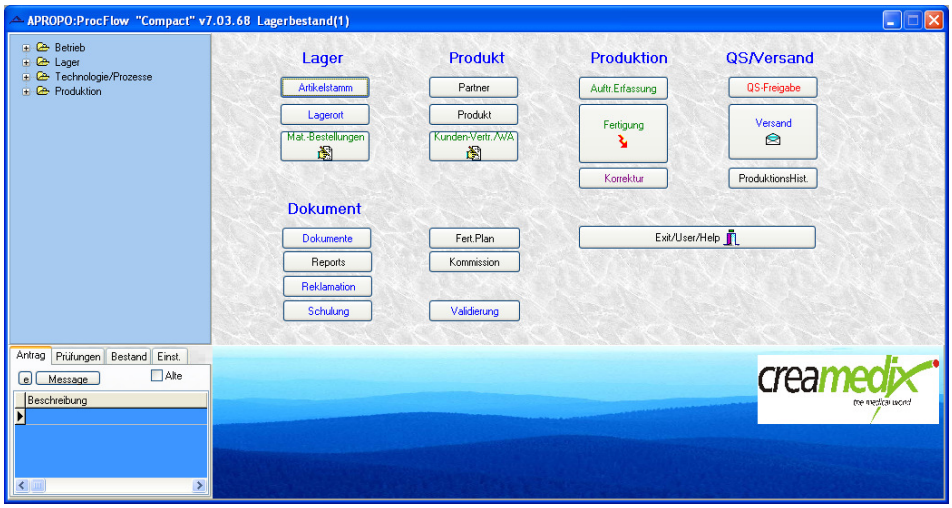
APROPO

Short Schema of Production Costs Planning



AproSoft GmbH

CONTENT

1 Introduction

The product price calculation of ARPOPO assumes the knowledge of

- technology of the product (i.e.chain of manufacturing processes)
- process times and setup times
- operator hourly costs for each processes
- number operators required
- Setup times and number of operators for setup activities
- Machine costs incl. amortization hourly for each process

Furthermore

- Material quantities and prices used in manufacturing (incl. energy, supply, tools)
- Overhead costs
- Planned profit
- Sales, distribution and transport costs

Scalability of the products

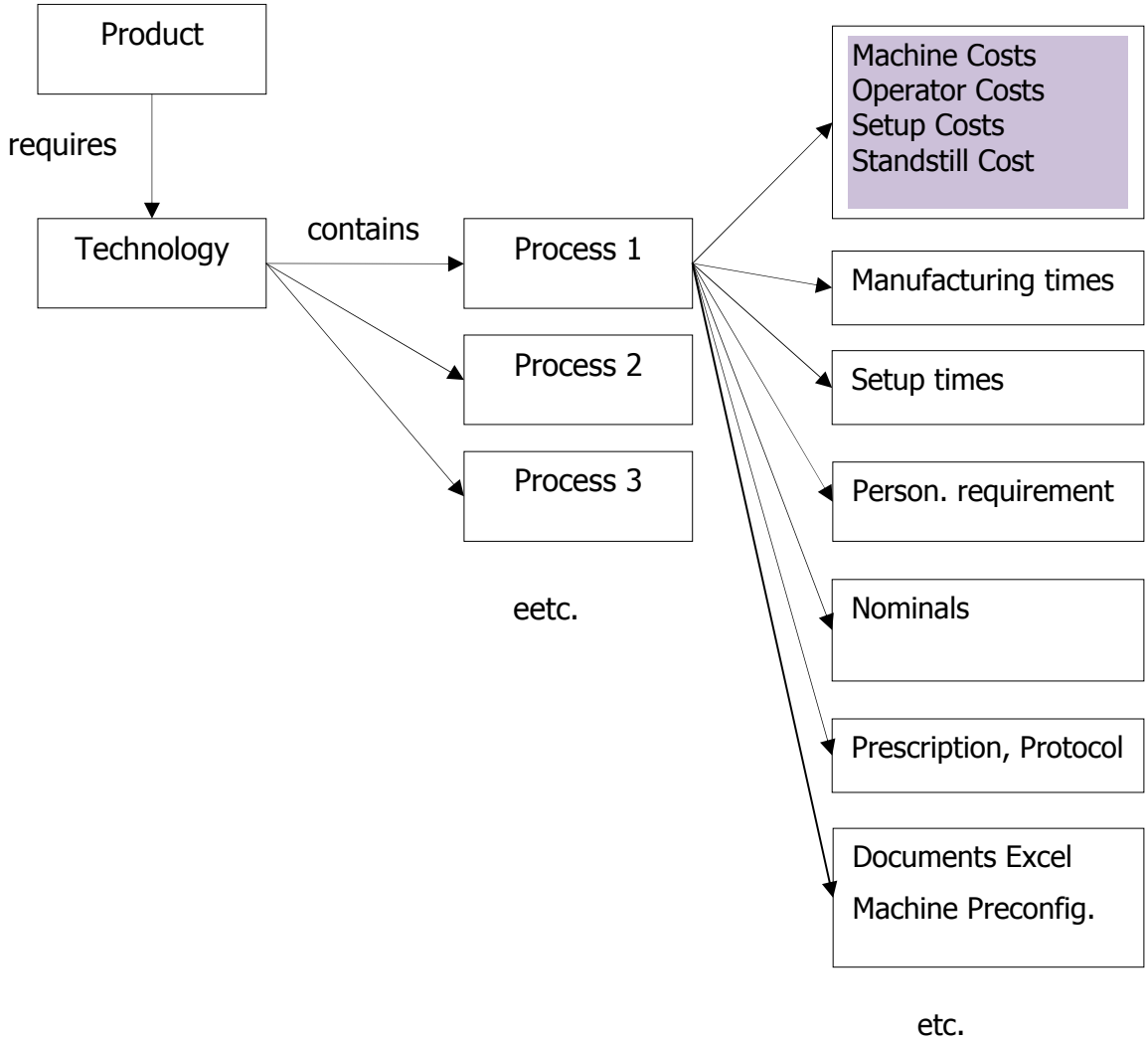
- Material demand, process parameters and process times can be expressed as variables (nominals)
- Prices can be expressed by names (tariffs)
- Configuration of product classes - only the differing products features are to be configured

Independence of technologies and processes mean:

