Calculation Schema

Setting up the calculation schema in beas

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1. INTRODUCTION

According to experts, product costing is used to value the internal cost of materials and production for profitability and management accounting. Many people avoid it due to complexity. This is why this tutorial will help to understand the importance and practicality to include it in the business.

Throughout a given period, actual expenses are recorded in SAP as purchases are made, payroll is processed, bills are paid, and production occurs. At month-end, work in progress, variance, and settlement are calculated. The variance between actual costs and standard costs can result in changes to product costing for the next period or year. Costs are settled, and the posting period is closed at the end of the month.

Product cost planning is a concept where the business can plan costs for materials or finished goods without references to orders and set prices for materials and other cost accounting objects.

Analyzing product costs helps provide answers to questions such as:

- What is the value added of a particular step in the production process?
- What proportion of the value added can be attributed to a particular organization unit?
- What are the material, production, and overhead costs?
- How can production efficiency be improved?
- Can the product be sold at a competitive price?

Beas offers the *Pre-calculation* functionality where product cost is planned. This function allows you to simulate the planned cost based on the information from the item master data (BOM and Routing). Also, this function allows you to check the structure of an item based on its cost structure.

This guide will show you how to set up the calculation schema, understanding the main fields in the master data used for product cost planning.

2. PROCESS

In order to understand the calculation schema and its importance, we must first talk about manufacturing costs.

Manufacturing costs, also known as "Cost of Production" is the sum of the costs involved in the process of making an item. Manufacturing costs include a variety of expenses including labor, raw materials, consumable manufacturing supplies and general overhead.
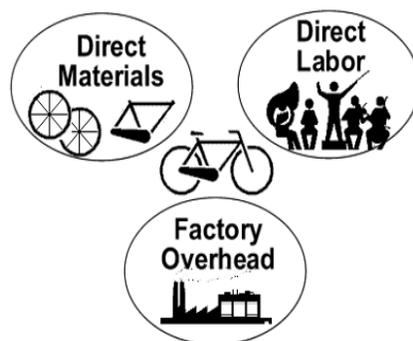
In production, there are direct costs and indirect costs. A direct cost is a price that can be completely attributed to the production of specific goods or services. Some costs, such as depreciation or administrative expenses, are more difficult to assign to a specific product and therefore, are considered as indirect costs.

> For example, direct costs for manufacturing an automobile are materials such as the plastic and metal materials used, as well as the labor required, to produce the finished product. Indirect costs include overhead such as rent, administrative salaries or utility expenses.

A direct cost can be considered a **variable cost** if it is inconsistent, i.e. the amounts often change.

It is important also to understand the concepts of marginal and full cost. When a resource rate is defined, a **marginal** and **full** cost rate have to be provided. In addition, several parameters related to cost could be defined as marginal and full cost.

Marginal cost refers to **variable cost**, it is the change in total cost that comes from making or producing one additional item.

Fixed cost is the cost that does not vary with output. For example, costs that include rents, insurance, depreciation and set-up costs.

Full cost is the sum of marginal cost and fixed cost, meaning that it is the marginal base and other costs included.

> Example: If there is a marginal cost of 60€ and a full cost of 100€, it means that:
>
> Marginal cost rate = 60€
>
> Fixed cost rate = 40€ (Difference between full cost minus marginal cost)
>
> **Full cost = Marginal cost + Fixed cost = 100€**

All calculation cost functions can be displayed as marginal cost or full cost view. Even, for accounting purposes, there can be a distinction between marginal cost and fixed costs in different accounts or in some cases the full cost only is used.

For product cost analysis, beas uses the Calculation Schema which contains all the costs and surcharges involved in manufacturing. This is the source to estimate costs and prices. Beas allows you to set by default a specific calculation schema for pre-calculation. For more information about this setting, please go to the Configuration Wizard.

PATH: Administration > Setup > Pre-calculation > Calculation Schema
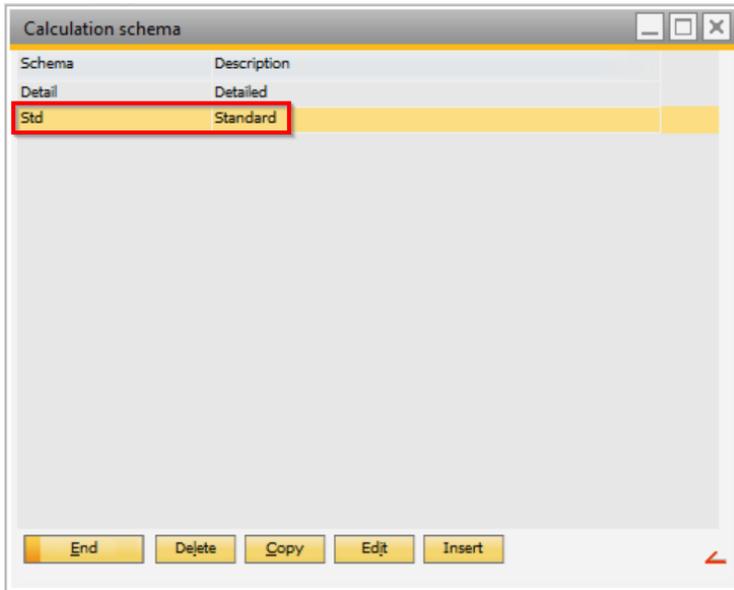
Additionally, this schema can be modified in order to add other costs related to the item, or create a new schema based on the standard.

