs, and reference the PMMI sales contract language for details.

The following can be found in the PMMI Model Sales Contract.

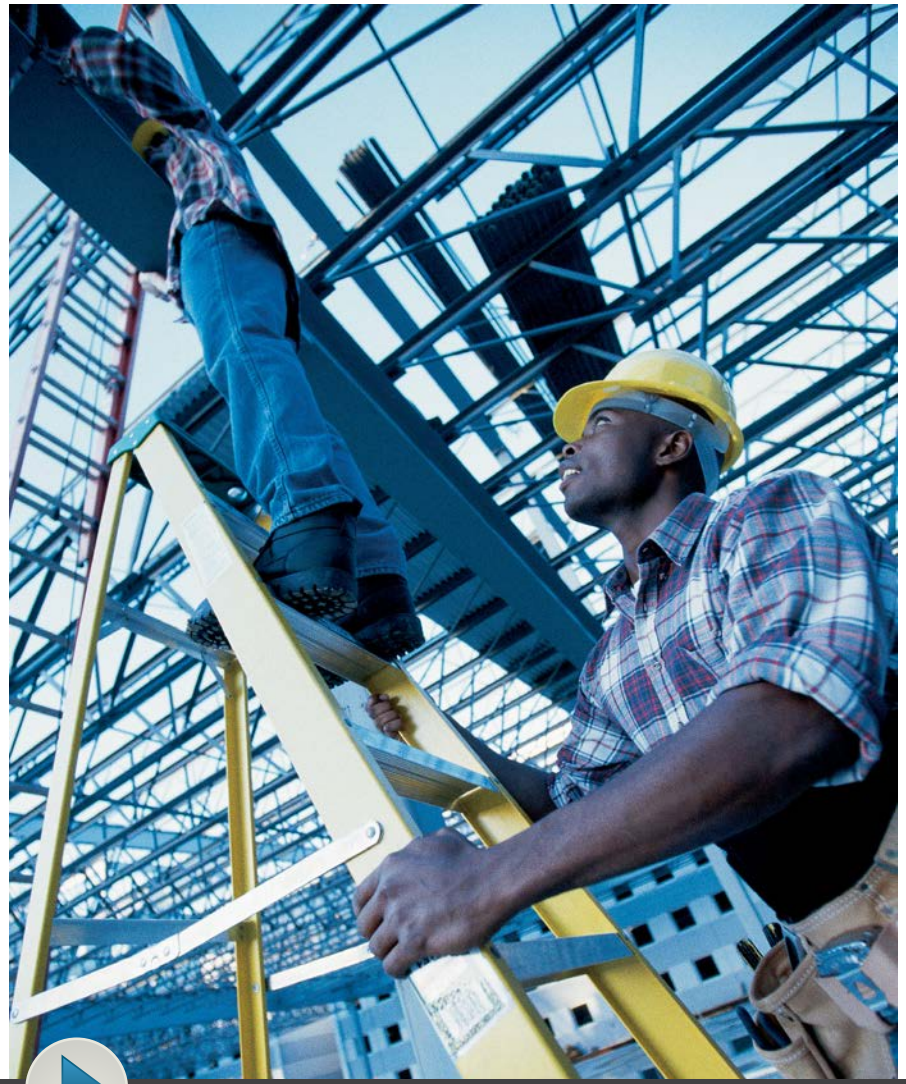
D. Shipment:
Shipment to the Buyer shall be in accordance with INCOTERMS® 2010 rules, the exact section of which will be mutually agreed between Buyer and Seller. Refer to www.iccwbo.org for the latest updates.



Installation

Consider the full scope of intallation costs when calculating the total cost of ownership from an acquisition perspective. It's key to define the requirements and responsibilities in preparing for and executing the installation.

- Unloading, uncrating and disposal
- Assembly
- Initial set-up
- Installation service technicians
- Special considerations



Unloading, Uncrating and Disposal

Unloading, uncrating and disposal is another factor that must be brought to bear against total acquisition costs, and is often forgotten when calculating TCO. Be sure to consider:

- Weights
- Special requirements
- Necessary equipment

The CPG begins with expectations for unloading, uncrating and waste disposal, while the OEM counters with any exceptions to those expectations.

Assembly

Once new equipment is delivered, uncrated, and shipping materials are discarded, then assembly, including labor involved and any special requirements, must be factored into the balance of the TCO. Be sure to consider:

- Rigging
- Electrical

Once again, the CPG provides the expectations, while the OEM provides necessary supervision and/or labor, as requested or needed.

Courtesy of Red Viking Engineering

Initial Set-Up

Consider post-assembly factors involved with initial set-up when determining the TCO with regards to machine acquisition. Factors to identify and quantify include:

- Assembled as defined
- Prepared with software, changeover parts
- Adjustments noted

The CPG will first verify that the installation is in good working order, then the OEM will provide necessary assurance that he equipment is prepared for the validation.

Installation Service Technicians

Installation involves human labor in the form of service techs. Be sure to consider the following, which affect the TCO:

- OEM startup costs
- Timeline for startup
- Proposed plan
- Related costs
- Special conditions

The CPG provides expectations for installation service tech requirements, and the OEM will provide a response.

Initial Training

To properly account for TCO, the CPG and OEM must agree upon the training requirements related to a machine installation, and cost implications that they carry. The OEM provides needs assessment, theory of operation, classroom vs. hands-on, CPG and OEM develop plan, identify needs & resources, time required.

