Total Cost of Ownership

How can you measure the TCO of palletising equipment?

CSI palletising

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SUMMARY

The initial investment in your installation is important. However, the CAPEX is only part of the installation costs. Costs during the lifetime also influence the total costs of your installation. The OPEX provides you with a complete picture of the Total Cost of Ownership of your installation.

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Introduction

Palletising negotiations during the sales phase are usually based on the installation, its technical specifications, and the financial conditions and price. In addition, the reputation and references of the supplier, as well as the engineering and service capabilities to meet customer expectations, are important for decision-makers. Lastly, customers search for the highest added value compared with the related costs when considering a palletising investment.

The approaches combined can be considered as the Total Cost of Ownership (TCO). In this white paper, we explain that both the CAPEX and OPEX investments influence the Total Cost of Ownership of your installation. In addition, we describe how this can be measured for CSi palletising equipment.

What is the Total Cost of Ownership?

Total Cost of Ownership

Total Cost of Ownership (TCO) is an accounting method or model used to understand and control costs, while maintaining the productivity of an asset throughout its life. In this case, TCO also focuses on the costs of owning the asset after the purchase has been made. This method was initially used to select the best supplier for a specific asset and the supply chain. Nowadays, it is also used to improve products, processes and services.

A customer considering an investment in a palletiser has to take into account the 'hidden' costs that are usually beneath the surface while making the investment. These costs are often not clearly apparent during negotiations, but represent a critical part of the TCO.

Using palletising equipment incurs the necessary costs, while the goal of asset use is to create a certain amount of value. It is important to achieve a healthy balance between the added value and the costs while using and operating a piece of equipment, in which case the added value becomes relatively larger. Minimising downtime and disturbances by applying a well-regulated maintenance plan maximises the value of palletising equipment. Therefore, Total Value of Ownership (TVO) is considered, just as is Total Cost of Ownership.

CAPEX and OPEX

Various types of costs are involved when evaluating different suppliers based on price differences. The challenge is to determine the costs for each cost type. The best way to start is to divide the cost types into two different approaches:

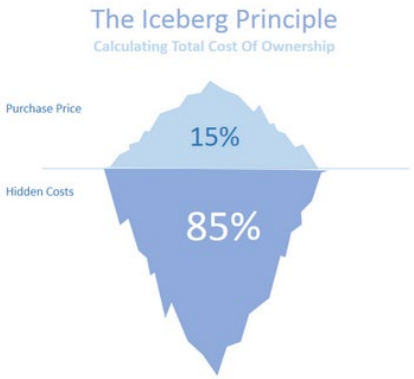
- Capital Expenditure costs (CAPEX), comprising the price based on the cost of sole investment together with the start-up
  - Engineering, evaluating technical solutions and customisation
  - Investment cost
  - Commissioning and start-up costs

- Operation Expenditure costs (OPEX), comprising the price based on costs during the usage of a palletising asset, including what the supplier can offer to optimise the asset:
  - Unplanned downtime due to asset failures
  - Labour cost for operators, maintenance and engineers
  - Maintenance costs
  - Packaging and raw materials
  - Changeovers and modifications
  - Capacity losses
  - Material consumption
  - Energy consumption
  - Space occupancy
  - Spare parts stock



Basically, TCO takes into consideration all the CAPEX and OPEX costs over the life cycle of the palletiser, from its design, to its use and maintenance, to its eventual decommissioning. Based on your strategy, the life cycle could consist of different life-cycle periods, which will lead to several TCO frameworks.

The TCO is ultimately important, because in contrast to what most customers expect, CAPEX represents only 5 to 15 per cent of the TCO. A customer approaching an investment in a palletising machine has to have a clear understanding of the hidden costs that are usually beneath the surface and not clearly visible during the negotiation. Much like an iceberg, these expenses usually represent the most critical and expensive cost elements.



In addition to the cost elements above, the OEE rate (availability x performance x quality) has a strong influence on the OPEX and therefore the TCO/TVO. Depending on the revenue lost per unproduced product, OEE probably has the most influence on the TCO in general.