Delete: Button used to delete a calculation schema from beas.

Copy: Button used to copy the selected calculation schema and then create a new one by clicking on *Insert* button.

Edit: Button used to edit the selected calculation schema. Also, it can be edited by double clicking a specific calculation schema.

Insert: Button used to create a new calculation schema. It only works when the user has previously selected an existing calculation schema and has clicked the *Copy* button.

2.1. Master Data Tab

By double clicking on *Standard*, a new screen will be displayed.
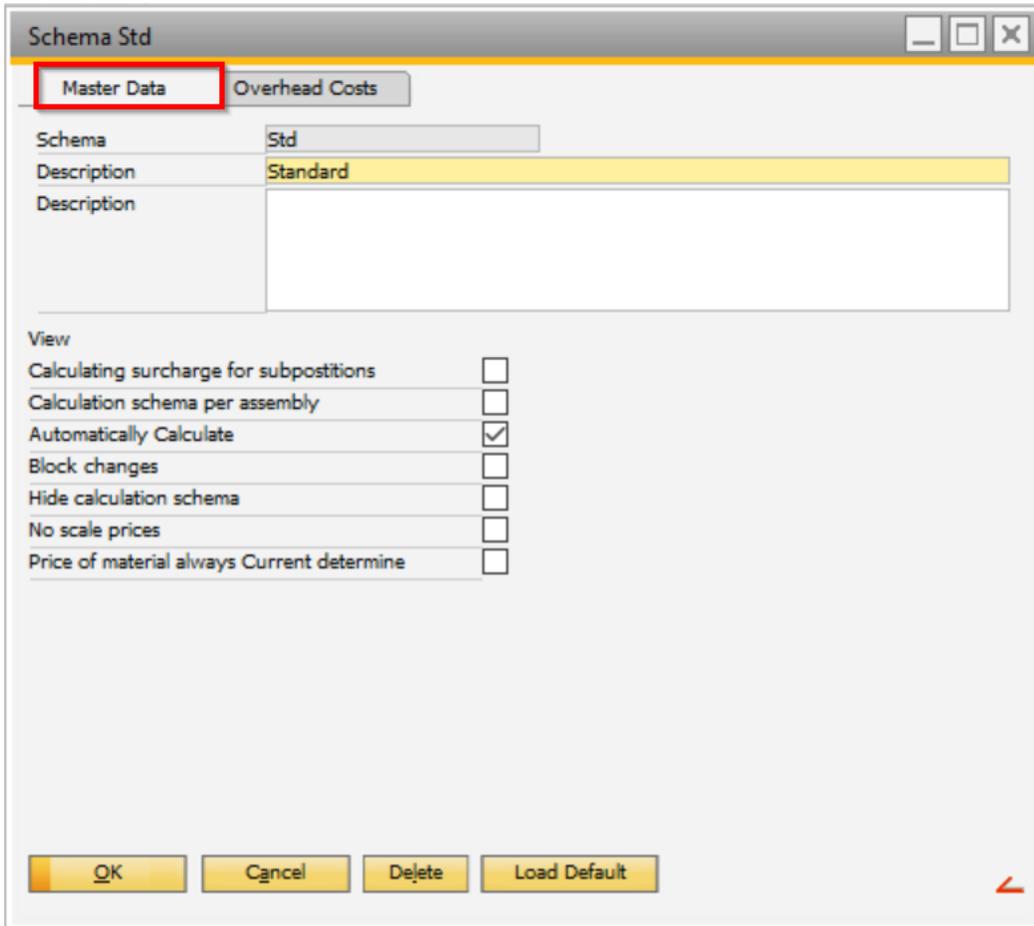
In the *Master Data* tab, all the information related to the definition is managed.

Schema: Field used to define a name for the calculation schema.

Description: Field used to include a description for the calculation schema.

The next field will only concern the calculation view:

Automatically Calculate: Field used to set the calculation to automatically run every time a change is made.

IMPORTANT: It will take much longer for big calculations. If it happens, this option should be disabled.

A calculation can be executed manually by going directly to the pre-calculation functionality. Also, it can be switched on and off to automatically execute in the pre-calculation functionality. This will be detailed in the upcoming section.

