Glossary - Total Cost of Ownership

Contents

Preface

This document was written by a team of members of the Association of Beverage Machinery Industry (ABMI), because the overall economic aspect of future investments becomes more important than the pure capital costs.

The intention of this document is to give a uniform method for Total Cost of Ownership calculation within the beverage industry focusing on the economic prediction in the pre-investment phase of equipment.

With this uniform method customers of the beverage machinery industry can fairly compare different competing solutions or technologies from different suppliers or the same supplier.

The document describes the process of carrying out a TCO, a standardized input, the method itself and a uniform representation of the results.

The references to literature and standards are specified in the bibliography at the end of the paper.

Definitions

Total Cost of Ownership – TCO

The total cost of ownership approach gives a detailed economic view to the operation of machinery or production systems.

That all monetary aspects of operations are considered, one speaks of total cost approach.

The following costs are considered:

- Capital costs:
  investment (scope of system)
  miscellaneous costs

$$cost_{capital} = cost_{investment} + cost_{misc.capex}$$

- Operating costs
  packaging material costs
  labour costs,
  energy and media costs,
  maintenance costs
  miscellaneous costs

$$cost_{operation} = cost_{material} + cost_{labour} + cost_{energy\&media} + cost_{maintenance} + cost_{misc.op.}$$

In the following chapters all contributions are clarified and explained.

The most meaningful result of a TCO-calculation is the cost per produced goods.

The primary economic view to a system is given by the costs per unit for a single-period view:

$$cost_{per\ unit} = \frac{cost_{investment} + cost_{operation}}{q_Q}$$

The number of produced goods is given herein by the quality output of the system q_Q in the terminology of the DIN8743 (DIN 8743, 2014).

For further reading the following references can be used (Geissdörfer, 2009), (Krämer, 2007), (Ellram, Total Cost of Ownership: Elements and Implementation, 1993) and (Ellram, A Framework for Total Cost of Ownership, 1993).

TCO within Beverage Industry

Within the beverage machinery industry beverage processing machines are to be described by this approach.

One single-period is a year.

All quantities are considered by using a snap-shot to a given date. All assumptions on costs are constant during the considered time period (period of depreciation, if it exists).

The most important result of a total cost of ownership calculation is the unit € per 1000 container. Transformations to other currencies or to other units for goods are of course possible. For this document the upper unit will be used.

The following cost types are considered within a standard TCO calculation:

- Capital costs (scope of system)
- Packaging material costs
- Labor costs
- Energy and media costs (no product contents)
- Maintenance costs

Comment: As a consequence of generating a fast analysis for decisions not all of the named cost types have to be considered, especially when they are negligible or not important for a comparison of alternatives. The cost figures, which were not considered, have to be indicated.
This is especially applicable, when different technologies have to be compared.

TCO analysis regard only costs from the point of view of the purchaser

TCO analysis consider only outgoing payments and no incoming payments (in contrast to standard investment analysis, e.g. net present value method)

The underlying TCO calculation serves as a comparative analysis of different solutions. It does not list all costs of a full and absolute economic calculation.

In the following Life cycle costing, Return on Investment and time of pay-back is briefly described, because these key performance indicators are part of a decision process. However, most of the input data of these methods are not available for suppliers or are not part of discussions between suppliers and customers (i.e. procurement costs, net profit).

Therefore the TCO is the most adequate method to assist the decision process for an investment and is used in discussions between suppliers and customers, since all input data used is part of the conversation between supplier and customer.

Life Cycle Costing – LCC

The Life Cycle Costing approach also considers cost figures but has a more general view. It includes as well preparatory costs (procurement, infrastructure and other creation costs) and disposal costs (dismantling, residual value and other disposal costs). Thus LCC covers all costs from cradle to grave.

Comment: Within a TCO the residual value is zero after the depreciation period. Preparatory and disposal costs are not in focus of a TCO. Thus one can easily say that one considers only the operation of a system including investment.

Comment: As we have less insight in all costs when are considering a LCC approach, a TCO analysis leads to a quicker decision process assuming preparatory and disposal costs being the same for each alternative, that needs to be analyzed.

For further reading the following references can be used: (VDMA, 2006) and (Bünting, 2009).

Return on Investment – ROI

The return on investment is, for example, described in literature within the DuPont-System of Financial Control (Steger, 2014) and is an indicator for a company in total.

A modern approach is reached by focusing on single investments within a company. The relation of net profit to the investment is one economic measure.