- Technologies can be used and configured for different product classes
- Processes can be used for different technolgies

2 Technology and Product Price Schema of APROPO

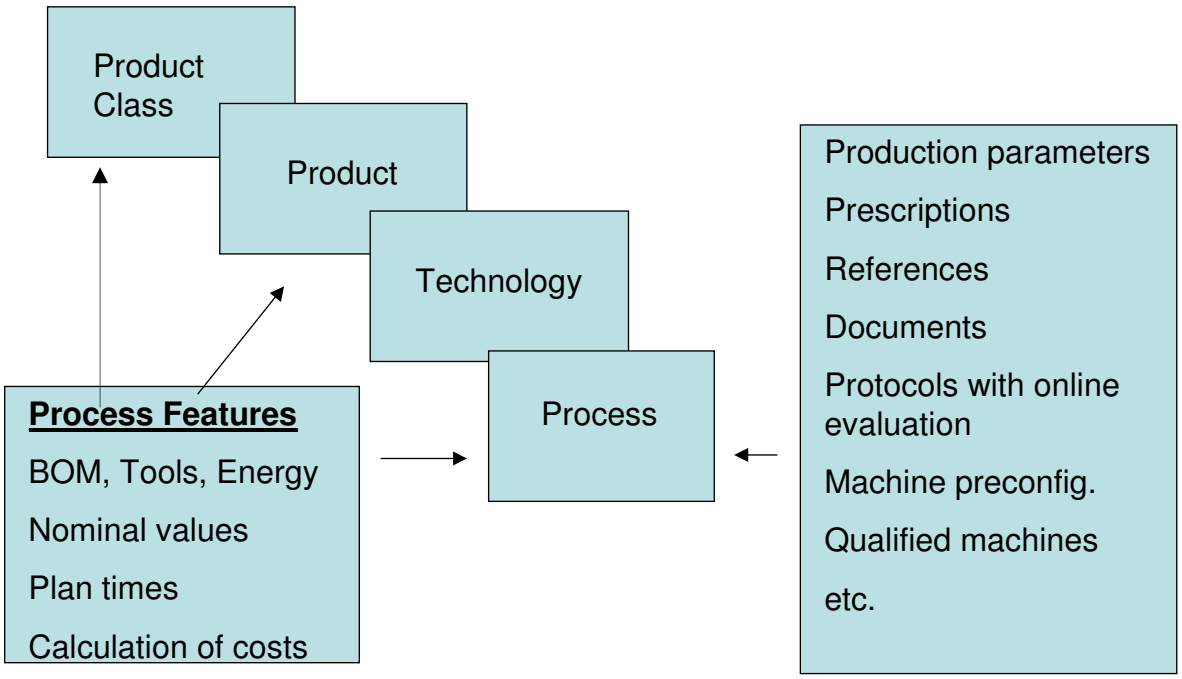
A technology – sometimes called work plan or routing - is assigned to each product. The technology contains several manufacturing processes required for production. The technology can be configured independently of the product. The master data level is as follows:



The process is the main important category for production: it contains all production information from BOM till machine preconfiguration files.

The **technology** (i.e. the processes) can be configured product-dependent:

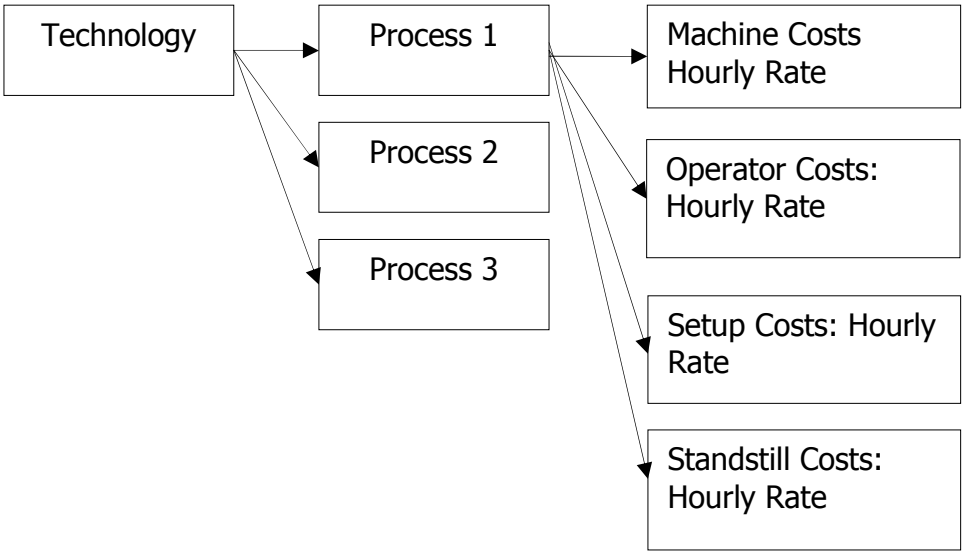
1. Material demand (BOM), operation and setup times and personnel requirements are assigned simultaneously to products (or product classes) and processes (for more information see p. 22)
2. Several products with the same technology and similar production features build a common **product class**. The configuration should be concentrated on the product class: The products themselves only get these features which differ from the features of the product class.
3. Material demand quantities, production times, personnel requirements , QC-criteria, process parameters and internal process calculation elements can be hold in variables called nominals. The products of the same product class usually differ only by some nominal values.