2.2. Overhead Costs Tab

The calculation schema is structured in objects and surcharges and is called **Overhead Costs**.

The most important cost objects are: the **direct material cost** and the **labor and machine cost** (L+M cost or operating cost). Both are calculated based on the information from the item structure master data: bill of material and routing, respectively.

To estimate the **direct material cost**, beas will multiply the quantity for each material from the bill of material, per the material price defined by the user. This price can have a default value set, but for product cost analysis purposes, beas allows you to use a different one in the calculation functionalities. For more information about this setting, please go to the Configuration Wizard.

To estimate the **labor and machine cost**, beas will multiply the time needed for production from the routing, setup and/or time per unit, with the cost defined in the resource where the activity will be performed.

| Direct Material Cost | (Quantity **X** Material Price) |
| Labor & Machine Cost | (Time **X** Resource Cost) |

There are additional fees, depending on the business and the type of industries, called **Surcharges**. To get to the sales price, beas takes into account several surcharges that involve the item's distribution, sales and administration.

These can be added as:

- *Percentage*. It can be a percentage of other cost, for example 3% or the L+M cost.
- *Fixed cost by lot size*. A fixed price for all produced units in the same lot. For example, 100€. This will apply 100€. Even if we produce 1, 500 or 1000 units this surcharge never grows.
- *Fixed cost by unit*. A fixed cost per each unit, the total of this surcharge will vary according to the number of units we produce.

Beas sums all costs related to material and production to define the **Cost of Goods Sold**. The Cost of Goods Sold (COGS) are the direct costs attributable to the production of the goods sold by a company. This amount includes the cost of the materials used in creating the product along with the direct labor costs used to produce the item.

To calculate sales price, the calculation schema takes cost of sales, profit margin and discounts, when applicable. In order to get to the sales price, the **cost of sales** is first calculated. Cost of sales is the total expenditure incurred by a company to produce, store and sell a particular product or service. This includes all fixed and variable costs, from material costs and L + M costs, involved in production. In other words, it is the **cost of goods sold** plus costs related to the sales process, such as administrative, marketing or salesforce expenses.

The **net sales price** is obtained after applying a profit margin to the cost of sales. And last but not least, in case there are discounts to be included in the price, those must be applied after the net sales price to get the **large sales price**. This will be taken into account if a gross sales price is calculated, which is the price used in the sales order, and then a discount is applied. The total of the sales order is the large sales price.

All these objects are included in the standard calculation schema, as we said before. Depending on the business needs, more surcharges can be added, edited or deleted. The cost structure of the standard cost schema is distributed as:

Schema Std

Tabs: Master Data | Overhead Costs

Type	Description	Material	Production	Manufacturing	Default
	Travel Expenses	☑	☐	☐	☐
	Material Costs by Bill of Materials	☑	☐	☐	☑
	External processing	☑	☐	☐	☑
	Direct Material Costs	☑	☐	☐	☑
	Indirect Material Costs	☑	☐	☐	☑
	L+M costs	☐	☑	☐	☑
	Indirect Production Costs	☐	☑	☐	☑
	Costs of goods sold	☐	☑	☐	☑
	Shipping cost	☐	☐	☑	☑
	Sales and Administration	☐	☐	☑	☑
	Cost of Sales	☐	☐	☑	☑
	Profit Margin	☐	☐	☑	☑
	Net Sales Price	☐	☐	☑	☑
	Discount	☐	☐	☑	☑
	large sales price	☐	☐	☑	☑
	Sales Price	☐	☐	☑	☑
	Profit Margin	☐	☐	☑	☑
	Profit margin %	☐	☐	☑	☑
	Profit margin by hour	☐	☐	☑	☑

Annotations: *Needed to calculate Cost Of Goods Sold* (applies to Indirect Material Costs through Costs of goods sold); *Needed to calculate Sales Price* (applies to Cost of Sales through large sales price).

Buttons: Edit | End | New

The standard calculation schema has by default specific colors to differentiate the objects. Main objects and subtotals are displayed in light red, all surcharges in light blue, and sales price and revenue in dark blue.

The objects and surcharges can be edited directly on the calculation schema by double clicking the object or by selecting it and clicking on *Edit*. Also, new objects can be added depending on the business needs by clicking on *New*.

The calculation schema is displayed like a financial statement where everything is grouped according to categories, based on the surcharge assignment of the calculation object. The sequence can be changed using the drag & drop functionality, which means to drag one object with the mouse and then drop it in the screen in the specific place needed.

Some of these fields will only be available depending on the settings in specific fields.

> **IMPORTANT:** The calculation schema will always be copied from the set up at a post-calculation. This means that changes made in the pre-calculation will not be considered in the post-calculation.

Description: Field used to include a description for the object.

Type: Field used to determine the object type whether it is a surcharge, subtotal, sales price or revenue.

Surcharge to: Field used to specify the subtotal object where the selected object will be charged.