The calculation is reached by for a single period view:

$$ROI = \frac{profit_{net}}{investment}$$

For a single-period view, divide the return (net profit) by the resources that were committed (investment)

Comment: As a fact, that beverage machinery manufacturers and their customers have no fast access to the net profit for each project, the ROI is seldom in use by suppliers.

Time of Pay-back

Sometimes not the total net benefit but a partial benefit per period is considered in order to compare options or alternatives (i.e. sustainable technology).

The time of pay-back (static without inflation) is then given for a single-period view by:

$$t_{pay-back} = \frac{investment}{benefit_{partial}}$$

Limits and Basics of a TCO calculation

A TCO prediction consolidates all known parameters of a future operation.
It can, therefore, only be a guideline for decisions.

It is no guarantee for all future costs due to complexity of real life, estimations and an unknown future production planning, uncertain volumes of goods, simplified cost model and the fact, that not all costs are considered.

Particular cost types can be excluded in order to reach a fast comparison of solutions (no full cost overview).

The usage of TCO within beverage machinery industries is a relative approach only. Only the main contributors of all cost types are considered for simplicity.

In addition and in order to minimize the amount of open parameters unit prices of goods, energy, media and packaging material should be considered as constant.
However, it should be borne in mind, that future higher prices of goods will increase the gap within a comparison of different alternatives.

When comparing different alternatives from different suppliers it has to be clarified from customer's side, that:

- The same scope of supply is considered in all line analysis data
- The same constraints to machinery are applied to all suppliers
- The same set and definitions of cost types are used in all data
- The currencies have to be transformed by the purchaser or at least the exchange rate has to be given by the purchaser
- The same depreciation time and method has to be used
- The same rate of operators have to be used
- The same number of SKUs have to be used (in the standard only one SKU is considered)
- The same set of packaging material has to be considered (example: preforms and caps only or full set of packaging)
- The same unit prices for packaging material have to be used
- The same unit prices for energy and media have to be used
- The same model for maintenance has to be applied (spare parts, wear & tear parts with predetermined or condition based)
- The same operational data has to be used, that influences idle time, scheduled downtime, which are related to a production plan of the customer

The upper list is to be considered, when comparing alternatives with the same features.

However, features and differences could vary from solution to solution (for example different speeds, different packaging concepts, different packaging weights etc). These primary sets of differences have to be pointed out by the person, who compares different systems with the help of TCO.

Cost figure types

Capital costs (CAPEX)

A complete list has to be given to describe the scope of supply.

Within this list the following might be included to the investment:

- Machinery, which will be delivered
- Necessary tooling (moulds, etc.)
- Packaging of machines
- Commissioning, Freight costs
- Installation, Cabling, Piping, Network
- Validation
- Acceptance

In a standard TCO only one SKU is considered, consequently only one set of tooling or set of machines has to be considered by the calculation. The considered items have to be indicated as considered within a list of all items to be delivered.

The method of depreciation has to be documented:

- Book depreciation[1] – not used
- Cost accounting depreciation with annuity factor in advance[2] – not used
- Cost accounting depreciation: annuity factor end of period[3] = ABMI Standard

The interest rate per period (usually one year) has to be indicated.

The depreciation time has to be indicated.

As default within the ABMI organisation a depreciation time of 10 years will be used. Thus 10 periods are used as standard as long not specified by the customer.

As default depreciation method the end of period method will be used as long as not specified by the customer.

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[1] Book depreciation:
in Excel given by SLN(investment; 0; time) – with 0% interest

[2] Cost accounting depreciations with annuity factor in advance:
in Excel given by PMT(interest rate; number of periods; -investment; 1)

[3] Cost accounting depreciation with annuity factor end of period:
in Excel given by PMT(interest rate; number of periods; -investment; 0)

The yearly cost for capital in the standard TCO approach is given by

$cost_{investment}$ = *PMT(interest rate; 10; -investment; ; 0)*

or in written formula

$$cost_{investment} = investment \cdot annuity\ factor$$

with

$$annuity\ factor = \frac{(1 + interest\ rate)^{depreciation\ time} \cdot interest\ rate}{(1 + interest\ rate)^{depreciation\ time} - 1}.$$

Labor costs (OPEX)

Many staff members could be considered for an operation of the line:

- machine operators
- technicians
- laboratory staff
- maintenance staff
- administrative overheads
- management staff
- forklift drivers

For an easy access to a standardized method, only machine operators are considered as default within the ABMI organization.