3 Financial Concept

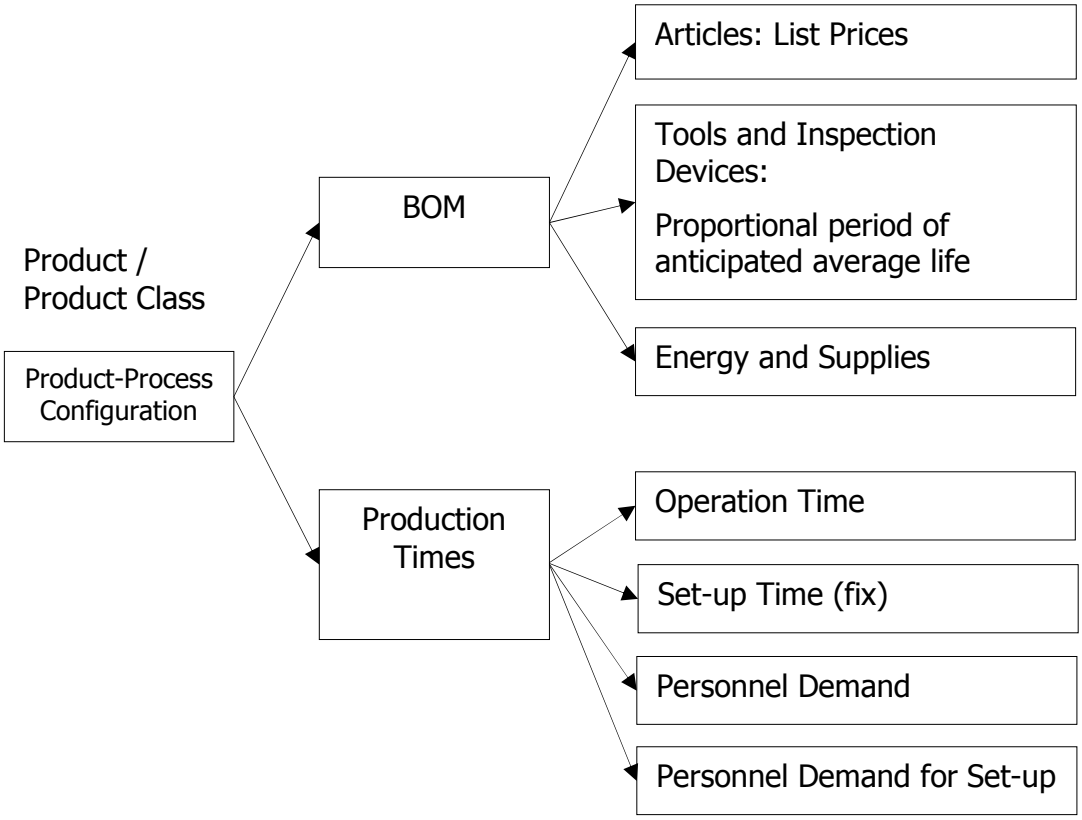
3.1 Technology

The hourly rates for each process are assigned to the 'process carriers': the machines or workplaces. All these cost factors can be overwritten in dependency of the product/ product class.



3.2 Product dependent Financials

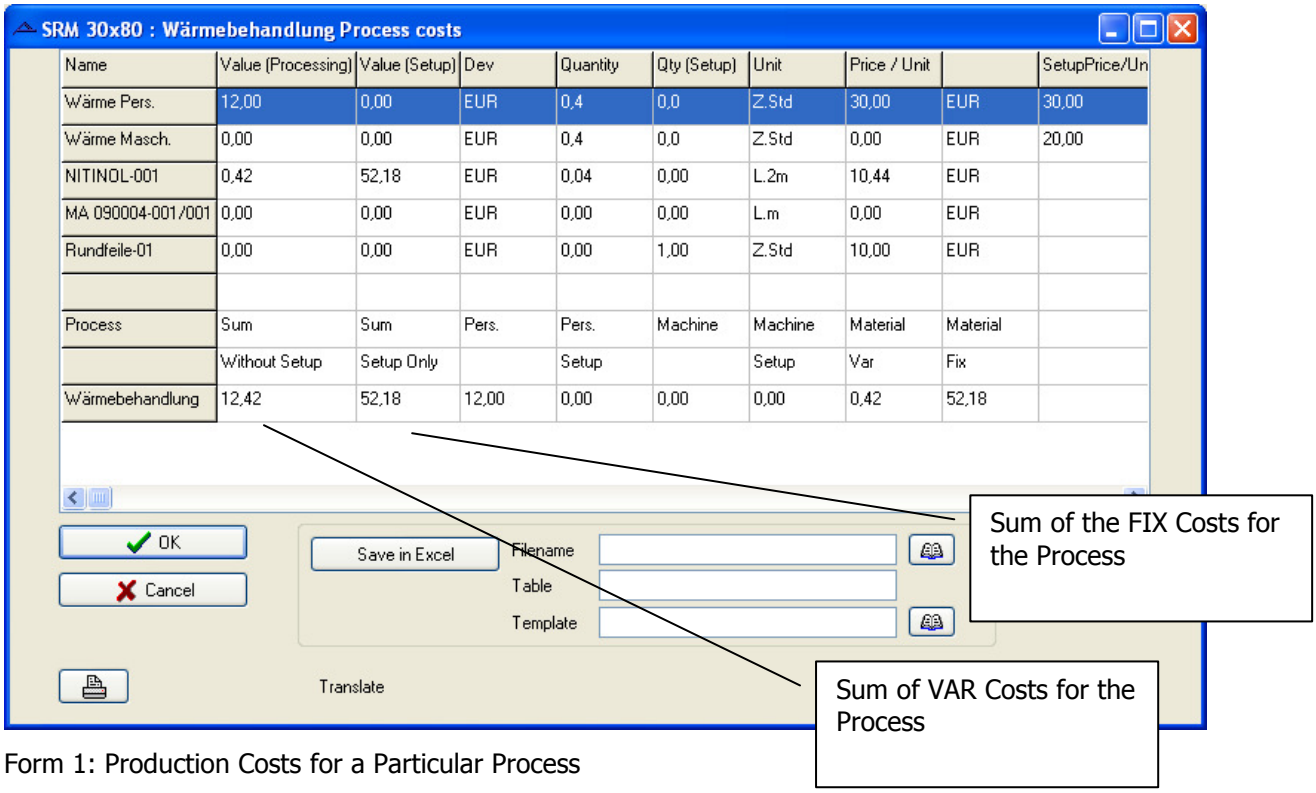
First, for one product the personnel, machine and material costs of the processes are calculated:



3.3 Calculation of Process Costs

Production Costs for Each Process

All calculated personnel, machine and material costs are divided into variable (in proportion to the product quantity) and fix values.



Form 1: Production Costs for a Particular Process

The **variable costs of materials** result from the materials defined in the BOM (→ Article/ Finances) multiplied by the quantity declared to the product class or product. Additionally, there are the hourly rates of the used tools/inspection devices in relation to the processing time.

The **fixed costs of materials** are determined by the fixed quantities of the BOM. Possible material overheads caused by operating supplies are only considered if they have been defined as auxiliary supplies.