Reference: Field used to make a reference of the current object to the costs to be used. Depending on the reference given to the object, new fields will appear.

> *No* – This option will allow manual input of surcharges as amounts and / or percentages at marginal and full costs. The following fields will appear:

>> *Percentage Surcharge (marginal & full cost):* Field used to determine the percentage value of the surcharge at marginal and full cost, for example 3% or the L+M cost.

Refers to result: Field used to determine whether the percentage value is related to the previous sum or to the reference sum (A) or, to the reference sum plus addition to be calculated (B).

For example, if the field is disabled, reference is A (100€) first sum 100€ + 10% of A (10€) = 110

For example, if the field is enabled, reference is B (110€) second sum 99€ + 10% of B (11€) = 110

> Another good example is using the discount object from the calculation schema.
>
> If <u>disabled</u>, the discount is calculated based on the net sales price and then added to this, in order to calculate the gross sales price.
>
> If <u>enabled</u>, due to the type of the gross sales price, which is the sum total, this price is an automatically calculated object, so the system will calculate the discount based on the gross sales price and show it as an amount to be added to the net sales price in order to obtain the gross sales price.

Surcharge per Lot Size (marginal & full cost): Field used to determine the fixed value of the surcharge added per lot size.

In <u>pre-calculation</u>, this refers to the lot size of the item to be calculated. If the item does not have a lot size, the calculation lot size applies. For example, if the lot size is 10 and the surcharge lot size is 5€. If the user changes the view to 100 pieces, then it will display 50€ for the 100 pieces.

In <u>production</u>, the lot size depends on the valuation method:

- At planned cost, it is always the planned quantity
- At actual costs at partial posting, it is the planned quantity
- At actual cost and final posting, it is the actual quantity

At planned cost, the surcharge is broken down "per piece" independent of how much really had been posted.

> <u>Example</u>: There is a planned production of 10 pieces, a defined surcharge of 50€ per production quantity:
>
> o   Partial posting 1 piece = (50 / 10) * 1 = 5€
> o   Partial posting 2 pieces = (50 / 10) * 2 = 10€
> o   Partial posting 1 piece = (50 / 10) * 1 = 5€
>
> In sum = 20€

Partial posting at actual costs is calculated as follows:

Surcharge = Production Quantity * Posting Quantity

> Example: There is a planned production of 10 pieces, and a defined surcharge of 50€ per production quantity:
>
> o   Partial posting 5 pieces = (50 / 10) * 5 = 25€
> o   Partial posting 6 pieces = (50 / 10) * 6 = 25€, because total sum must not exceed 50€
> o   Partial posting 2 pieces = 0€, because total sum must not exceed 50€

If the planned quantity is not reached, the remainder are added at final valuation.

Example: There is a planned production of 10 pieces, and a defined surcharge of 50€ per production quantity:

- o Partial posting 5 pieces = 50:10*5 = 25€
- o Partial posting 2 pieces and order is closed, valued at 25€

On assembly valuation, if an account is defined in the calculation object, the determined price is transferred. Post-calculation works with the sum of previous postings plus the current posting. From second partial posting, the transferred value would be too high. That is why the value of the quantity to be posted is determined, but for the sum the values from previously posted and to be posted is used.

Example: There is a planned production of 10 pieces, and defined surcharge of 50€ per production quantity:

- o First partial posting 5 pieces = 50:10*5 = 25€

For determination of total sum:

- o Second partial posting 1 piece = 50:10*6 = 30€

For determination of journal entry:

- o Second partial posting 1 piece = 50:10*1 = 5€

In post-calculation, 5€ is displayed, but in the background 30€ is the total.

Surcharge per Unit (marginal & full cost): Field used to define the surcharge per unit.

In <u>pre-calculation</u>, the lot size is given in pre-calculation.

In production the post-calculation is as follows:

- Planned value is the quantity as per manufacturing position quantity in warehouse units
- Actual value is the total posted quantity

The assembly valuation will be calculated as follows:

- Partial posting (Calculation object): quantity to be posted
- Partial posting (Subtotal): already posted + quantity to be posted
- Final posting (Calculation object): quantity to be posted
- Final posting (Total): already posted + quantity to be posted

IMPORTANT: in valuation of planned costs, only the posted quantity is valued, not the planned quantity. At the final valuation, upon closing the work order, the total planned quantity is taken as reference

Example: The surcharge per unit is 5€

- o Partial posting 2 pieces = 5 * 2 = 10€ an object, 10€ in sum
- o Partial posting 3 pieces = 5 * 3 = 15€ an object, 25€ in sum (10€ + 15€)

An account can be stored in the calculation object, and because of this it is mandatory to calculate costs for posting.

Example: calculation at post-calculation price referring to the previous example.