The job description of a machine operator is given and defined within an ABMI standard. For reference see (ABMI, 2014).

A short description is given by: Machine operators are responsible for a smooth course of machine production. The operator must ensure man, machine and product safety and fulfil all the tasks of his job profile with high accuracy, contributing to a stable course of production and a high level of machine efficiency. Besides "running" the machine, he is able to perform small daily and weekly maintenance, light repair and cleaning works to instructions. To guarantee a high efficiency, a proactive observation upstream and downstream of the machinery is necessary.

However different/higher skill levels or additional competences can be necessary for certain type of equipment. In order to cover this effect appropriately, different rates are to be considered within a TCO calculation.

Thus two different skill levels are suggested as default within the ABMI organization:

- operators with a basic skill level,
- operators with additional specialized skills

These are considered as arithmetical costs, which includes compensation, effects of holidays, overhead, fringe benefits, taxes or others.
These effects will be considered by the purchaser and will not be considered as a part of the calculation of the machine manufacturer.

For these two types of operator rates have to be given the purchaser.

The number of each type of operator per shift has to be given by the machine manufacturer or agreed between both parties depending on customer organization.

The labour costs are calculated by using different rates (basic skill, specialized skill) per year

$$cost_{labour} = \sum_{i\epsilon\{basic,special\}} number_{shift} \cdot number_{operator}^{i} \cdot rate^{i}.$$

Packaging material costs (OPEX)

In general all packaging material can be considered. Packaging material plays an important role in the total cost of the finished product.

Due to the fact that products have different combinations of packaging materials one refers to a unique description for each product. Therefore we use the term SKU (stock keeping unit) in the following.

For simplicity only one SKU will be considered in a standard TCO calculation. Thus, all formulas refer to this simplification in this document.

However, if the same material is processed in all alternative solutions, the cost type of packaging material can be neglected. In this case, this has to be indicated.

Thus only a set of material can be included and some material can be excluded and sometimes no packaging material is considered. This has to be indicated as well.

All used packaging for all considered SKUs have to be indicated.

Per SKU all materials have to be listed:

- Preforms
- Bottles
- Cans
- Caps
- Lids
- Labels
- Shrinkfilm
- Pads
- Trays
- Cartons
- Interlayer
- Pallets
- Stretchfilm
- Returnable Bottle Refreshment
- Returnable Crates Refreshment
- Returnable Pallets Refreshment

The cost for each material has to be listed and indicated. The cost has to be determined by the purchaser including a reference to the particular amount of material in units of produced containers.

The amount of produced goods per SKU and per period has to be listed and indicated.

For each material i the costs per 1000 container $cost_{packaging}^{i}$ has to be indicated.

It can be necessary to indicate and calculate the amount of refreshment (returnable bottling lines) or packaging material scrapped due to normal operation of the line.

Sampling by the customer is not considered within a standard approach.

The variable cost for packaging material is thus given by

$$cost_{material} = \sum_{i \epsilon \{preform, cap, ...\}} cost^{i}_{packaging} \cdot \frac{number_{produced\ units}}{1000}.$$

An extension to more SKUs is straight forward, but is not part of this glossary.

Miscellaneous costs (CAPEX)

Miscellaneous costs can be considered but are not obligatory and are not included by a standard TCO.

The following costs can be implemented:

- Additional IT-Systems
- Change parts carrier
- Additional tools
- Training – 1st time
- Platforms, stages and step-ways
- Storage costs (! different depreciation time)
- Room/Space/Footprint costs (! different depreciation time)
- other capital costs

All additional invest has to be considered and calculated in an appropriate way in analogy to the above mentioned capital costs.

The consideration of one or more of these items has to be indicated.

Miscellaneous costs (OPEX)

Miscellaneous costs can be considered but are not obligatory

The following costs can be implemented:

- Spare parts package – starter package
- Consumables – starter package
- Training
- Maintenance or service contracts
- Waste disposal costs
- Losses (product, no packaging material)
- other operational costs

All additional operational costs have to be considered and calculated in an appropriate way in analogy to the above mentioned operational costs.

The consideration of one or more of these items has to be indicated.

Energy & Media Costs (OPEX)

The consumption of energy and media is considered by a simplified approach.

In the standard calculation the production process within ideal conditions (100% and balanced conditions) for one SKU (i.e. container size) is considered for each machine or component within the scope.

In addition a cleaning process can be considered. Here the absolute amount of energy and media, which is consumed per cycle, is used. Therefore, one can consolidate the amount of media used for cleaning/sanitation per period by a simple multiplication with the total amount of cleaning processes.