- Technical training
- Documents and references
- Definition
- Training level
  (Basic, Intermediate, Advanced)

Technical Training

Comprehensive technical training can be costly both in expense and time, so it needs to be considered in TCO. Training should improve an employee's ability to do the following with any physical assets:

- Set-up
- Operate
- Changeover
- Teardown
- Maintain
- Repair
- Troubleshoot

PMMI Resources:

- Electrical Components
- Hydraulic and Pneumatic Components
- Mechanical Components
- Risk Assessment
- Packaging Machinery
- Troubleshooting

Qualified Training – Technical training programs need to be provided by a qualified resource and include:

- Stated objectives
- Practice
- Skill check and testing protocol (as applicable)

Be sure to check PMMI U

Documentation & References

The OEM needs to provide a theory of operation, which is a description of how a device or system should work. It is often included in documentation, especially maintenance/service documentation, or a user manual. It aids troubleshooting, who ideally would have been trained by a PMMI Certified Trainer, by providing the troubleshooter with a mental model of how the system is supposed to work. The troubleshooter can then more easily identify discrepancies, to aid diagnosis of problem.

Scope of Training

The CPG and OEM must work together to estimate the cost to provide the training, and the time required to deliver the training. Classroom and hands-on operator and technicians training shall be provided and completed prior to start-up of equipment as needed to instruct employees on the proper operation, maintenance, and troubleshooting procedures as described in the provided manuals

- Be sure to check PMMIU
- PMMI Certified Training

Appendix: for more information and resources PMMIU from the pages, of *Packaging World*, see page 71

Training Level Required

The level of training needed is to be determined by the receiving plant and its familiarization with the equipment.

Basic

- Less than one day, and
- Requires minimal operational or maintenance training to successfully
- Operate and care for this equipment – i.e. – a tank or a small conveyor
- PMs and BOMs (with critical spares identified) required

"If it was a really advanced piece of equipment and we were involved in both our operators and craftsmen, there could be a considerable cost because if we bring that equipment manufacturer in a few weeks early, before we start up the equipment then we are going to have the cost to pay our maintenance employees and operator, in order to do that and pull them maybe off of their current role that they are doing now. "

TCO team, Webinar

Training Level Required

Intermediate

- Two days to cover all personnel
- In depth training of system components to successfully operate and maintain this equipment.
- Examples- larger equipment with some electronics that require skills training
- All PMs, SOPs, BOMs, and critical spares are discussed and documented

Advanced

- Operators & craftsmen
- Week duration +/-
- Classroom & hands on
- Complex equipment
- PMs, SOPs, BOMs documented and reviewed

Validation

The OEM provides needs assessment, while the GPG and OEM develop plan.

Commissioning: The process of the orderly transfer or handover of ownership of the capital equipment from the OEM to the CPG. This assures the compliance to the requirements.

A. COMMISSIONING

Demonstrates the equipment can produce the products at the quality and speed required

- Meets all SKUs
- Improve quality criteria
- Meets or exceeds QA testing criteria
- Sterility tests
- Induced Failure tests

Endpoint: Completion of Commercial Sterility (test to verify acceptance for saleable product) and FU (follow up) to IFTs (induced failure tests)

Qualification: Testing to assure the equipment is properly installed, operates properly, performs to meet the agreed upon manufacturing and product safety requirements.

B. QUALIFICATION

Demonstrates the capability of the total system (equipment, material and people); to operate safely at specified MTBF (mean time between failure) levels necessary to achieve going performance criteria.

- Operating techs are qualified and team capability is at the desired level.
- Supporting systems & procedures are operational and delivering desired results.

CONTINUED

Validation

- Accurate LEDS (line event data system) data is being collected and evaluated to identify growth

Endpoint: MTBF performance is validated while sustaining target quality.

Verification: Is similar to the Qualification as it addresses the same issues. The difference is the degree to which the parties agree to the degree of testing and or "independent" verification required.

C. VERIFICATION

Demonstrates that people, material, supporting systems, and equipment have the capability to operate at going performance criteria on a continuous, daily basis, over normal manufacturing system conditions.

- System now produces quality product at specified rate without outside support.
- Continually improve operating team and equipment capability, material compatibility with the production system, supporting systems & procedures.
- Track results, identify issues and improvement items, forwarding to the appropriate groups.

Endpoint: Project Close out

Appendix: for more information and resources on Validation from the pages, of *Packaging World*, see page 71

Utility/Energy Costs

The OEM provides usage requirements at maximum and continuous consumption rates, while the CPG calculates costs base on local site conditions.

- Compressed Air
- Electrical
- Gas
- Water Usage
- Water Treatment

II. OPERATION COSTS FACTOR INTO TCO

Machine acquisition is only half the battle when it comes to calculating TCO. Download the Operating Cost checklist to factor in all of the possible costs related to running and maitaining a machine after you have purchased it.

Download Checklist

Quality

When it comes to the operating costs portion of TCO, quality is of utmost importance. But what does it mean?

- Defects, Scrap & Rework
- Start-up
- Procurement of Materials
- Machine Performance Reliability

"When we talk about quality, what do we mean? It can mean any number of aspects including defective scraps, those eyeing design values of loss upfront or rework being unforeseen or unknown loss during production. Materials can also be a significant cost. Different equip net can have varying sensitivities to materials, tolerances, thicknesses, finishes, and what have you. You want to consider all of these responsibly."