Cost are booked to the given account:

- o Partial posting 2 pieces = 5 * 2 = 10€
- o Partial posting 3 pieces = 5 * 3 = 15€

Calculation of L+M costs:

- o Partial posting 2 pieces = 5 * 2 = 10€
- o Partial posting 3 pieces = 5 * 5 = 25€
  Less the already posted 10€ = 15€

Even if the calculation type is different, the result is the same.

Percent depends on: Field used to define the reference of the percentage value to a cost. The user can select the pre-calculated calculation schema sums where the percentage will apply.

With the "Automatic" option the surcharge applies to the first preceding sum it finds in the calculation schema.

The other options are self-explanatory:

- Price of material by bill of material

- L + M costs (work sequence)

- Cost of external operation

- Material + Cost of external operation

Marginal Costs to Fixed Costs: Field used to allow beas to add to marginal costs, the fixed cost surcharge determined in calculation of marginal costs.

Cost Element – This option can be used to perform an analysis for setup, processing, tool costs, wage cost). The sum of the cost element is defined here. The following fields will appear:

Cost Element: Field used to determine which cost element sum should be considered. This field is also available when *Cost Element Surcharge* option is selected. For more information about cost element, please refer to *Cost Element* tutorial.

Display Time Requirement: Field used to allow beas to display the planned time requirement for this cost element in the calculation (visually only).

Cost Element Surcharge – This option can be used to define the surcharge sum of the cost elements. The following fields will appear:

Cost Element Group: Field used to determine which cost element group sum should be considered. This field is also available when *Cost Element Option* is selected. For more information about cost element group, please refer to *Cost Element* tutorial.

Script – This option can be used to define the surcharge calculation from a script. For more information about script, please refer to *Advanced Calculation Schema* tutorial. The following fields will appear:

Script: Field used to specify the script to be used for surcharge calculation. For more information about *beas Script* tutorial.

To: Field used refers to the amount to be posted:

Accumulated Costs – This option is used when the actual accumulated cost is posted (actual value)

Planned costs – This option is used when the planned costs as per pre-calculation are posted

Planned for Partial Delivery, Other Accumulated – This option is used when for partial delivery, the planned value (target value) is posted, otherwise the accumulated costs (actual value) is posted. This can only be used if posting of overheads "For assembly receipt" is active.

Valuation in Pre-calculation: Field used to value the object in the pre-calculation. If disabled, the object selected is displayed in the pre-calculation screen but not valued.

Post-calculation: Field used to value the object in the post-calculation. If disabled, the object selected is NOT displayed in the pre-calculation screen and also not valued.

3.   FIELD GUIDE

For product cost analysis, beas uses the Calculation Schema which contains all the costs and surcharges involved in manufacturing. This is the source to estimate costs and prices. Beas allows you to set by default a specific calculation schema for pre-calculation. For more information about this setting, please go to the Configuration Wizard.

PATH: Administration > Setup > Pre-calculation > Calculation Schema

Delete: Button used to delete a calculation schema from beas.

Copy: Button used to copy the selected calculation schema and then create a new one by clicking on *Insert* button.

Edit: Button used to edit the selected calculation schema. Also, it can be edited by double clicking on a specific calculation schema.

Insert: Button used to create a new calculation schema. It only works when the user has previously selected an existing calculation schema and has clicked on the *Copy* button.

3.1. Master Data Tab

By double clicking on *Standard*, a new screen will be displayed.

In the *Master Data* tab, all the information related to the definition is managed.

Schema: Field used to define a name for the calculation schema.

Description: Field used to include a description for the calculation schema.

Description: Field used to include a longer description for the calculation schema.

The next following fields will only concern the calculation view:

Calculating Surcharges for Sub-positions: Field to let beas calculate surcharges not only in the main assembly, but also for all sub-assemblies. The results of the sub-assembly can be seen by double clicking on the sub-assembly and selecting the *Scale Price* or *Result* tabs. Another way is by defining the enlarged view in tab *Display* in the calculation template and changing the view in the calculation via tab *View*, button *Extended View*.

IMPORTANT: It will take much longer for big calculations. If no calculation is required per sub-assembly, this option should be disabled.

Calculating Schema per Assembly: Field used to enable separate editing for each sub-assembly. This option is only active if *Calculation Surcharges for Sub-position* is enabled. This is done by double clicking on the assembly, in the tab *Schema*.

Automatically Calculate: Field used to set to automatic the calculation run each time a change is made. For more information, please refer to the field *Automatically Calculate* in the Process section of this document.

Block Changes: Field used to block the calculation of making changes like including new objects or deleting existing ones. This is important when working with the extended display.

Hide Calculation Schema: Field used to hide the calculation schema in the pre-calculation result screen.

No scale Prices: Field used to assign only a sales price, which applies for all lot sizes. In this case, all other sales price fields are locked. If the sales price is changed for scale 1, this applies for all other scales.