This description is a simplification. In principle several SKUs and several cleaning processes could have different fingerprints in consumption. For simplicity here, we focus on one SKU and on one cleaning process.

	Production	Cleaning	
Media	Unit	Unit per cycle	
Electric Consumption	kW	kWh per cycle	
Steam	kg/h	kg per cycle	
Clean Steam	kg/h	kg per cycle	
Low pr. Air	Nm^3/h	Nm^3 per cycle	
City water	m^3/h	m^3 per cycle	
Treated water	m^3/h	m^3 per cycle	
Tower water	kW	kWh per cycle	(thermic energy!)
Chilled water	kW	kWh per cycle	(thermic energy!)
Gaseous N_2	Nm^3/h	Nm^3 per cycle	
Liquid N_2	kg/h	kg per cycle	
CO_2	kg/h	kg per cycle	
PAA	kg/h	kg per cycle	
H_2O_2	kg/h	kg per cycle	
NaOH	kg/h	kg per cycle	
HNO_3	kg/h	kg per cycle	

Consumed media should give a representative snap-shot of the machinery. Thus water as constituent of the filled product is not considered as consumed media. The same is valid for CO_2.

For each media *i* the consumption during production $consumption^{i}_{production}$, for a cleaning cycle $consumption^{i}_{cleaning}$ and a possible intermediate cleaning cycle $consuption^{i}_{intermediate}$ has to be given.

Two different cleaning types in common shall be used as a basic description of a filling and packaging system. Thus, main cleaning process and an possible intermediate cleaning process can be handled in the calculation. Therefore, consumption figures for both will be handled separately as input.

For a considered media the customer has to provide a price $price_{media}^{i}$ in combination with the delivered unit. The number of cleaning and intermediate cleaning processes per year has as well to be considered leading to costs for energy and media for a single-period view (one year):

$$
\begin{aligned}
cost_{energy\&media} &= \sum_{i\epsilon\{energy\&\,media\}} price_{media}^{i} \cdot consumption_{production}^{i} \cdot time_{operating} \\
&+ \sum_{i\epsilon\{energy\&\,media\}} price_{media}^{i} \cdot consumption_{cleaning}^{i} \cdot number_{cleaning} \\
&+ \sum_{i\epsilon\{energy\&\,media\}} price_{media}^{i} \cdot consumption_{intermediate}^{i} \cdot number_{intermediate}
\end{aligned}
$$

Description of media

Steam – saturated steam
example of usage: for heating application in a heat exchanger
(energy content is defined by the temperature of saturated steam of 175,4°C, 9bar)

Culinary Steam – saturated steam
example of usage: for sterilizing a surface
(energy content is defined by the temperature of saturated steam of 175,4°C, 9bar)

Low pressurized air - according to DIN1343
example of usage: for pneumatic activated instruments

Sterile Air – according to DIN1343,
as long as not specified it is assumed within a standard ABMI TCO approach,
that sterile air is produced by filtration of low pressurized air.
In this standard case sterile air is considered by an amount of low pressurized air
example of usage: for cap handling systems or rinsing a bottle

High-pressurised air – maximum 40bar, according to DIN1343
If the compressor is not part of the solution,
this information is used and the unit is Nm³/h.
If the compressor is part of the solution,
the amount of air and its cost is considered in kW of electrical power.
In case of no specific data of the compressor one might use
an approximate value of 0.18 kW / Nm³/h for conversion with the aim to make TCOs comparable.

City water – drinkable water
(compliant to Drinking Water Directive (Council Directive 98/83/EC)
Example of usage: caustic solution, bottle shower

Treated or process water – specially prepared water for certain processes
example of usage: water suitable to use within a heat exchanger,
basis for culinary steam

Tower water – describes here a cooling process in a closed loop
(with a temperature 5 to 15°C)
Within a TCO the amount of energy is considered here. Thus the unit here is kW or kWh per cycle respectively
Example of usage: extraction of heat energy from a cooling process

Chilled/Glycol water - describes here a cooling process in a closed loop
(with a temperature of about 2° C)
Within a TCO the amount of energy is considered here. Thus, the unit here is kW or kWh per cycle respectively.
Example of usage: extraction of heat energy from a cooling process

Gaseous Nitrogen (N_2)
Example of usage: for generation of counter pressure, avoidance of oxidation

