

Calculating the Total Cost of Ownership for production line equipment

Content overview

1. Insight and outlook!

2. Clarify principles!

Consider your operating goals

3. Numbers count!

TCO assessment – a solid, meaningful business model

TCO assessment as the basis for management and decision-makers

TCO assessment as a protection against "unwelcome surprises"

4. Individuality is crucial!

TCO tailored to dynamic weighing technology

5. Check the costs!

Direct costs

Indirect costs

Numbers tell us much, but not everything!

6. It's the years that make the difference!

Costs due to the implementation of a checkweighing program

7. Take advantage of the potential savings!

Your investment pays off. But where?

7 points that should not be forgotten

8. What you really want to know: the ROI time

ROI requires – sometimes very little – time!

9. Ask for support!

10. More detailed information

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1 Insight and Outlook!

- Investments are the building blocks of a company's future.
- Planning and implementing them requires strategy and system.
- Decision-makers who know their goals and carry out the implementation according to plan are more successful than those who rely exclusively on their impulses.
- Meaningful information forms the basis of a good investment decision.
- It helps to protect the future prosperity of your company.

Investments
are vital.
Decisions
are needed!

On this basis, a process of assessing the total cost of ownership (TCO), was developed over 20 years ago in the United States, and has since been used by many companies. Considering TCO helps to understand better the costs over and above the purchase price and also – when suppliers have differing offers – to compare them and ultimately to substantiate the investment decision. What is critical here is that the method is oriented in each case to the circumstances of the industry and the company. This also applies to the field of automatic checkweighers.

This white paper answers the following questions:

- Have you clarified the foundations of your investment decisions?
- Are you familiar with the advantages of a TCO assessment?
- Do you know what costs are critical for dynamic checkweighers?
- Do you know what savings accrue as a result of using dynamic checkweighers?
- Have you ever calculated the "return on investment" (ROI) time of an investment?
- Does your supplier support you?

2 Clarify principles!

Any investment requires clear basic principles. In key industries dynamic checkweighers have gained acceptance as an effective component in quality assurance. However, the installation and the associated investment do not automatically guarantee that better products are made. A clear understanding of the operating targets and requirements makes a vital contribution to this. Closely connected to this is the knowledge obtained through the TCO assessment; that is the total cost of ownership over the service life of the investment, and the expectations for the income from the investment.

Consider your operating goals

The operating goals should be clearly defined before introducing a checkweighing program. They form the basis for additional steps, such as clearly formulated enquiries to potential suppliers.

Possible goals:

- Introduction of a new system
- Improvement of production time by "x" percent
- 100% of the products are to be weighed in future (one hundred percent check)
- Reduction of the waste rate due to over/underfilling of "x" percent
- Reduction of erroneous ejections (incorrectly rejected good products)
- Reduction of the quality assurance costs by "x" percent

Note: What is critical here is that each target can be measured with the aid of traceable data. And that each goal can be presented in terms of its financial implications for your company.

3 Numbers count!

Make sure that the calculation is correct! Decision-makers are expected to track investments and estimate them precisely. The acquisition costs here are usually not a problem and planning them within the context of an investment decision is easy. However, anyone who wants to include the critical costs for the entire course of usage in their considerations must dig deeper and proceed systematically. Cost components emerge here that can easily exceed the purchase price. Machines must be maintained, supplied with power or additional materials, and employees must be trained – and this is over a machine lifetime which can easily exceed a decade.

Total ownership costs assessment – a solid, meaningful business model

If possible, all the costs connected with the new purchase should be taken into account. Whether large corporations or individual entrepreneurs, anyone who wants to assess an investment properly should estimate **all** the costs incurred. By considering the TCO, a calculation process is available that can help companies in precisely this area. This procedure, which was originally developed for the IT sector, has in the interim been taken up in all industry branches and lists all the relevant costs of an investment – from the purchasing process through to disposal. The principle is really very simple.

TCO assessment as the basis for management and project decisions

An investment that is made for a department within the company can have an effect on quite different parts of the company. Frequently, investment decisions compete with other financial priorities, and other projects must therefore be postponed. Not infrequently conflicts arise between business management and project management. Accurate budgeting – thanks to consideration of the TCO – over the entire service life of an investment can make it very clear, particularly to senior management, which financial expectations the investment satisfies. It often makes it easier to come to a decision and prevents conflicts between departments.