IMPORTANT: This relates to a specific area in the pre-calculation definition screen:
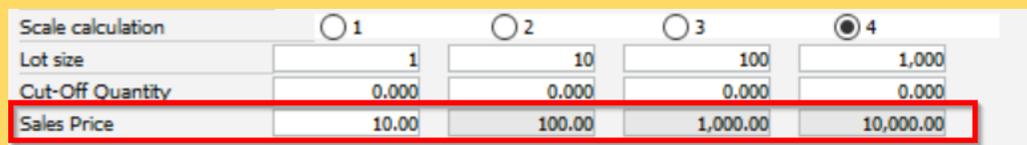
Scale calculation	○ 1	○ 2	○ 3	◉ 4
Lot size	1	10	100	1,000
Cut-Off Quantity	0.000	0.000	0.000	0.000
Sales Price	10.00	100.00	1,000.00	10,000.00

This will affect the sale prices fields that, if active, are not editable.

These fields are available in the pre-calculation definition screen. For more information, please refer to the *Pre-calculation* tutorial.

Always Determine Current Material Prices: Field used to determine a new material price at the moment of the calculation execution. If it is checked, the material price cannot be changed in pre-calculation, as it is always determined automatically.

IMPORTANT: It will take much longer for big calculations. This option is disabled by default.

If disabled, the price entered in material position is used. The price is determined at the moment of execution. This option is considered also for pricing of external operations.

IMPORTANT: This option is not taken into account at batch pre-calculation.

3.2. Overhead Costs Tab

The calculation schema is structured in objects and surcharges and is called **Overhead Costs**.

Schema Std

	Master Data	Overhead Costs				

Type	Description	Material	Production	Manufacturing	Default
≡	Travel Expenses	☑	☐	☐	☐
≡	Material Costs by Bill of Materials	☑	☐	☐	☑
≡	External processing	☑	☐	☐	☑
≡	Direct Material Costs	☑	☐	☐	☑
≡	Indirect Material Costs	☑	☐	☐	☑
≡	L+M costs	☐	☑	☐	☑
≡	Indirect Production Costs	☐	☑	☐	☑
≡	Costs of goods sold	☐	☑	☐	☑
≡	Shipping cost	☐	☐	☑	☑
≡	Sales and Administration	☐	☐	☑	☑
≡	Cost of Sales	☐	☐	☑	☑
≡	Profit Margin	☐	☐	☑	☑
≡	Net Sales Price	☐	☐	☑	☑
≡	Discount	☐	☐	☑	☑
≡	large sales price	☐	☐	☑	☑
≡	Sales Price	☐	☐	☑	☑
≡	Profit Margin	☐	☐	☑	☑
≡	Profit margin %	☐	☐	☑	☑
≡	Profit margin by hour	☐	☐	☑	☑

Edit	End	New

To display the detailed information of each object, click on *Edit* button or double click on the object. A new screen will be displayed.

Some of these fields will only be available depending on the settings of specific fields.

Description: Field used to include a description of the object.

Color: Field used to assign a color for the object. It is defined by default: light blue (RGB 10785280) for surcharges, red (RGB 4793544) for subtotals and dark blue (RGB 11941650) for sales price and revenue.

Default: Field used to set this object as visible and to be taken into account in the calculation process.

Picture: Field used to assign an image that will represent it in all lists.

Type: Field used to determine the object type whether it is a surcharge, subtotal, sales price or revenue.

Surcharge to: Field used to specify the subtotal object where the selected object will be charged.

Reference: Field used to make a reference of the current object to the costs to be used. Depending on the reference given to the object, new fields will appear. For more information, please refer to the field *Reference* in the Process section of this document.

Save Value As: Field used to specify the location where the value will be saved. The values saved are definable by the user. There are two fixed fields: material surcharged, and production surcharged. Four further fields can be defined in the Configuration Wizard.

The following fields are to assign an account of the costs for booking production:

Marginal Cost: Field used to specify the account to be credited. This field is only valid if an account is stored and a specific parameter is set in the Configuration Wizard.

Fixed Costs: Field used to specify the account, from the fixed costs, to be credited.

Full Cost: Field used to specify the account, from the full costs, to be credited.

To: Field used to refer to the amount to be posted. For more information, please refer to the field *To* in the Process section of this document.

WIP Inventory Account: Field used to specify a WIP account where postings are made. This is only visible in SAP settings when WIP account is active.

Valuation in Pre-calculation: Field used to value the object in pre-calculation. For more information, please refer to the field *Pre-calculation* in the Process section of this document.

Post-calculation: Field used to value the object in post-calculation. For more information, please refer to the field *Post-calculation* in the Process section of this document.

4. CONFIGURATION WIZARD

In this section, all parameters and settings from the configuration wizard that impact fields in the Calculation Schema setup are listed.