Gene Diringer
Campbell's Soup

Defects, Scrap & Rework

A defect could constitute anything the customer determines is wrong. With well-defined parameters established early on in the acquisition process, definitions for what is a defect and what is within the spec will be agreed upon by both parties. These parameters should be detailed in the OEM's equipment to perform within an "acceptable" range of quality variation and loss due to defect. This is different than scrap and waste.

Material that is not considered saleable product, including cost of disposal, is scrap - waste. Material that is unisable in the production of saleable prodict is also considered to be scrap. Avoid waste with the Overall Equipment Effectiveness (OEE) Opportunity calculator.

Any costs that must be added to the machine to make it acceptable to the customer is considered Rework, and is yet another drag on TCO.

"When you are talking about labor, there is a tremendous focus now-a-days on the effective use of resources and skilled labor."

TCO team member

Start-up

Start up
This addresses the time and cost required to do a cold start of the equipment. For example, this could be following a weekend downtime.

- Routine start up in plant
- material & associated labor

Pro

Costs associated with the of materials, including the a and flexibility of the equipme materials, affects TCO.

QUALITY/DEFECTS/SCRAP/REWORK ☑				
Characteristic (direct costs or cost implications)	**Information Provided By:**	**Status on Track?** Y/N	**Importance to Project Success** H-M-L	**Cost Basis** (see above)
Defect (designed loss)	OEM provides machine efficiency, defects per "x" rate, CPG provides minimum requirements			
Scrap (designed waste)	OEM provides machine efficiency, scrap per "x" rate, CPG provides minimum requirements			
General Start up expenses	OEM and CPG discuss requirements			
Cost of procurement of materials	OEM and CPG discuss tolerance of materials needed			
Throughput-machine performance reliability	OEM provides machine efficiency (OEE, design and planned), CPG provide their minimum requirements.			
Rework	Unintentional loss, needs to be extrapolated by CPG based upon its experience			

"We have utilized another tool, the OEE Benefit Calculator, to assist in presenting the impact of an alternative material, while costing less negatively impacted the line's OEE. Viewing this from a total cost of ownership approach actually contributed to improved profitability."

Roy Greengrass
DelMonte

Machine Performance Reliability

Machine performance reliabilty can be defined as the abililty of the equipment to meet the agreed upon expectations within the agreed upon time frame. Having these reliability standards and time frames in writing ahead of time will clear up any gray areas between expectation and reality. Utilize the OEE Starter Tool and the OEE Benefit Calculator to assist in defining how the OEE performance has a pervasive impact on shareholder value:

- Access OEE calculators
- Customer service & delivery
- Quality variation and defect loss
- Raw material scrap & waste
- Labor efficiency
- Equipment repair & maintenance expense
- Overhead spending and absorption

"What [the OEE calculator] does is it uses data, which is fairly common to most manufacturers, and also available financial data to estimate the cost, which impacts OEE efforts or OEE improvements."

Mark Hanley
Land O' Lakes

Labor

Labor is a core consideration when calculating operating costs in a TCO model.

- Staff & skills
- Material addition and operability
- Risk assessment

"Labor is an important consideration as we strive for manufacturing excellence long term. There is an increased focus on the ability to access, hire, and retain technical resources and skilled labor. As organizations continually improve, effective engagement and utilization of resources is key."

Madinah Allen
Snyder's-Lance

Staff & Skills

Does your current staff have the ability to run the new machine as is? Does the staff require training, or is new staff necessary?

- Staff: How many people and who is on this line? Operators, maintenance, supervisors, all staff much be considered
- Skill sets: What specific skill sets does this specific line require? Mechatronics.
- Access PMMI's online Mechatronics Certificate Tests
- Access Workforce Engagement Document

Adding Materials & Operability

A machine needs to be fed materials to run - have you considered the costs of material handling? A new machine also often means new controls, diagnostics, etc. Have you considered optimizing for operability?

- Time to add materials - Labor and material costs associated with initial start up
- Designed for operability - Consideration for ease of controls, clear diagnostics

"Has the equipment been designed for maintainability, in easy access, minimal special tool requirements, etc.?"

Mark Hanley
Land O' Lakes

Risk Assessment

Safety is king, and safe operations of the equipment is essential for both personal safety and product viability. *You also want to understand a true and robust risk assessment which includes any number of aspects whether it be safety, ergonomics, personal protection equipment, blackout type of procedures etc. Again, tools are available through OpX, such as the PackSage/designsafe software.*

- Access PackSafe/designsafe®
- Access Hygienic Equipment Document

Maintenance, Set-up & Changeover

The regular maintenance, set-up time, and changeover time must all be factored into the TCO, and are available in the Operating Cost Checklist.

- Daily set-up time
- Changeover
- Preventative maintenance
- Maintenance labor cost
- Service costs
- Alignment and special tools
- Spare parts, components

Daily Set-up Time

Daily set-up time refers to the amount of time required ensuring equipment is set for designated run (before packaging change), shift or day. This could be:

- Lubrication
- Maintenance checks
- Operator visual checks
- Labor requirements
- "Cold start" requirements

Changeover

Changeovers are critical junctures in packaging and processing production, and a time in which efficiencies are often lost.