The **direct production costs** refer to the non-material related use of resources. These are the machine and personnel costs that result from the hourly rates for the machine and personnel[1] of the target machine (→ Machine group/ Finances) related to the

[1] The determining factor for the hourly rates is the relevant tariff group of the selected process validity or machine group.

Please note that the write-off of a machine is involved in the hourly rate.

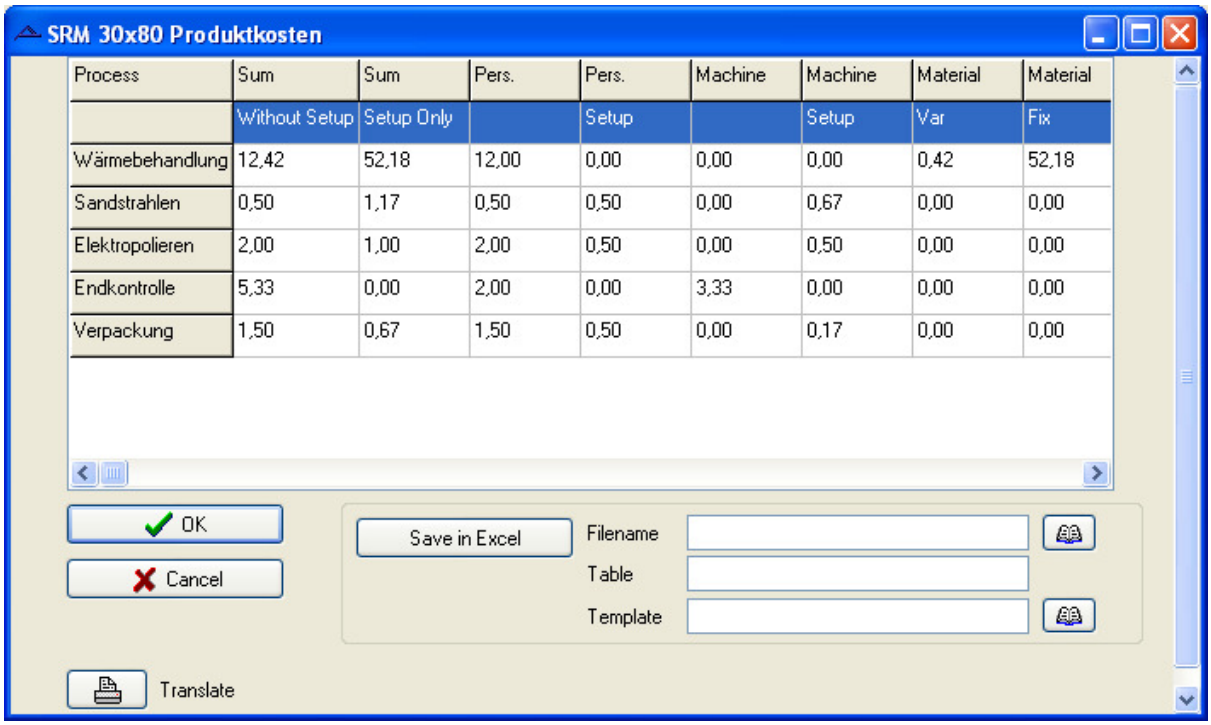
processing and set-up time. They include the cost per unit (variable) and the fixed cost, which are normally setup costs or preproduction costs.

	Displayed by APROPO	Calculated from:
Material costs	*Cell title in figure above*	
Cost per unit	*Value (Processing)* in an Article row	Quantity indicated at BOM (*Quantity*) and price of article (*Price / Unit*)
Cost per order event / lot: Supplies	*Value (Setup)* in an Article row (Supply!) (you must have defined them at the BOM!)	quantity indicated at BOM (*Qty(Setup)*)and price of article
Direct Production cost		
Cost rates / production time	*Value (Processing)* in Pers or Machine row	Hourly rates of machine + personnel (*Price/Unit*) and Processing time (*Quantity*)
Setup costs	*Value (Setup)* in Pers or Machine row	Setup rates (*SetupPrice/Unit*) and setup time (*Qty (Setup)*)

The calculation of the production costs refers to the **hourly rates of the machine groups only**, but not to a possibly deviating rate of a single machine. If, however, an hourly rate of a machine differs from the one for its group, you can get the actual costs using the post calculation of a production lot in Quality Assurance.

Total Production Costs

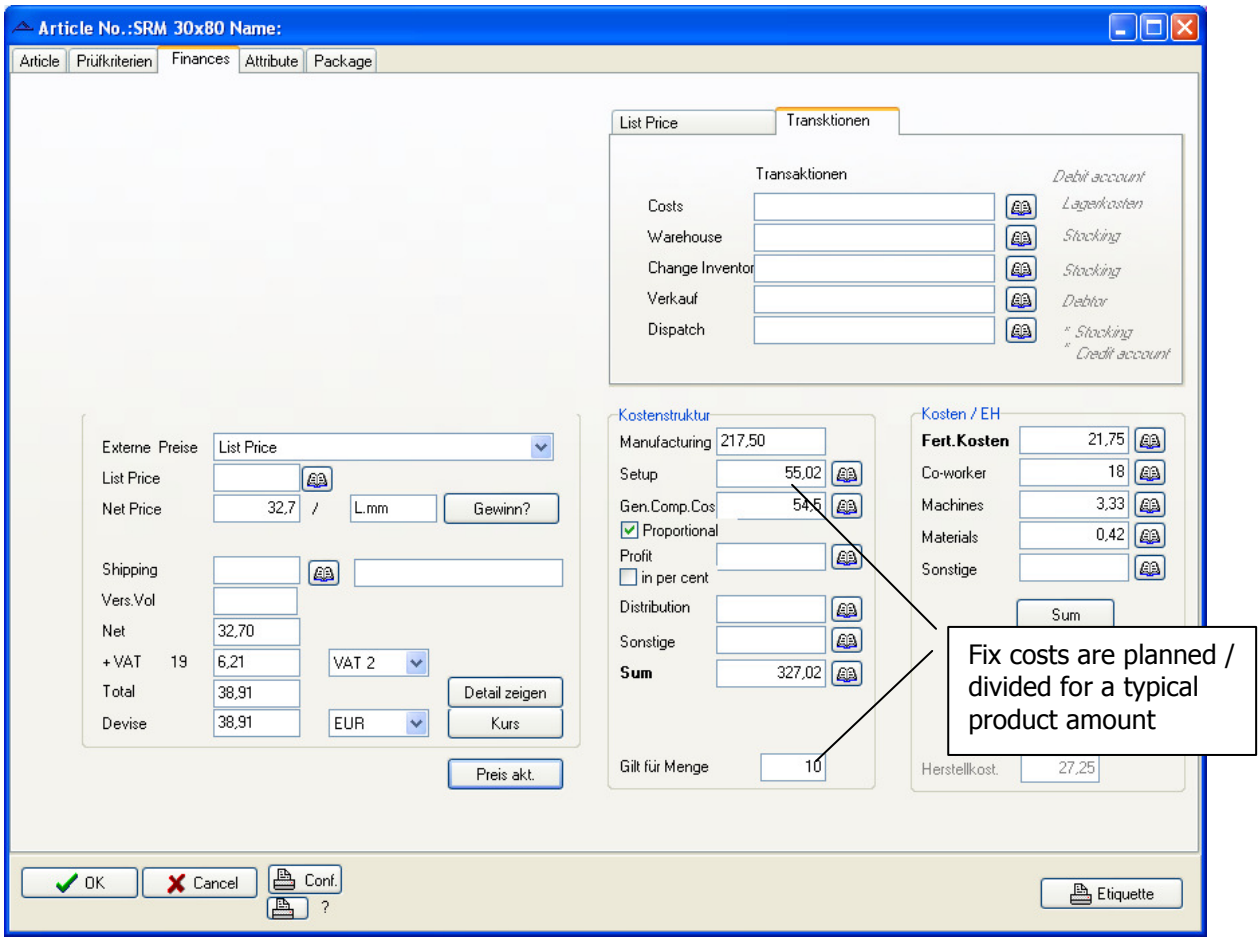
Having determined all process plan costs a summary list is provided:



Form 2: Calculating Total Production Costs for a Product

3.4 Product Cost Structure

The product net price can be determined directly from process manufacturing costs by adding overhead company costs, sales costs and planned gains:



Form 3: Applying Production Costs to Product Cost Structure

4 Core Data

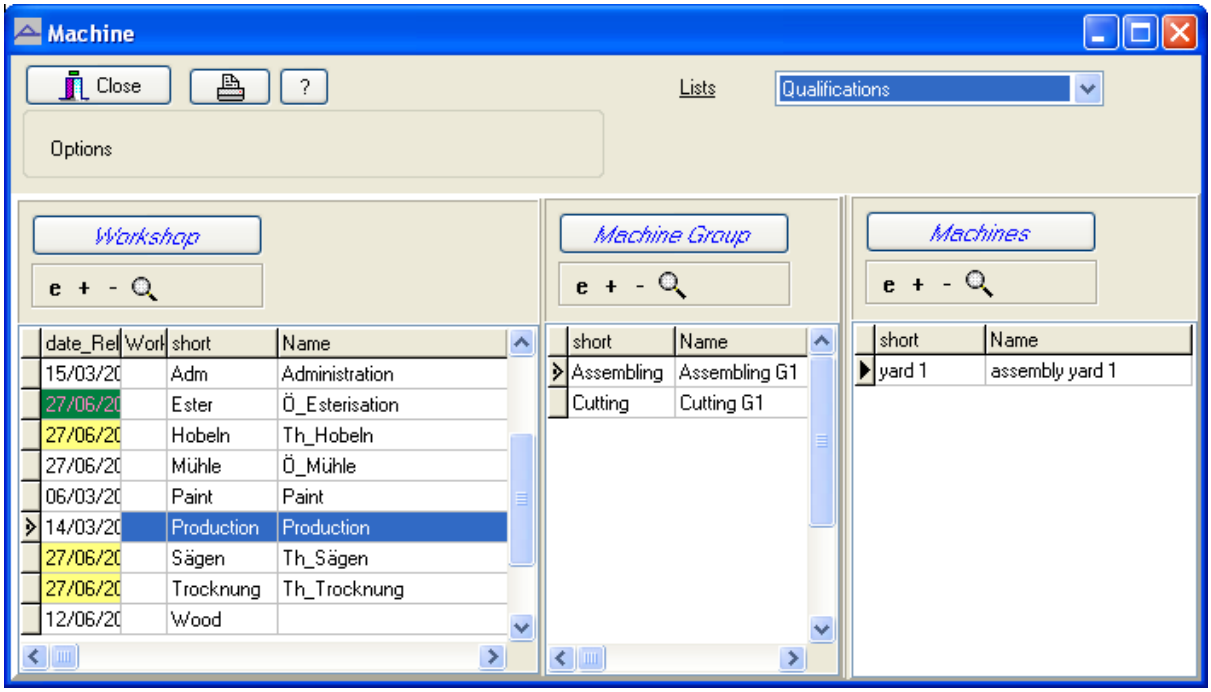
Short overview of the administration of data relevant for the production cost planning

4.1 Machines or workstations

4.1.1 Structure of Workplaces/Machines

By default the workplaces or machines are organized hierarchically into workshops and groups.

So, in the first instance, **ProcFlow** is intended for **job-shop production**. If, however, you have **flow production**, just pool all your resources and machines into a single workshop to remove the hierarchy. The workshop is then the assembly belt. By chain linking you can arrange the processes or machines according to the production flow.