TCO assessment as a protection against "unwelcome surprises"

The selection process demands highly cost transparency! One reason for introducing TCO assessments was to create a better basis for choosing a supplier. An investment commitment that is based exclusively on a good purchase price can turn out to be a fatal money-pit over the course of time. Hidden costs, which can only be recognised in ongoing operation, can turn a bargain into financial nightmare. If the design makes modifications difficult and costly, or if frequent maintenance intervals require frequent stoppages, the costs can really shoot up. With TCO assessments, hidden cost drivers can often make the difference even before reaching an investment decision. Anyone who takes into account all the costs of an investment will make provision for unwelcome surprises and will protect against them.

4 Individuality is crucial!

Industries and companies are distinguished from each other in many ways, but one rule applies to them all: a solid business model should be created before making an investment. The TCO calculation supplies properly grounded evidence for the total cost of ownership for management and decision-makers. It is appropriate here to take into account the particular circumstances of each industrial sector and company.

TCO – tailored to dynamic weighing technology

It is vital in the TCO consideration to highlight the savings that result from an investment as well as the various costs connected with the system and process. Only such a procedure leads to an accurate overview of the total cost of ownership and thus to a clear assessment of the return on investment time.

5 Check the costs!

TCO throws light on the costs of an investment over the entire lifecycle. This means that all expenses that are connected directly or indirectly with the investment are added into the calculation.

Direct costs

Direct costs are normally easy to determine. They are the follow-up costs that can be directly attributed to an investment. Direct costs include, for example:

- The procurement costs
- The costs of software updates
- The costs for the operation of a machine (electric energy, compressed air, etc.)
- The costs for wear and tear parts
- The costs for training
- The costs for service contracts and for maintenance and calibration

Indirect costs

Unfortunately, indirect costs are rather more difficult to determine in operative practice. They cannot be attributed exactly to one investment, and usually arise if the productivity is impeded in connection with the investment. Examples can make this clear:

- Failure times originate due to lack of maintenance, repairs and the like, and the system is not available
- Incorrect machine settings lead to poor performance or production stops
- When faults occur, colleagues are brought in from other departments in order to resolve the problem

Numbers tell us much, but not everything!

A consideration of the TCO assessment offers a very good basis when a decision must be made in favour of an investment, and therefore also of a supplier. It is based on quantifiable factors and values. It must not, however, be forgotten that other, more subtle factors that cannot be expressed in monetary units may also play a role in coming to a decision. This includes some very important points, such as the reputation of a checkweigher supplier as well as his pre-emptive service offerings, the quality of service and the availability of consumable and spare parts, even after a good number of years. A favourable purchase price is not much use if, later, a company is left to deal with problems alone!

Note: As it is often difficult to quantify the indirect costs, estimates should be used where a calculated value is not available. It is however very important that these costs are taken into account. Identifying these costs may even show areas where other improvements within the company can be made to reduce them.

6 It's the years that make the difference!

Take a close look at the TCO analysis: the first 12 months and the subsequent years are critical. The TCO calculation in the dynamic checkweighing field distinguishes between the costs of the initial investment (the first year) and the costs in the subsequent years. The first year after the purchase is, naturally, the most cost-intensive. The purchase price, the installation, the required training, spare parts packages and integration into the production line have a significant impact here. In some cases external consulting costs or the disposal of old devices also come into play.

The subsequent years have their own cost aspects. In addition to operating and maintenance costs, unplanned downtimes and costly guarantee/warranty extensions take their financial toll. If official verification certification is required, the costs for conformity assessments and official tests need to be taken into account. And it should not be forgotten that the service life of a machine now can be ten years or even longer.