- Level of involvement required for operators and maintenance
- Simplicity (e.g. tool-less)

> *"Meeting the consumers' expectations is manifesting itself in a significant growth in SKUs. As a result, flexibility and the need for changeovers continues to play a key role in unit cost."*
>
> **Tony Vandenoever**
> PepsiCo

Appendix: for more information and resources on changeovers from the pages, of *Packaging World*, see page 71

Preventative Maintenance, Labor & Service Cost

Preventative maintenance includes the costs to help develop a comprehensive plan, in unison with purchasers, that provides detailed listing of steps, locations, frequency, parts and tools needed to properly maintain equipment. It also includes inventory requirements of spare parts and amount of proprietary parts identified.

Maintenance labor costs are a constant source of ometry input to any machine, old or new. To fully capture the TCO with regards to operating costs, be sure to consider maintenance labor costs such as:

- Wear parts
- Number of hours required to properly maintain machinery daily, weekly and annually (or based on operating hours)
- Hours to be based on a Preventative Maintenance Plan

Service costs can creep into TCO in the form of remote access necessities, service techs, or maintenance service contacts.

"Preventive maintenance and also annual maintenance activities which can differ from technology to technology. You will also need to consider labor cost, both internally for your maintenance teams and externally for additional complimentary OEM service cost that will exist over the cost of this assets life."

Gene Diringer
Campbell's Soup

Alignment, Special Tools, & Spare Parts

Equipment should be provided with alignment features and documentation of initial settings that help identify the extent of time and labor for operators to make adjustments. An OEM should also provide a recommended list of spare parts, components and materials

"You want to understand alignment and special tools, so, are you selecting equipment design for tools changeover; a quick changeover that will reduce your overall turnaround time and of course spare parts and components? So, what is the quantity of spare parts you have to keep on hand, the cost of keeping them on the inventory, consignment programs if available, and of course lead time for the orders?"

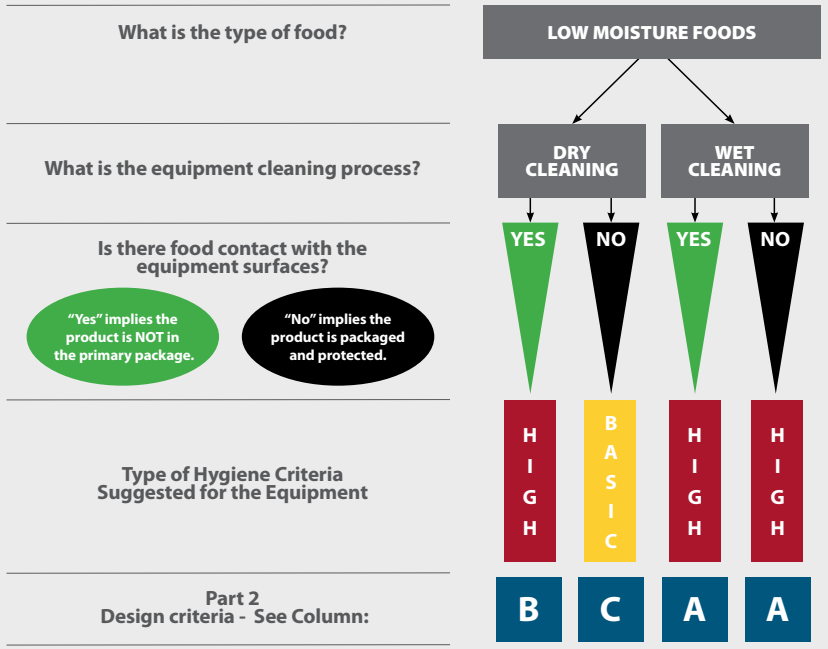
Mark Ruberg
Pro Mach, Inc

Cleaning & Sanitation

Sanitation requirements vary by product type (wet vs. dry), hygienic requirements, and more. Consider the hygienic decision tree from OpX:

- Hygienic decision tree

FIGURE 5 – EQUIPMENT HYGIENE LEVEL DECISION TREE FOR LOW-MOISTURE FOODS



Other Considerations

Beyond the simple sanitation considerations, Be sure to factor the following:

- Accessibility
- Frequency
- Materials and components - could include any specialized solvents, cleaners that are needed to adequately maintain the equipment and have a significant cost value.

"From a cleaning and sanitation perspective, you will really want to be considering cleaning in place versus cleaning out of place. The equipment cleaning processes whether it be wet, dry or the level of accessibility for your operator or technicians while performing cleaning procedures, time for cleaning occurrences and the frequency of those occurrences. You will also want to understand if there are any special conditions or special tools required for this type of cleaning."

Steve Blackowiak
Buhler Aeroglide

Training

A refresher on training consider:

- Ongoing costs associated with training during the life of the equipment for operators, craftsmen, and electricians
- Need to consider equipment complexity
- Need for outside resources and personnel turnover
- Training level required [beginner, intermediate and advanced]

"When you consider the factors inherent to any workforce, whether it be enhancing employee technical skills or responding to employee turnover, training needs to be a continual process to ensure the effective operation of any asset."