Overall Equipment Effectiveness influencing the TCO

Overall Equipment Effectiveness, OEE, is the ratio between what a machine could produce in theory and what it actually does produce.

For example: if we assume that our palletising system has a theoretical maximum speed of 100 products per minute, then at the end of a 480 minute shift there should be 48,000 units.
1 shift = 8 hours = 480 minutes
480 x 100 = 48,000 units
Then we need to count what was actually produced at the end point in the production process, for example by counting what is on the pallet going to the warehouse. If there are only 41,280 units on the pallet, the OEE is 86 per cent:
OEE = A x P x Q.
The OEE formula includes Availability (A), Performance (P) and Quality (Q)

Availability: if 25 minutes is lost due to machine downtime during the shift:
RUN TIME = 480-25 = 455 minutes,
A = 455 : 480 = 95%.

Performance: if the theoretical maximum speed of the system is 100ppm, the ideal cycle time will be 0.6 seconds per product.
This means in the remaining 455 minutes, the system can wrap 455 x 100 products = 45,550.
If production is at a slower SPEED (cycle time = 0.8 sec), in the same time the figure will be 455 x 100 x 0.8 = 36,400 products wrapped.
P = 36,400 : 45,550 = 80%,
20% x 455 = 91 minutes lost performance.

Quality: at this point, if 200 out of the 36,400 products were out of specification, the quality rate of those products would be:
Q = 36,200 : 36,400 = 99%,
200 scrapped : 100 ppm = 2 minutes lost quality.

Subsequently, calculating the total OEE rate is possible in three different ways:

- Minutes; (480 – (25 + 91 + 2)) : 480 = 75% OEE
- Products; 36,200 : 48,000 = 75% OEE
- Percentages; A x P x Q = 95% x 80% x 99% = 75% OEE

When broken down into its three main components, OEE can be used to analyse where the production is lost. In this example, an unplanned stop of one hour means a loss of 6,000 products that should have been produced. Translating this to revenue losses per product indicates the importance of the availability, performance and quality of a palletising system.

Keeping in mind the easy possibility of running into unplanned downtime, an OEE of 90% represents a very good system output.

Planned and unplanned downtime

We can divide the downtime of a palletising system into two parts:

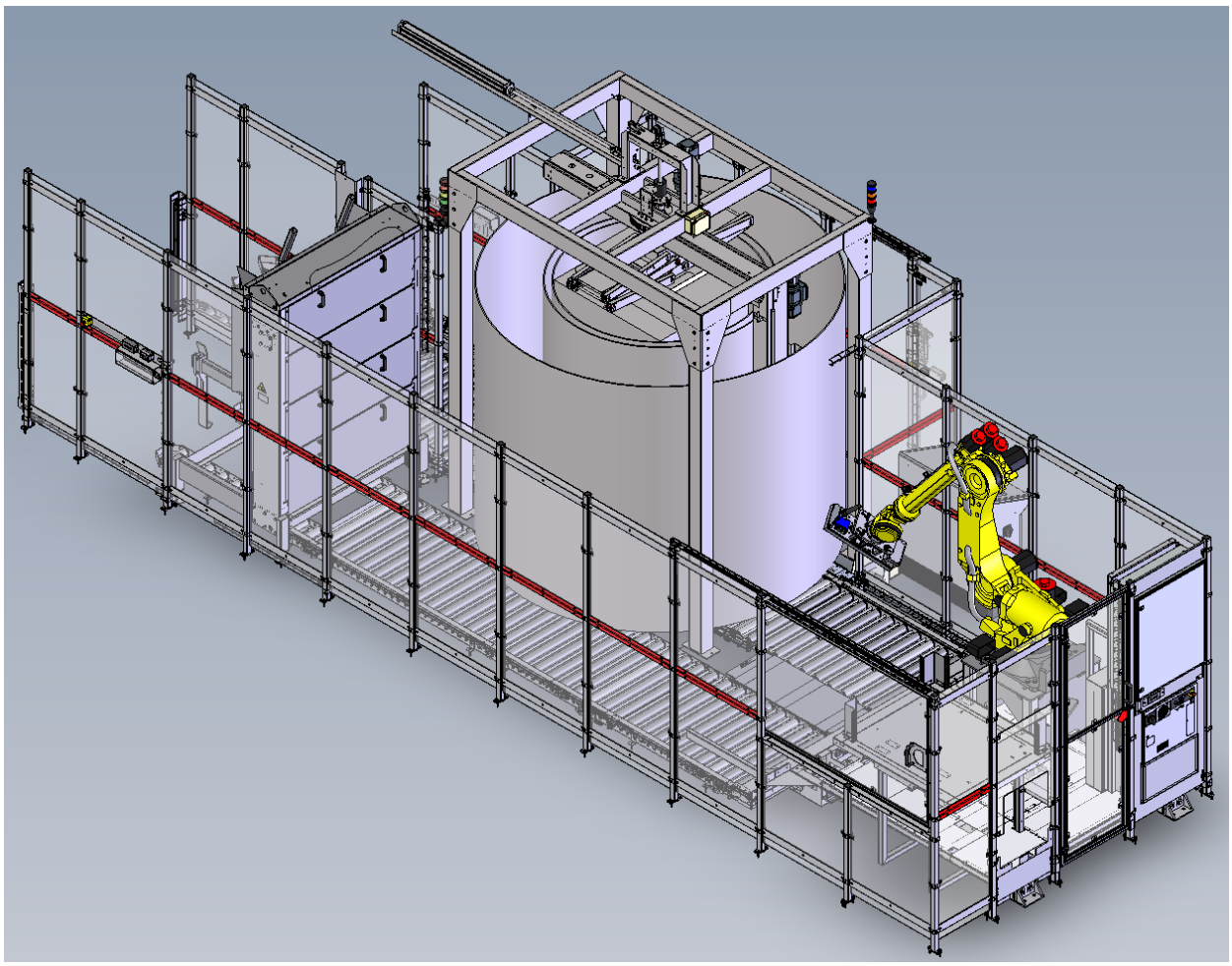
- Planned downtime
- Unplanned downtime

Planned downtime events can be defined as those during which no output of products results, affecting the customer's revenue. Planned activities are events that do not influence the business objectives set by the management and include planned maintenance, sanitation and change-over time (such as setting up another palletising pattern). Unplanned downtime, on the other hand, involves events that can affect the OEE availability.

Example Case

Note: The purpose of this example case is to give an insight into the approach of TCO in practice using CSi palletising equipment. The data used for this example are fictional.

In this short case study, we consider an i-Pal with integrated stretch wrapper, obtaining an insight into the Total Cost of Ownership.



i-Pal with integrated stretch wrapper

The cost elements should be divided into the CAPEX and OPEX investments. In addition, both CSi and the customer should complete particular fields in order to calculate the TCO.

The following template is filled in by CSi and the customer, in which the following cost elements are noted:

- Initial investment, including equipment, installation, freight, etc.
- Services (including contracts)
- Spare parts
- Training
- Labour work
- Utilities
- Space occupancy
- Production losses
- Depreciation