4.1. Master Data Tab

Calculation Schema:

Configuration Wizard: Here, a specific calculation schema can be set as default for pre-calculation runs.

PATH: Calculation > Calculation Schema

If there is nothing assigned here, the second place for beas to check is the item master data, *Calculation* tab, in the *Schema* field.

Pricing:

Configuration Wizard: Here, there are many parameters used for pricing in the calculation functionalities.

PATH: Calculation > Pre-calculation > Pricing
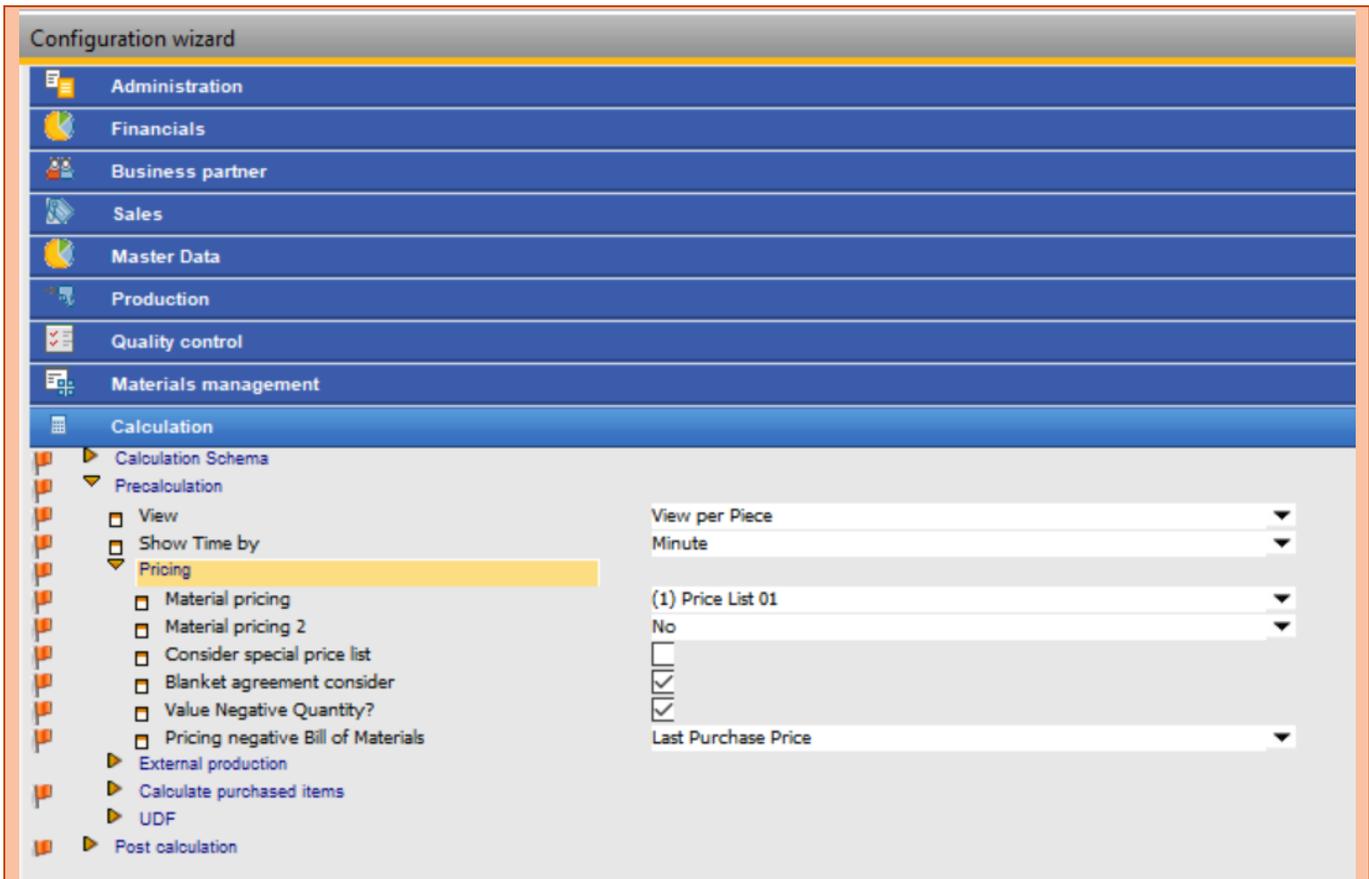
Material Pricing: Field used to specify the pricing of the materials when valuating assemblies.

Material Pricing 2: Field used to specify the pricing of the materials when valuating assemblies, in case there is no value for the field *Material Pricing*.

Consider Special Price List: Field used to consider the special price defined for a preferred vendor when valuating assemblies. This has higher priority than *Material Pricing* option and relates only to pre-calculation and batch calculation.