Jill King
Hormel Foods

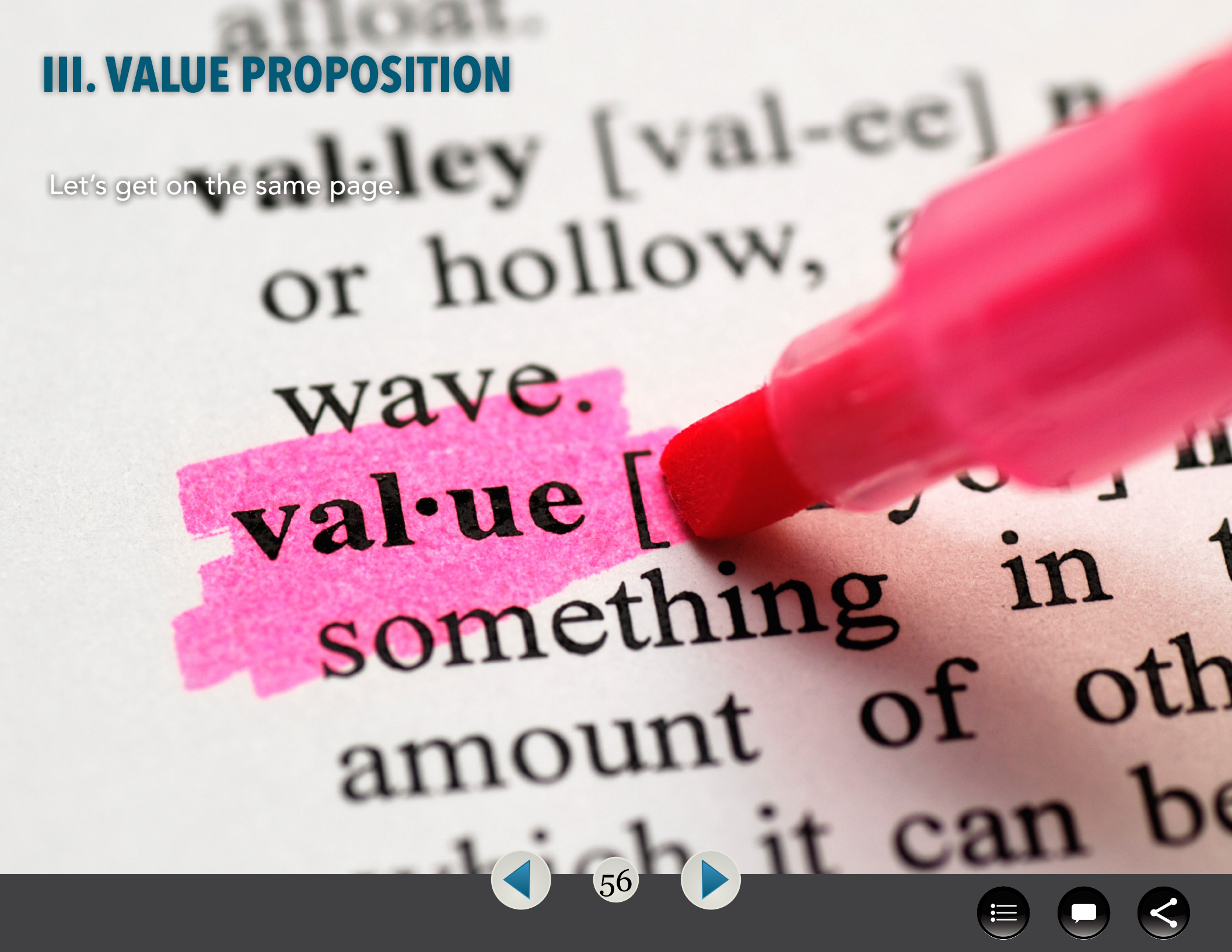
Utilities and Environmental

Expected usage rate with throughput and associated unit cost for each:

- Utilies (compressed air, electrical, gas, water usage, water treatment)
- Environmental (wastewater, air emissions, disposal, lubricants, solvents)

III. VALUE PROPOSITION

Let's get on the same page.



TCO Value prop: Why standardize TCO? Why Now?

Answers below provided by TCO Solution Group Members during a recent webinar

It's a creative way to mitigate against shrinking margins

Chris Schoen, procurement manager, Campbell's Soup: "Why should we be doing this? Why does this make sense right now? The best way to answer that is if we look at the CPG landscape and food in particular, there is a lot of declining or stagnant categories that have shrinking margins. There are a lot of cost challenges that are facing our businesses right tow.

"So we need to be very mindful that we be creative and come up with ways to help mitigate cost to the best of our ability from cash flow for our businesses."

It takes opinion and colloquialism out of the equitation

Schoen: "I have been in procurement for a while now and as we go through and execute our sourcing strategies, and sit in proposal review meetings and we examine our bids there and we talk through the minutes, it's very easy to get caught up in opinions of different folks and lot of emotions that are flowing adorn based on maybe past experiences with different suppliers.

"What I found is the TCO model really helps to level-set that and come to focus on what's black and white and what's real around the acquisition (that) goes through the life cycle of that purchase and helps to level-set people. I mean it helps to significantly drive decision-making and alignment across the organization and remove some of those opinions and emotion that's out there. So for me, it's been very helpful from that perspective."

Removing emotion from the situation

Schoen: "Personally, I have been in sanitation where we have done the TCO with various technologies and it's been successful. We piloted this sometime ago on vertical form fill seal

TCO Value prop: Why standardize TCO? Why Now?

CONTINUED

technologies and again, it was a situation where there was a lot of emotion involved and which was the best path forward to take and the TCO was great. It shed some light on off-season cost that probably would've been overlooked and would've gone in a different direction, possibly the wrong direction had it not been for the leveraging the model."

It's really the right thing to do for the industry

Schoen: "Another reason that I am passionate about this and I speak for Campbell's as a whole when I say this is it's about doing the right thing for our industry or we are very empowered by this whole process, just not with the TCO but we participate in the Hygienic Design team, the FAT team and the OEE team.