Costs due to the implementation of a checkweighing program

A view of the costs of the initial investment. You must take a look at the following:

- **Purchase price:** The quotations from the various manufacturers who were invited to bid provide a basis.
- **Installation/commissioning (initial operation):** The relevant quotations indicate the external costs for support by service providers, consultants or fitters. Internal costs are determined through in-house hourly rates or charge rates. The critical figure is the total time required starting from the stoppage of the production line for the purpose of installation i.e. integration of a checkweighing solution through to the resumption of production.
- **Validation documents:** Costs for validation and certification (e.g. according to the Global Food Standard (GFS)) can be supplied by the manufacturer concerned.
- **Costs for official verifications:** A good supplier will indicate all the costs for necessary official verifications, from support through to official testing.
- **Training with the supplier or on-site with the system:** Because training is offered directly by the checkweigher supplier, the costs are clearly quantifiable.
- **Purchasing costs for spare parts:** Any serious supplier can make appropriate statements regarding spare parts that may be required in the first year and in the subsequent years.
- **Service offerings:** A number of suppliers offer service agreements that include various services, such as inspections, maintenance visits and spare parts. Also check the various offers for service reaction time, inclusive services, price discounts for spare parts and remote diagnostics options. Remote diagnostics/remote maintenance reduces costs because aberrations can be detected earlier. As a result, any intervention by technicians can be prepared for, allowing problems to be rectified more quickly.

Note: Important items in service agreements to which you should pay particular attention include:

- Does the agreement include all the necessary visits and services?
- Does the agreement include a single lump-sum payment (regardless of how much service work becomes necessary)?
- Does the agreement also include the cost of spare parts? Does this extend to wear and tear parts?
- Does the agreement also include all travel costs and the technicians' hourly rates?

- **Integration into the production line:** The expense of integration can vary according to the situation. Does a checkweighing program need to be introduced for the first time, or do current checkweighers need to be replaced or expanded? Producers are helpful here, within the parameters of their capability, and will highlight potential for optimisation.
- **Disposal of the old equipment:** On request, a supplier can take responsibility and provide a firm price.

A view of the costs of subsequent years. Here you must take a look at the following:

- **Operating costs:** The cost of energy and additional materials may vary widely. The supplier should have the corresponding technical information to hand.
- **Maintenance costs:** The supplier can specify maintenance intervals and expenditures. A serious supplier should be able to quote average values related to repairs.
- **Unplanned downtimes:** An overview of the past and the calculations that were previously made is the most helpful guide here.
- **Guarantee/warranty extension:** The supplier will provide the corresponding quotations and prices.
- **Software/hardware updates:** The supplier will provide information about frequency and costs.
- **Personnel costs:** Time required for the creation/setup of new products and switching of product setups (changeover). There are big differences between the solutions of various suppliers here. Make an estimate of how often a completely new product needs to be set up on your production line or the product setup has to be changed over.

Note: Normally every supplier is convinced that his system is the fastest and easiest to set up. You will do better to have them show you exactly which working steps are necessary, and then make up your own mind whether the operation is time consuming and needs a lot of personnel input, or whether instead it saves time and costs.

Enter your values:

Overview of the costs of an automatic checkweigher							
C O S T S	Costs of initial investment	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
	Purchase price		-	-	-	-	-
	Installation/commissioning		-	-	-	-	-
	Validation documents		-	-	-	-	-
	Official verification costs (if applicable)		-	-	-	-	-
	Training with the supplier or with the customer		-	-	-	-	-
	Procurement costs for spare parts packages		-	-	-	-	-
	Service contract		-	-	-	-	-
	Integration into the production line		-	-	-	-	-
	Disposal of the old equipment		-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
	Total		-	-	-	-	-

C O S T S	Subsequent years (generally up to 5 years)	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
	Operating costs	-					
	Maintenance costs	-					
	Unplanned downtimes	-					
	Guarantee/warranty extension	-					
	Official verification costs (if applicable)	-					
	Software/hardware updates and support	-					
	Personnel costs	-					
	Service contract	-					
		-					
		-					
		-					
		-					
	Total	-					

7 Take advantage of the potential savings!

Compare the cost analysis with the possible savings! Whenever we make an investment, the cost is always the main focus for management and decision-makers. But the consideration of savings, in particular over the entire lifetime of a machine, can be decisive for an investment in a new system. It is worthwhile including the varying savings potentials and allowing them to influence the TCO calculation.

Your investment pays off. But where?

Automatic checkweighers have an enormous savings potential! Production practice shows that the greatest savings are achieved by reduction of giveaway and prevention of waste. In concrete terms this means reducing scrap, product rework and product waste; in addition, avoiding product recalls resulting from insufficient weight or missing parts.

Quite small levels of overfilling can easily grow into giant "profit eaters". The accurate filling of products can be regulated by connecting a checkweigher to a filling unit. Each additional gram that is poured in adds up, and at the end of a day's production can result in enormous losses. Stated in another way: exact filling is amongst the best reasons for investing in a high-precision checkweighing system.