Liquid Nitrogen (N_2)
Example of usage: injection into the bottle

Gaseous carbon dioxide (CO_2)
carbon dioxide, which is used for the carbonization of a product, is not considered within a standard ABMI TCO calculation.
Example of usage: for generation of counter pressure, pre-evacuation

Sterilizing agents

Peracetic acid (PAA)
The concentration has to be specified (default is 15%).
Example of usage: cap disinfection, bottle disinfection
Hydrogen Peroxide (H_2O_2)
The concentration has to be specified (default is 35%).
Example of usage: preform disinfection

Cleaning agents

Soda (NaOH)
example of usage: preparation of a CIP solution
The concentration has to be specified (default is 33%).
Nitric – acid (HNO_3)
Example of usage: preparation of a CIP solution
The concentration has to be specified (default is 53%).

The following references are used (DIN 1343, 1990) and (Council Directive 98/83/EC, 1998).

Maintenance Costs (OPEX)

For simplicity, only parts are considered by a standard TCO calculation.

Budgetary information:

The simplest way of considering maintenance is to use a percentage value per year of the investment. This value may change for different technologies (for example: aseptic lines, CSD lines etc.) and running time per year (one shift, three shifts).

A more detailed view is given by the following approach:

The standards DIN 31051 (DIN 31051, 2012) and DIN EN 13306 (DIN EN 13306, 2010) act as a basis for the definition of maintenance.

The standard (DIN 8743, 2014) is used for describing the operational model.

All numbers will be given as an average over the considered depreciation period for the full scope.

Spare parts and wear & tear parts are indicated separately. The model of preventive maintenance has to be documented as well (predetermined or condition based) based on the working time of the machine.

Spare Parts

As an effect of corrective maintenance spare part cost are to be considered. Spare parts are needed for immediate or deferred actions.

Wear & Tear Parts

Wear & Tear parts are needed for driving preventive maintenance. Two different models of action can be chosen:

Predetermined (periodical preventive) = ABMI Standard
Condition based

Within a standard TCO calculation the predetermined model shall be applied by all suppliers in order to get comparable results.

The costs in a single-period view (one year) are to be derived for the full scope of supply:

$$cost_{maintenance} = cost_{spare\ parts} + cost_{wear\&tear}^{periodical\ preventive}$$

Consumables

Consumables like lubricants, adhesives, cleaning agents will be not considered within a standard approach.

Labour

Labour for Maintenance or services like inspections up to full maintenance contracts are not considered by the maintenance cost figure in a standard TCO for simplicity and transparency.

When considered, labour or services have to be included in a way that no double-counting of costs occurs.
All particular contributions are to be indicated and described, since different models, services and content can make a comparison difficult.

Operational Model of the System

In this section all terms refer to DIN8743 (DIN 8743, 2014).

Shift Model and machine working time

Starting with the theoretical available time t_T per year (8h/shift * 3 shifts/day * 7days/week * 52weeks/year = 8736h) one has to subtract the idle time, in which the system cannot be scheduled for production, in order to calculate the machine working time t_W.

The machine working time is given as a product of the following quantities:

a = Hours per shift
b = Shifts per day
c = Working days per week
d = Working weeks per year

The machine working time t_W is the time in which the system is scheduled for production. It is given by:

$$t_W = a \cdot b \cdot c \cdot d$$

The idle time t_I is thus given by:

$$t_I = t_T - t_W$$

The idle time can consist of general holidays, plant overhaul or effects, which are not related to the system or machine.

Scheduled downtime and operating time

All contributions to the scheduled down time and operating time has to be indicated within a TCO calculation in order to have a transparent view on the operational system.

The scheduled downtime consists of:

a) Line / system overhaul in days per year
b) Maintenance in hours per week
c) Start-up in hours per sequence
d) Number of start-up sequences per week
e) Emptying time in hours per sequence
f) Number of emptying sequences per week
g) Product change-over (representative, average) in hours per sequence
h) Indication of Product change-over (description) has to be given.
i) Number of Product changes per week
j) Pack/Format change-over (representative, average) in hours per sequence
k) Indication of Pack/Format change-over (description) has to be given.
l) Number of pack/format change-over per week
m) Cleaning process (representative, average) in hours per sequence
n) Indication of cleaning process (description) has to be given
o) Number of intermediate cleaning processes per week
p) Intermediate cleaning process (representative, average) in hours per sequence
q) Indication of intermediate cleaning process (description)
r) Number of intermediate cleaning processes per week