"We think it's the right thing to be doing in the CPG sector and helping everyone to drive to the best decisions and providing guidance to maximize return on investment for the industry. We don't want to be operating in a silo with this. We want to be promoting it and sharing with others some of the successes we had with this so others can realize the same as well."

TCO Value prop: International-sourcing applications

A better, more holistic look at low-cost-country sourcing

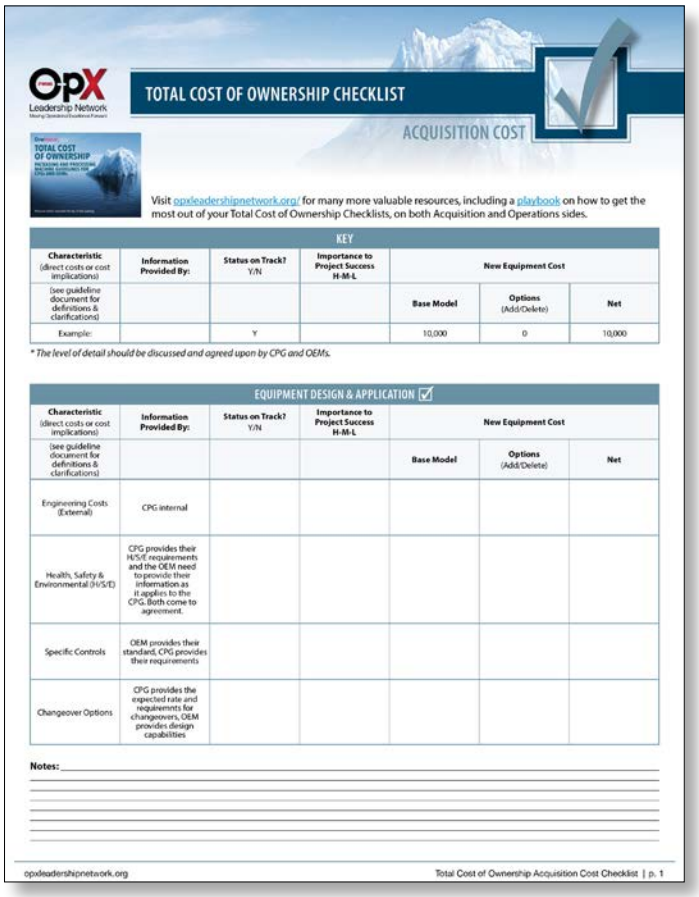
Schoen: "Another place I see the good application for the TCO model is when it comes to low-cost countries sourcing. That's been a huge push in our organization and there are challenges to look to, all across Asia and India, you hear stories about these incredible buyers where your acquisition costs are cut by 30% to 40%. That's attractive to someone on the outside, but we need to understand what's behind that and things that are easily overlooked.

"One example I can speak to is we have looked to leverage this model across open technologies. You have certain providers in China and in Vietnam that make arguably similar type of technology to some of their European competition, but when you start to peel back the layers, you start to find some things.

"For example, you might get an oven, but then you look at the frame of the oven or you look at the stainless steel skin on the oven and lo and behold, you find out six years down the road that the stainless steel has been stripped out, or that the nickel had been stripped out of it by a supplier that they were using. It's corroding, it's rotting out on you and it's just an unforeseen cost that can come back to bite you in the long run when you look at the life cycle of the equipment.

"So, it is just an example of some things, not to go off on a tangent but it's in particularly to look how is the company sourcing, that will come across and how the TCO model has again helped to drive that line with some of the executive leadership that's possibly dazzled by that upfront acquisition cost and not fully realizing ramifications of going down that path which the TCO helps to remediate to an extent."

TCO Value Prop: Operating costs and acquisition costs checklists



TOTAL COST OF OWNERSHIP CHECKLIST

ACQUISITION COST

Visit opxleadershipnetwork.org/ for many more valuable resources, including a playbook on how to get the most out of your Total Cost of Ownership Checklists, on both Acquisition and Operations sides.

KEY						
Characteristic (direct costs or cost implications) (see guideline document for definitions & clarifications)	Information Provided By:	Status on Track? Y/N	Importance to Project Success H-M-L	New Equipment Cost		
				Base Model	Options (Add/Delete)	Net
Example:		Y		10,000	0	10,000

* The level of detail should be discussed and agreed upon by CPG and OEMs.

EQUIPMENT DESIGN & APPLICATION ☑						
Characteristic (direct costs or cost implications) (see guideline document for definitions & clarifications)	Information Provided By:	Status on Track? Y/N	Importance to Project Success H-M-L	New Equipment Cost		
				Base Model	Options (Add/Delete)	Net
Engineering Costs (External)	CPG internal					
Health, Safety & Environmental (H/S/E)	CPG provides their H/S/E requirements and the OEM need to provide their information as it applies to the CPG. Both come to agreement.					
Specific Controls	OEM provides their standard, CPG provides their requirements					
Changeover Options	CPG provides the expected rate and requirements for changeovers, OEM provides design capabilities					

Notes:

opxleadershipnetwork.org Total Cost of Ownership Acquisition Cost Checklist | p. 1

Checklist Genesis

Schoen: "Initially, this was in an Excel spreadsheet that the team had put together and it has since been migrated over to this operating cost checklist, the acquisition cost checklist, really just for ease of use. It flows a little nicer we think and it will be a little easier to interact with the supply base in this fashion.

"Its best to use when you go through the ERP process, this becomes live documenting to have some back and forth."