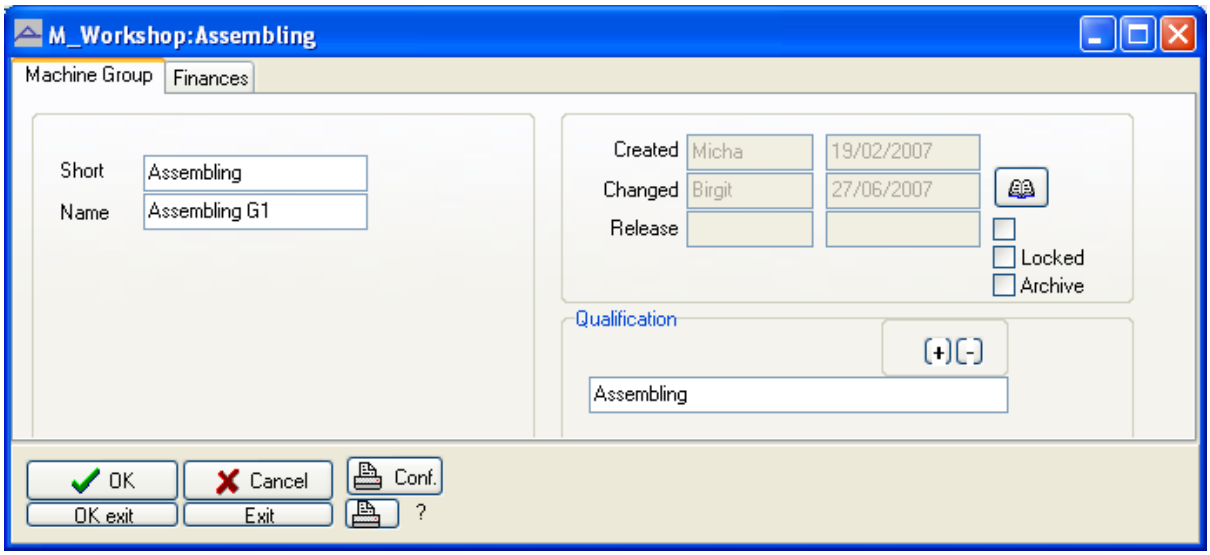


List 1: List of Machines

The workshops or departments in **APROPO** serve as highest classification level not only for the machines but also for the personnel. Even more production-related data is subordinated to the workshops.

The groups represent an intermediate level that helps you organize your data in a hierarchical structure. In contrast to the workshops which pool machines and staff the machine groups are different from the co-worker groups, there is no relation between them!

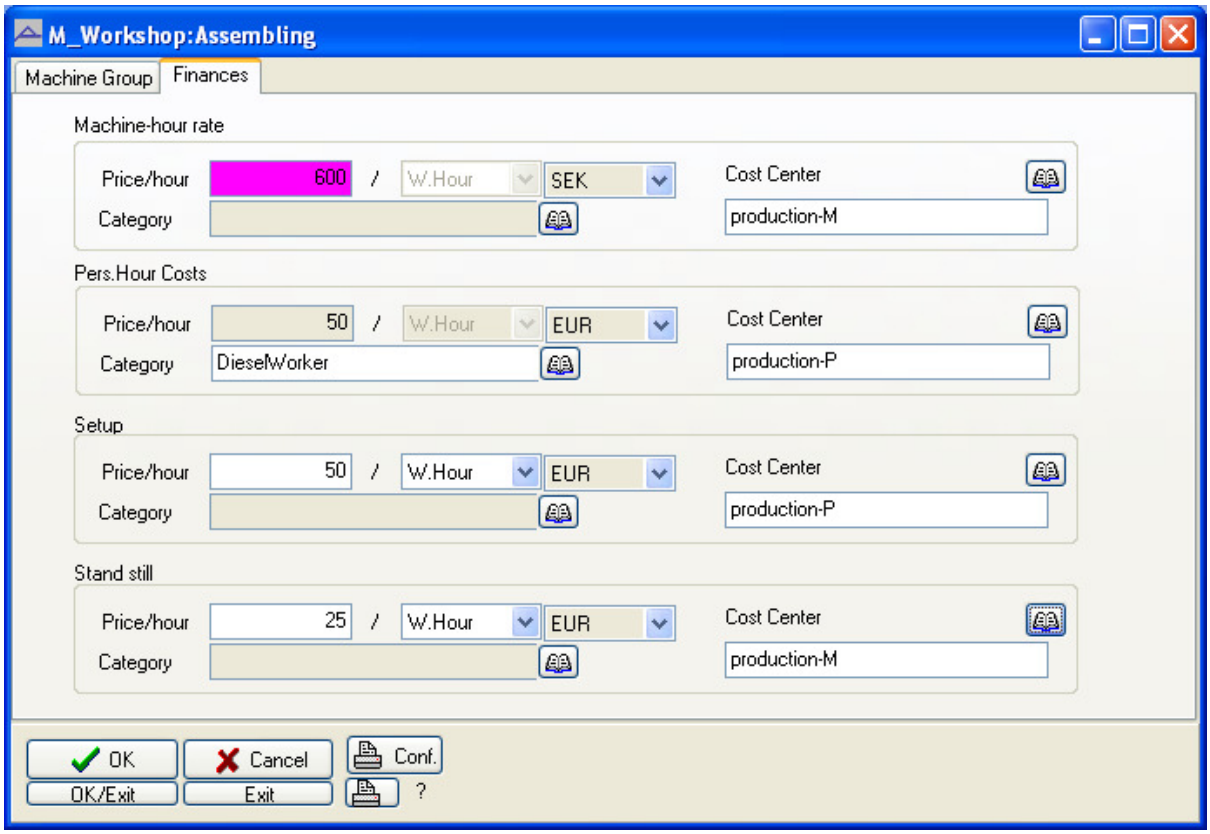
4.1.2 Financial Data of the Machines



Form 4: New Machine Group

apart from names and operating licence the machine groups usually contain the relevant financial information:

- **Hourly rates of the machines** or pre-defined tariff for them
- H**ourly rates of the personnel** operating these machines or pre-defined tariff These are the default costs for operating the machine. They actually can differ depending on the product!
- Hourly rate for the setup time of the relevant machines
- rate in standstill times
- cost centers to all of the rates



Form 5: Machine Group / *Finances* tab

We strongly recommend setting up the groups so that they contain machines of similar type disposing of the same hourly rates:

On the *Finances* tab of a machine group, enter the hourly rates for the machine and operating personnel which are valid for all subordinate machines.