The scheduled downtime is thus given by

$$t_D = t_{overhaul} + t_{maintenance} \cdot d +$$

$$+ t_{start-up} \cdot number_{start-up} \cdot d + t_{emptying} \cdot number_{emptying} \cdot d +$$

$$+ t_{product\ change} \cdot number_{product\ change} + t_{format\ change} \cdot number_{formatt\ change}$$

$$+ t_{cleaning} \cdot number_{cleaning} + t_{intermediate} \cdot number_{intermediate} \cdot$$

The operating time t_O is given by

$$t_O = t_W - t_D \ .$$

Loss time and quality time of the machine

The loss time is given by any unplanned disruption or shortage of the production, such as: slow speed, time equivalents to scrap, waiting time of the leading machine within the system, etc.

In order to establish the reason for the loss time double quantities are used.

The loss time t_L is given by:

$$t_L = t_{L,line\ related} + t_{L,not\ line\ related}$$

The quality time t_Q describes the time, in which the machine produces goods with the nominal speed conforming to all applied quality standards.

The quality time t_Q is given by

$$t_Q = t_O - t_L$$

Key performance Indicators

The following key performance indicators thus can be built:

Technical efficiency

$$E_S = \frac{t_Q}{t_Q + t_{L,line\ related}}$$

Efficiency

$$E_S = \frac{t_Q}{t_Q + t_L} = \frac{t_Q}{t_Q + t_{L,line\ related} + t_{L,not\ line\ related}}$$

Availability

$$A = \frac{t_O}{t_O + t_D}$$

Overall Equipment Effectiveness

$$OEE = \frac{t_Q}{t_W}$$

Loading factor

$$L = \frac{t_W}{t_T}$$

Amount of produced bottles

The number of produced goods is given by the quality output of the system q_Q and derived from the quality time t_Q and the nominal performance p_Q(line capacity).

$$q_Q = t_Q \cdot p_Q$$

Structure of a standard TCO calculation

The structure of a standard TCO calculation is important in order to have comparable documents, when comparing two or more systems.

As a consequence of the demand of transparency the input, the facts of the machinery and the report must contain a minimum set of information. In the following this minimum set is listed. This information must be indicated.

Input sheet – Customer data

- Interest rate [%]
- Depreciation method (end of period is ABMI standard)
- Depreciation time [a]
- Operator rates [€]
- Costs for each packaging material [€/1000b]
- Amount of refreshment (returnable lines only) [%]
- Prices for energy and media (in combination of the delivered unit) [€/unit]
- Machine working time [h]
- Maintenance in hours per week [h]
- Number of start-up sequences per week [1]
- Number of shut-down sequences per week [1]
- Description of the product change
- Number of product changes per week [1]
- Description of the format change
- Number of format changes per week [1]
- Number of main cleaning processes [1]
- Number of intermediate cleaning processes [1]
- Loss time per week (not line related [h]

Facts sheet – Supplier

- Detailed list of scope of supply
- Number of operators per shift [1]
- Scrap [%], inclusive description
- Description of packaging (SKU information)
- Consumption of energy and media during production [unit/h]
- Description of cleaning cycle
- Consumption of energy for a cleaning cycle [unit/cycle]
- Description of intermediate cleaning cycle
- Consumption of energy and media for an intermediated cleaning cycle [unit/cycle]

- Costs for spare parts per period [€/a]
- Costs for Wear & tear parts per period [€/a]
- Description of type of maintenance model
  (predetermined / periodical preventive is ABMI standard)
- Nominal performance of the line (line capacity [b/h]
- Line or system overhaul per year [d]
- Startup duration [h]
- Shutdown duration [h]
- Duration of a product change [h]
- Duration of a format change [h]
- Loss time line related (alternative technical efficiency)

Report sheet – Result of the calculation

- Cost of investment [€/a]
- Cost of labour [€/a]
- Cost of energy and media [€/a]
- Cost of packaging material [€/a]
- Cost of maintenance [€/a]
- Idle time [h]
- Operating time [h]
- Scheduled down time [h]
- Loss time [h] (line related and not line related)
- Quality time [h]
- Technical efficiency [%]
- Efficiency [%]
- Availability [%]
- Overall Equipment Effectiveness [%]
- Loading factor [%]
- Quality output per year [b]
- Cost of investment [€/1000b]
- Cost of labour [€/1000b]
- Cost of energy and media [€/1000b]
- Cost of packaging material [€/1000b]
- Cost of maintenance [€/1000b]

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