DOWNLOAD CHECKLIST

IV. FREQUENTLY ASKED QUESTIONS

Let's get on the same page.

FAQs with CPG members

Answers below provided by TCO Solution Group Members during a recent webinar

Q How does the on-time delivery of repair parts from suppliers work into the equation? Do you scorecard suppliers in terms of responsiveness?

Jill King, Hormel: I think the response time definitely impacts that, I mean within our company that would really impact the decision on whether we choose to stock the part or hand or the quantity that we would stock on hand, based on that responsiveness and may potentially look at sourcing it from someone else if we didn't get a good response time from that supplier.

Q What are the most significant issues you are seeing with regard to food safety, and then place safety? How can an OEM best address that?

Chris Schoen, Campbell's Soup: One area that is pretty new and emerging and we see more in Europe than in the US is network safety on a machine. From an employee safety standpoint, there is a very powerful set of new capabilities that are coming through all along with the new regulations.

Q If an OEM presents a solution that offers significant improvements in yield, quality, safety, etc.; do you factor these improvements as offsets in your cost analysis?

Gene Diringer, Campbell's Soup: I can field that. I think if there is significant improvement or incremental capability as well, those are aspects that we definitely look to factor into these. Some of these could be considered intangibles but we need to consider them because that could at the end of the day give us a competitive advantage long term

FAQs with CPG members

CONTINUED

and give us capability that we would certainly need in the future.

Jill King: would definitely consider that and would potentially be part of our cost justification for that equipment as well.

Q When you were collaborating with an OEM on a process, what steps do you take to protect both your and their ideas and their intellectual property in the process of collaboration?

Gene Diringer: here at Campbell's, we try and promote an open and honest dialogue when we are collaborating with our partners, specially our strategic partners. I think we pride ourselves on the free exchange of information and ideas. I think ultimately you get the best work product when you have that type of collaboration and when you almost blur the lines between supplier and customer. That being said, we also pride ourselves on having pretty strict documentation in place in terms of our master service agreements and confidentiality agreements to make sure that both sides mutually are protected.

Q What do you consider to be the genuine life expectancy for equipment? Some customers believe that with ever-changing technology, they would rather that their facilities be up-to-date with what's out there in the market. How does that play into your decision-making ability?

Jill King: It's a tough one. I think we definitely go into the purchase of new equipment really expecting those to last a very long time and we have pieces of equipment here that are over 50 years old but still work well for us. We have pretty high expectations that the life of that is going to be long.

FAQs with CPG members

CONTINUED

Chris Schoen: I will just add that we depreciate over ten years but for a lot of our equipment after those ten years, the life isn't over and a lot of times we reinvent into that asset and maybe change a lot of the control systems or platform or do some major overhauls. But that's extending the life and then we can appreciate that and not extend that. So probably it's more like 15 and 20 years and in some instances it is even longer with other technologies depending on the ability to upgrade, to keep current with your processes and standardization across your sites.

Q What are your preferred methods of acquiring information on equipment when making purchasing decisions?

Chris Schoen: My experience and also a little bit more cost upfront... the best way to go about it is to actually get out there and support and visit these suppliers, walk their factories, talk to the folks on the floor, understand how their processes operate in their facilities, their level of organization and quality and cleanliness. I mean that's the best way, I think – to get out and see firsthand where-wards these machines are actually being manufactured and that give you the best understanding.

Q When we are looking at the utility cost under the operation section of a TCO model; do you factor in the location of where the asset will be used?

Gene Diringer: I think without a doubt you need to because of the quaint bearings and large swings there are in terms of utility costs from Campbell's perspective. We are spread across the continental United States and in order to make sure

FAQs with CPG members

CONTINUED

that we are comparing apples for apples and like for like, we make sure we normalize those calculations to take into account those differentiating costs.

Chris Schoen: A lot of companies including Campbell's has a lot of sustainability goals and CSR applications that they make to the local communities. Campbell part of that is putting in renewable energy sources. If you look at operating costs over time, if you put in a piece of equipment into a plant where the plant is carried off of a solar grid, I mean that's significant versus where you tumble into another plant where your 100% higher up the grid and at significantly higher rates, so absolutely that has to be considered.

Q How do you view TCO processes compared to say, value engineering?

Chris Scheon: I guess when you think of value engineering, 9 times out of 10 there is a compromise. So you are going to have to understand those costs as a compromise and how it would relate to a different solution that may not necessarily have the same value engineering. Again, it comes back to the total cost equation, so just understating what you're letting you to get something at a lesser cost or lesser value potentially.

Q How can I get my company to share this information that they normally would hold close and not share?

Jill King: I think it is one of those where you just start having that open dialogue and building that great partnership between the CPG and the OEM and just being real open on what your expectations

FAQs with CPG members

CONTINUED

are. I think as you keep asking and that part of having a group with a really one voice as CPGs and OEMs are coming together, so I think going forward, it is not just one company asking for this. We are really saying as CPGs and OEMs, here is the information that we need to make the best business decisions.

Gene Dirigner: We have had some great experiences actually performing these TCO analyses with our OEMs. We will get down and sit and have, more or less, a symposium with the OEM and all of the respected business partners in the room and start hashing up these numbers and try to understand what the real cost of ownership is for equipment. Through that process there are some great learning's and some great discovery. So I can't say enough about that.

John Kowal, B&R Industrial Automation Corp.: It could also relate to working within the OpX, any standards group, you certainly need to keep proprietary information separate but we are looking at our activities and issues that everyone is facing. So if you work in standards that the environment that you maintain integrity in.