CSi Project	i-Pal system for 1 line including wrapper
Customer	

CSi TCO Template

Cost elements to be filled in by CSi					**Cost elements to be filled in by customer**			
Cost element heading	**Cost element**		**Unit of measure**	**Value**	**Cost element heading**	**Cost element**	**Unit of measure**	**Value**
	TCO year forecast		**years**	10				
CAPEX					CAPEX			
	Base price					additional investment		
		Equipment	Currency (€)	€ 184.833,00		Import tariff / taxes	Currency (€)	
		Project services	Currency (€)	€ 24.583,00		Purchasing new space	Currency (€)	
		Freight	Currency (€)	€ 12.368,00		Hiring of operators	Currency (€)	
		Installation & Commisioning	Currency (€)	€ 30.084,00				
			Total base price €	€ 251.868,00			**Total additional investment €**	€ -
	Space required		m2	44		Cost of space required	€ / m2	30
							Total cost of space required €	€ 1.320,00
	Spare parts	Initial advice	Currency (€)	€ 22.000,00		Interest*	%	1,5
							* In case of investment based on a bank loan	Total capital investment	Currency (€)	€ 282.579,00
	Training proposal		Currency (€)	€ 1.380,00			Capital investment + interest	Currency (€)	€ 327.944,47
		Maintenance training	Currency (€)	€ 600,00				
	Service contract		Currency (€)	€ 5.411,00				
	System warranty		Months	36				
			Total CAPEX cost €	€ 281.259,00			**Total CAPEX cost €**	€ 327.944,47
OPEX					OPEX			
	Spare parts		Currency (€) / year	€ 1.200,00				
			Total spare parts cost	€ 12.000,00				
	Labour work					Labour work		
		Preventive Maintenance	hours / year	100			Operators needed	Number	0,5
							Operator wages	Currency (€) / year	50.000
							Maintenance	Currency (€) / hour	75
								Total labour cost €	€ 325.000,00
	Utility					Utility		
		Annual operating hours	hours / year	8760			Annual operating hours available	hours / year	8733,72
		Average energy consumption	KW / hour	10,4			Energy rate	€ / KWh	0,137
		Compressed air	NL / hour	4920			Compressed air cost	€ / NL	0,000015
							Utility cost per year		€ 13.127,74
								Total utility cost €	€ 131.277,36
	Asset availability		%	99,7		Cost for production loss		Currency (€) / hour	€ 20.000,00
		Asset actual operating hours	hours / year	8733,72					
						Actual cost of production loss			
		Asset output	Units / hour	1200			Price for a unit/hour	Currency (€)	€ 16,67
							Output with manual labour	Units / hour	400
							Actual production loss per hour	Units / hour	800
							Cost for actual production loss per hour	Currency (€)	€ 13.333,33
									€ 133.333,33
						Cleaning		Currency (€) / hour	20
							Hours	Hours / year	365
							Cost over TCO forecast	Currency (€)	73000
			Total OPEX cost €	€ 12.000,00				**Total OPEX cost €**	€ 662.610,69
Disposal					Disposal			
	Expected life length		years	20				
						Annual depreciation		Currency (€) / year	€ 9.241,65
						Disposal value		Currency (€)	10000
								Total disposal cost €	€ (10.000,00)
Total cost across forecast period			**€**	€ 12.000,00	**Total cost across forecast period**		**€**	€ 980.555,16

Total cost of ownership / Year	€ 110.055,52

In this example, the palletising system has a TCO of almost €1,000,000 over its lifespan.

Conclusion

To conclude, an indication of the TCO would ensure benefits strategically. Approaching a palletising investment with a TCO offers the ability to:

- Identify the different cost drivers
- Improve efficiency
- Evaluate and compare different investments and prices
- Have guidelines to support a global maintenance agreement
- Prepare a dedicated corrective and preventive maintenance plan
- Offer the right technology at the right price
- Achieve a win-win partnership between customer and supplier

The TCO consists of the Capital Expenditure costs and the Operation Expenditure costs, in which the OPEX is by far the largest part of the TCO. When this is properly realised, customers are ready to start optimising the operation of their palletising equipment, thereby increasing the TVO.

To obtain an indication of the total TCO, both CSi and the customer need to fill in parts of the template, since the knowledge of the cost elements is shared between the two parties.

How can we help you?

Do you want to obtain a greater understanding about the TCO/TVO of our palletising system? We are happy to support you in gaining a full picture of all cost elements involved and to help you with the decision-making during negotiations within the sales phase.

If you would like to receive more information and start a conversation, do not hesitate to contact your sales contact person or use our e-mail address info@CSiportal.com.

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