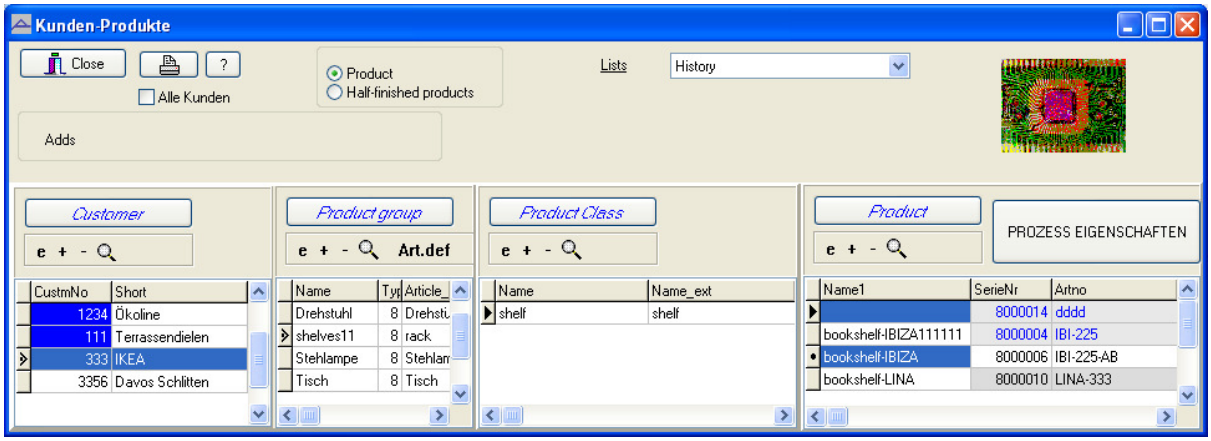
Calculation of the production costs refers to the **hourly rates of the machine groups only**, and not to a possibly deviating rate of a single machine (see Manual III, Production Costs). If, however, the hourly rate of a machine differs to the one for its group, you can determine the actual costs by post-calculating a production order in Quality Assurance (see Manual III, Post Calculation and Booking).

4.2 Articles and Products

4.2.1 Products

The customer products are subordinate to the product class, and to the product group, and finally also to the customers (or else to stock production).

The product class may contain a technology that is applied to all related products.



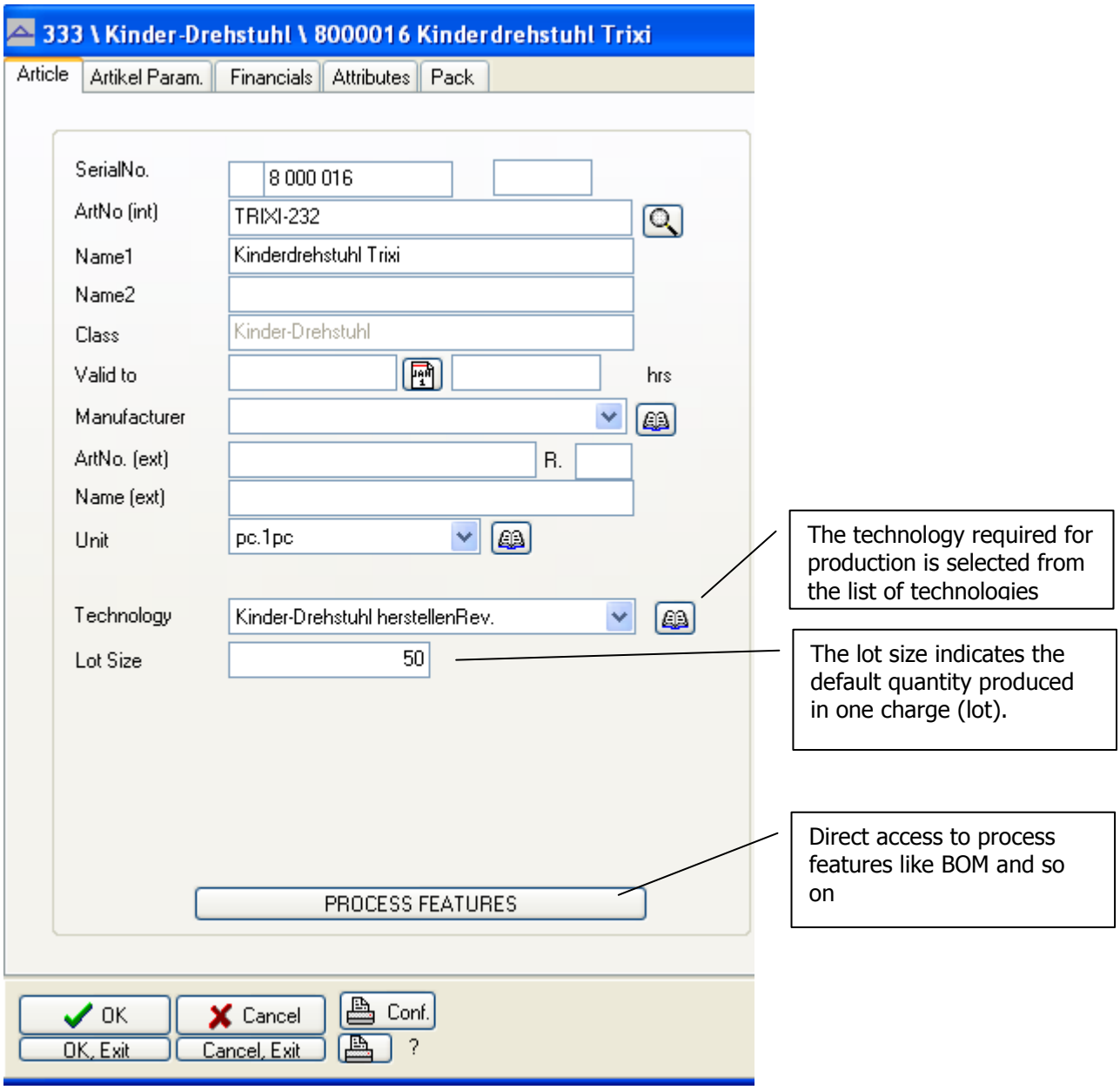
List 2: List of Customer Products

A product is defined by a unique serial number and/or article number and by a manufacturing technology assigned to it.

General data like names, validity, manufacturer, unit and the technology are requested on the ***Article* tab**. Fill in any data valid for all subordinate articles / products.

Als make sure to fill in default storage location (see p. **Fehler! Textmarke nicht definiert.**) and stock attributes on the ***Attributes* tab** and the financial information on the the ***Finances* tab**.

Apart of the regular article fields the customer product form provides some more specific fields:



Form 6: Customer Product 'Kinderdrehstuhl TRIXI '

The default lot size is of particular importance for advance production planning (for more information see Manual III).

Under the register *Attributes* can be entered if each production order or each part receives a unique charge number (single item tracking). The charge number is then displayed in the notation *lot number: sequential number for produced item*.

For more information about the data on all of the tabs see chapter 'Warehouse Articles', p. 17.

Qualified Products help you to protect a product and its technology including processes: They are blocked for editing. So, qualification of an element in **APROPO** means blocking of both the element and all of the subordinate elements.