Q An equipment vendor sometimes faces challenges bringing their methods about cost of ownership savings to t he right personnel within the CPG companies. Where should they focus their efforts – with purchasing, engineering or operations?

Gene Diringer: I can field that a little. I think ultimately the actual engineering project manager has a great stake it that but I will say that procurement, which I used to be a part of, has acted as a wonderful voice for the value of TCO to

FAQs with CPG members

CONTINUED

help socialize internally in our organization. I think engineering, operations, we all get it. The problem is socializing and getting other functions inside a company to really buy into it and understand it. When you think of it, for example a finance counterpart, for their part, and it's the way they are set up, their focus truly is really more on the upfront acquisition cost and focusing on tying to the lowest cost. We want to make sure that we bring a mindset of total value. That's what I can say at least from a fraternal perspective.

Q Do you think requirements and regulations differ in the US and the EU for companies that operate globally? What is your approach for product safety to meet multiple regulatory standards?

Gene Diringer: I can say that inside our global engineering organization, we have sub-teams. We call them Subject Matter Expert Teams that focus on key technologies and also processes. I can speak for at least Campbell's whereas we put together global teams that collaborate on standards and approaches and we try to normalize and create standards and documentation that is able to be leveraged on the whole. So this creates a lot of opportunity from the efficiency perspective internally but can also help our global partners and OEMs work more effectively with us.

Q What should I do if the OEM will not provide me with the detailed acquisition costs that you have discussed?

Jill King: I can try to fill that. I would say it really comes back to the earlier comment in building that partnership with them and I guess if they are not willing to provide that, then do you have other

FAQs with CPG members

CONTINUED

alternatives. Another option is, if you are really trying to figure out those costs maybe there is some similar equipment that you have within your company that you can build some kind of comparison with and extrapolate those costs out to try to get more of this true picture of the total cost of ownership.

Gene Dirigner: I think it is important that you set the expectation upfront that you are really going to be performing this type of in-depth analysis on the equipment. If they are continuing to be in transition I think the message should be that this is really the way we are going to be approaching sourcing decisions for significant or very costly capital equipment, moving forward, the way the business is going.

Q Why do spare parts cost matter when you are calculating acquisition costs?

Jill King: I feel like we are really encouraging people to look at that total cost of ownership, so there is going to be the upfront costs. Some of those space parts are things that you need to have on hand when you start up that equipment. So it could add up to several thousands of dollars depending on the complexity of the equipment.

Gene Diringer: It could also vary by CPG to CPG but typically a set of spare parts or ware parts are purchased upfront and capitalized. Therefore, we would lump that into the acquisition portion of our cost.

Q Do OMAC initiativesapply to TCO?

John Kowal: Absolutely! Probably the most relevant OMAC product is the PackSpec

FAQs with CPG members

CONTINUED

document which is a universal user requirements specification. It's built on functionalities, standards. It's been out about a year and it's amazing how it dovetails with the outline of OpX TCO document. That's available through www.omac.org.

Q How has your organization embraced to total cost of ownership mindset?

Gene Dirigner: I think I took a stone at it a little bit before. I think that from engineering and from a fraternal perspective, we get it, we buy into it, we understand the value of TCO. But again, in order to get that message out we have had to deliver initiative where we have been getting out the other functions, socializing the idea of TCO and drilling into it to better help them understand the detail that we are doing to. That helps bring some credibility to the model and helps drive adoption.

Chris Schoen: I will just add to that. If you would take the extent where global engineering is really on board with this, they've got this until their goals and objectives for the year. So it has really been driven from the top down through the organization. It helps our lives significantly when it comes to executing the model and having better participation moving forward.

Q Safety testing is a big investment annually for us. Do you estimate the time necessary to test and install equipment? Do you recommend small changes to make the equipment more users friendly?

Jill King: I would say the simple answer is yes to both of those. As part of our operating cost, it's certainly something for us to consider what are the further requirements on operating the equipment which the safety falls into as well as the maintenance tasks that are required, so if there is anything that's

FAQs with CPG members

CONTINUED

going on the regular frequency that definitely needs to be a consideration both from time and labor and any parts that might be a part of that testing.

Q How do you differentiate between purchases of software versus of equipment? Software also is important. Does your model remain the same?

Jill King: Companies may handle that differently, what their software costs are versus a physical asset, and what the financials are around that. I think it still needs to be included in that total cost, for special software requirements. That's part of looking at the controls that are part of what is included in our framework that we put together.

John Kowal: I know that when you look at software licensing costs you have to look at whether it's a one-time or what kind of annual life savings you are also seeing because now you are treating as operational costs.

Q What are some of the internal challenges to adopt TCO model philosophy into an organization?

Chris: I think we did touch on that one already but again, you have to take a little bit of road show, I tell you. You have to take it to the different functions within your organization. That's probably one of the biggest challenges, just getting people to understand the model and want it and agree to live into it. I think it helps to have some good examples of an executed scenario or case study when going in and having discussions. We just hope to educate the given stakeholders as to the value and the opportunity that it can create.

APPENDIX

From page 15:
More on OMAC from *Packaging World*

From Page 16 and 49:
More on Changeovers from *Packaging World*

From Page 21:
More on FATs from *Packaging World*

From Page 21:
More on SATs from *Packaging World*

From Page 31:
More on PMMIU

From Page 35:
More on Validation from *Packaging World*