This becomes most clear when demonstrated in a practical example. The parameters here are as follows: In a filling system, 200 cans per minute are filled in a production line. Work is done in three shifts of 7 hours each, 230 days per year. The company quotes a production line efficiency of 70%. During production, an average overfilling of the cans of 10 grams was found. The costs for the contents of the cans amounts to € 0.0001 per gram.

The costs:

The annual costs for overfilling amount to € 40,572.

The savings potential:

Using a checkweigher that operates to an accuracy of 2 grams at two standard deviations (sigma), € 32,457 per year can be saved!

The example has been calculated on the basis of the following form. Moreover, it serves as a template for you in order to calculate the actual operating values.

Product items per minute (ppm):	A	_____	
Operating hours of the line per day:	B	_____	
Number of production days per year:	C	_____	
Efficiency of the line:	OEE %	_____	(e.g. 70 %)
Average filling per package in grams:	D	_____	
Product costs per gram:	E €	_____	

The overfilling on a filling device should not be set lower than the accuracy of the checkweigher.

Accuracy of the checkweigher in g at 2 standard deviations.:	F	_____	
Number of product items per year:	G	_____	$A \times 60 \times B \times C \times OEE$
Current costs for overfilling/year:	H €	_____	$G \times E \times D$
Costs for overfilling/year when a checkweigher is used:	I €	_____	$G \times E \times F$
Savings/year with a checkweigher:	J €	_____	$H - I$

Seven points that should not be forgotten

During the implementation of a program for checkweighing, savings can be achieved by:

1. Reduction of scrap

Control via an optimum checkweighing program ensures the implementation of statutory regulations and thereby prevents expensive scrap. The financial benefit can be estimated by comparing the "before" and "after" rates.

2. Reduction of rework

Additional work that results from rejected products can be calculated from the additional personnel costs.

3. Reduction in the cost of working time

The supplier provides information on the time for product setup/changeover (refitting) and on cleaning times.

4. Reduction of "wasted" material

The costs for overfills in production can be calculated based on the sample calculation (see p. 6).

5. Prevention of product returns

Modern checkweighing programs weigh 100 percent of the products produced. Deviations that run contrary to official regulations or industry standards are detected as early as possible and avoided. Potential savings are calculated by comparison with previous production and cost of product returns.

6. Protection of the brand and customer relations

Non-material values such as brand and consumer loyalty can be difficult to estimate. However, they form the basis for reinforcing the repeat sale attitude and attracting new customers. Quality is what counts here.

7. Reduction of the expense involved in audits (e.g. for IFS, BRC and others)

The preparation of checkweighing tests and audits and their subsequent documentation can be time consuming and costly. Ask your suppliers for a documentation scheme that records all the relevant tests and audits and keeps this documentation up to date. In this way you can document at any time the proper operation and use of your checkweigher, both internally and for the requirements of external auditors – very easily.

Enter your values:

Overview of the possible savings							
S A V I N G S	Savings	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
	Reduction of waste						
	Reduction of rework						
	Reduction of work required						
	Reduction of product "giveaway"						
	Avoidance of returns						
	Protection of brand reputation and customer relationship						
	Reduction of expense involved in audits						
	Total						

8 What you really want to know: the ROI time

The TCO model, with its cost and savings values, provides a very good basis for an investment decision. In addition it supplies the financial basis for the ROI calculation. When has the machine paid for itself?

Comparing the costs to the savings allows the ROI period to be calculated. This is reached as soon as there is a balance between cumulative savings and costs for the total investment. The values you have entered for the cost and the potential savings serve as the basis for your calculation.

In the forms you have itemised the crucial costs: from the purchase costs of the checkweigher, the installation and training costs as well as maintenance and service costs, through to all the other additional costs. These are set against the savings that can be achieved as a result of the narrower tolerances, through which overfilling and waste are reduced. The length of time required to achieve the ROI is calculated from the relationship.

The calculation is usually done nowadays using special software tools that automatically perform the calculation on the basis of your values. A good supplier will gladly make such a tool available.

Dynamic checkweighers are frequently associated with the fulfilment of statutory mandates, but they also improve the operating result by reducing product losses, enabling tighter tolerances and ensuring more consistency. The savings from precise dynamic checkweighing then frequently show this result.