Blanket Agreement Consider: Field used to determine whether a blanket agreement will be considered. If enabled, a pricing blanket agreement of type "Specific" are considered. If disabled, only default pricing will be used.

4.2. Overhead Cost Tab

Value Save As:

Configuration Wizard: Freely definable result value for pre-calculation and costing analysis. Assigned in the calculation objects.

PATH: Calculation > Calculation Schema
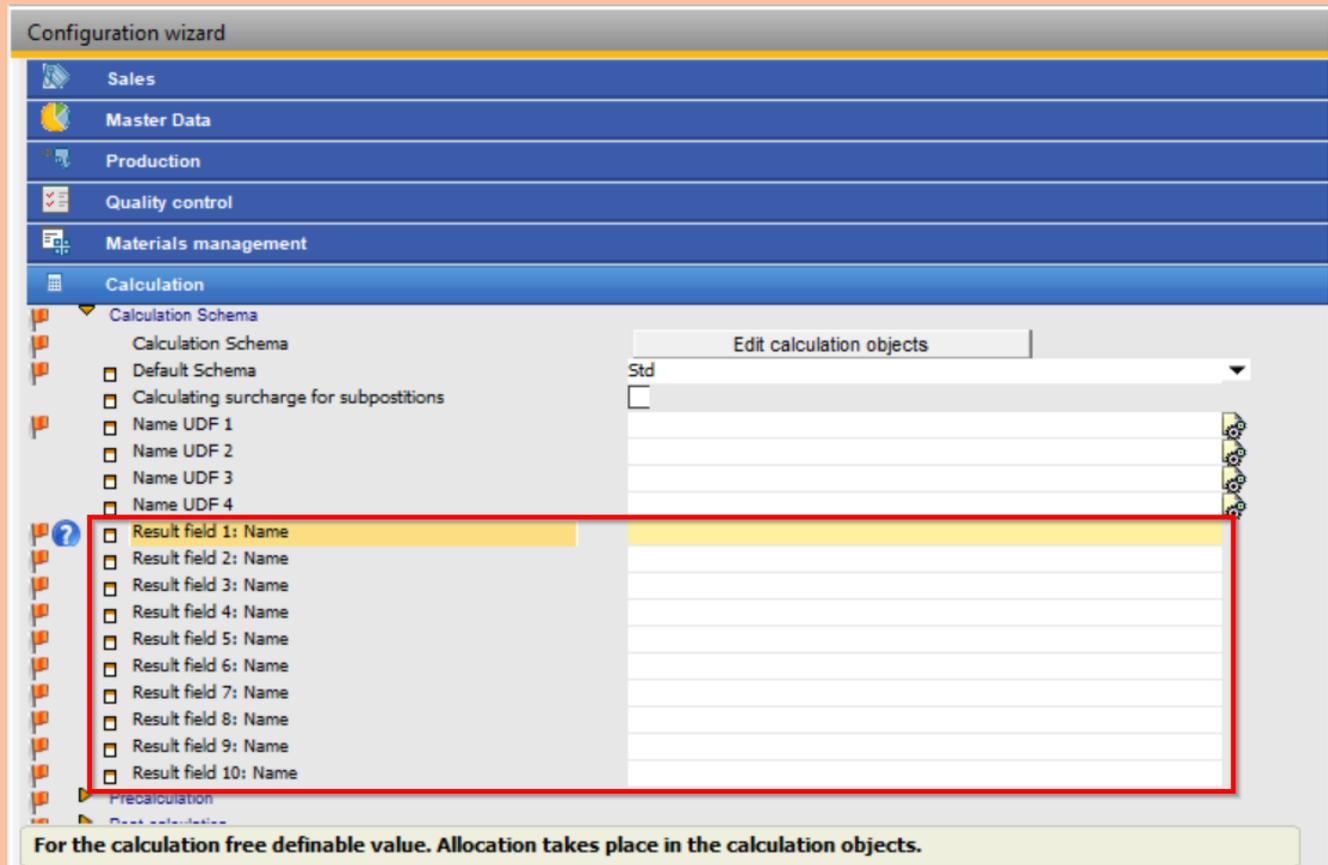
Example: The tool costs are to be separately accounted for in the results list of the batch pre-calculation / batch costs analysis.

1. Entry in results field 1: "Cost of Tools"
2. Creation of the cost element: Tools
3. Assignment of the tool costs in this cost element (Tool management)
4. Calculation template: New overall cost object type "Cost Element" select cost element "Tool" and select "Cost of Tools" in the *Value Save As* field.

All tool costs are now shown in the "Cost of Tools" column in the pre-calculation view screen.

Marginal Cost:

Configuration Wizard: If an account is stored and the value is not set to "None Booking" and continual inventory maintenance is activated, the accounts specified here are credited and the WIP account debited at the time indicated there.

PATH: Production > Valuation and booking of assembly > Account Setting > Account the costs on WIP depending on the scheme