ROI requires – **sometimes very little** – time!

Note: Most systems pay for themselves within a few years, months or even weeks!



Download a free calculator file as a pdf in order to calculate the return on investment time of a dynamic checkweigher based on the possible savings:
www.mt.com/garvens-ROI

9 Ask for support! A serious producer does not leave you alone.

Use the knowledge and the experience of your partners! In the course of carrying out a TCO calculation and considering the potential saving resulting from the investment, a wide range of data and figures that are relevant to the useful life – from purchasing to disposal – is required. Serious suppliers therefore represent an important source of the information for the values that will be entered into the calculation. Suppliers of machines and equipment should be willing to help you and to provide the relevant information. In particular this includes indications of operating and maintenance costs and of unplanned downtimes. In addition, active support at the investment planning stage can be an important criterion when selecting the supplier.

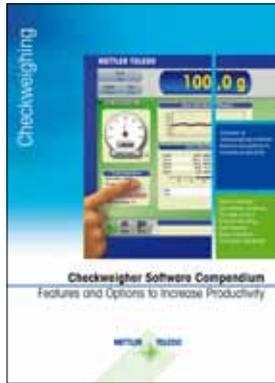
The following is important for supplier selection:

Only partners who think for and with you are good partners!

10 More detailed information

Checkweighing software compendium

The checkweighing software compendium describes software functions and options for achieving easy navigation as well as optimisation of the checkweigher system. It supplies a comprehensive overview of the checkweigher models in the X series. The compendium can help producers, for example, shorten the changeover times when changing the production line. In addition, there are solutions for improved fill quantity checking, perfect product transport and the greatest possible data security.

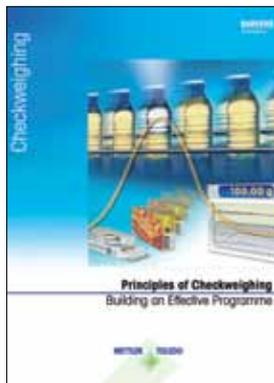


www.mt.com/garvens-software

Guidelines for weighing technology

Creating an effective checkweighing program

The Garvens guideline "Principles of Checkweighing" is recommended as a reference document. It offers insight into all aspects of checkweighing, starting with the basic principles up to the implementation of a comprehensive checkweighing program.



This 70-page FREE guideline helps producers as a companion document for setting up this sort of weighing program, and is required reading for everyone who has anything to do with checkweighing systems.

www.mt.com/cwguide

Calculators

ROI calculator for inline checkweighers

This calculator helps you to work out the amount of savings you can achieve by minimising overfilling and waste. Including sample calculation.

www.mt.com/garvens-roi

Manual or in line weighing?

Comparison of manual and dynamic weighing

This calculator helps you to decide whether replacing a static scale with a dynamic scale would be more profitable for you.

www.mt.com/garvens-dynamic

White papers

Overall Equipment Effectiveness (OEE)

This white paper provides a detailed description of the overall equipment effectiveness and demonstrates, using a simple calculation, how you can increase productivity at a low cost.

www.mt.com/garvens-oeo

Principles of hygienic design

This white paper covers all aspects of the hygienic design of checkweighers. The last chapter describes a tool that helps you to assess hygiene requirements.

www.mt.com/garvens-hygiene

Optimisation of filling systems

This white paper relates to typical problems with filling, and offers tips and solutions for optimising the fill quantities – this has a direct effect on quality and cost-effectiveness.

www.mt.com/garvens-filler

On-demand webinars

Those who are interested can access on-demand webinars, with flexibility around the clock. You can obtain specific information about applications and products, learn about everything related to trends in the sector and standards, and obtain useful and informative illustrations.

www.mt.com/pi-ondemand

Available webinars on checkweighing are listed below:

The European Directive 2004/22/EC (Measuring Instruments Directive, MID)

Maximise your profits through intelligent weighing technology

High performance checkweighing for an optimum overall equipment effectiveness

Pharmaceutical serialisation – selection of the right equipment suppliers

Weight measurement for the improvement of your products and processes

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For more information about checkweighing solutions please contact your local METTLER TOLEDO representative.

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Subject to technical modifications.
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1111/166 EN-EN