4.2.2 Warehouse Articles

The warehouse provides the following types of articles[2]:

- Raw materials
- Products
- Tools / inspection devices
- Energy / supplies / co-products
- Semi-finished products
- Shipment / package

Raw materials can also refer to assemblies and components in the sense of purchase articles which are used in the bills of material.

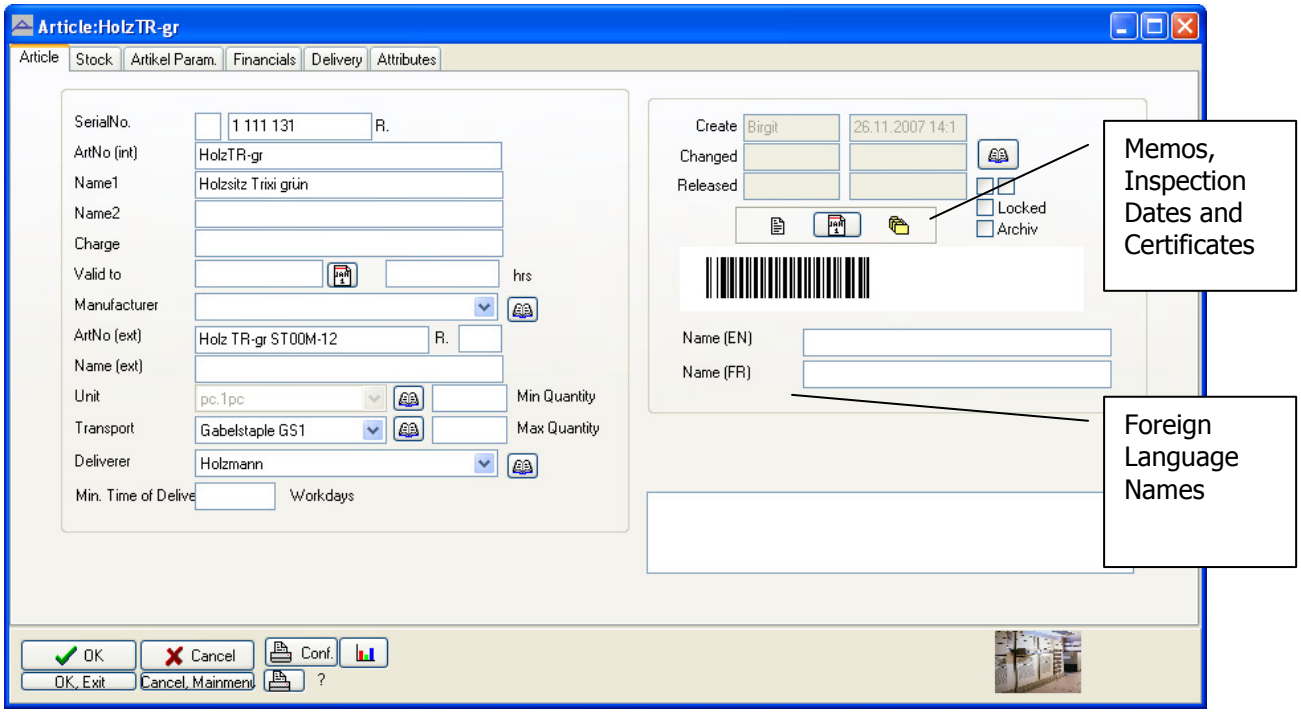
Products are meant to be finished goods on stock, and customer products ready for shipment. The *semi-finished products* are used for internal partial production of assemblies which can be pre-fabricated for stock.

Note that you cannot add or delete products to/from the warehouse. They belong to the customers and are managed there (Customer products).

Let's have a look at the main article features of stock articles and products.

[2] Of course you may rename these categories according to your specific structure.

4.2.2.1 Article Details



Form 7: Warehouse article

General data such as names, validity, manufacturer, unit and the technology is requested on the first tab *Article*, as far as it is not yet stored at article definition.

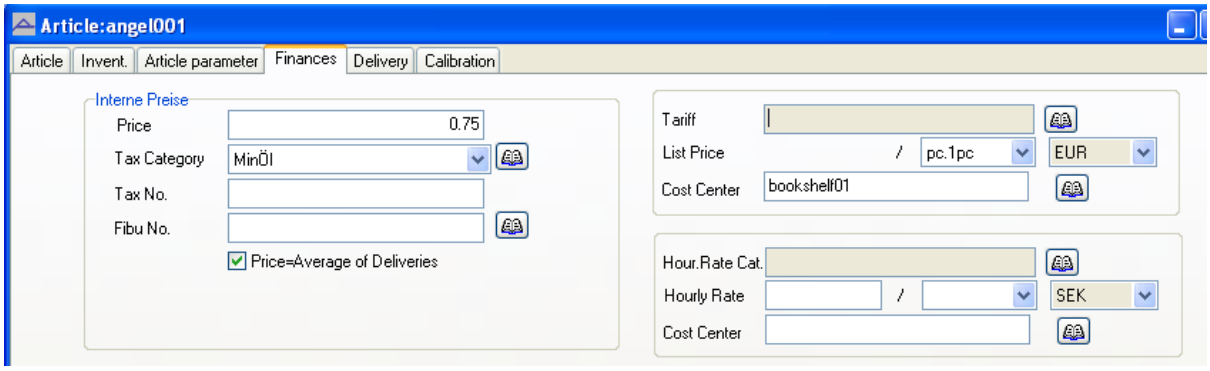
The fields *Valid to* and *Operating hours* refer to the lifetime of an article. With it, you can manage a kind of load utilization or degree of usage.

For all warehouse articles, you can manage **memos, quality inspection dates** and **certificates**. To access them use the icons in the upper right-hand corner of the form.

Storage Location, Attributes and Inventory of articles are not mentioned in this document.

4.2.2.2 Prices

You can find all the price data on the *Finances* tab. You should indicate your data as correct as possible since the purchase price of an article is the basis for the calculation of the material costs and the production costs.



Form 8: Warehouse Article / *Finances* tab

On the ***Finances* tab** you calculate the catalog price and assign the cost center. For more information about pricing see Manual VIII.

4.3 Processes

The processes and their folders that combine multiple processes belonging together are subordinate to the workshops.

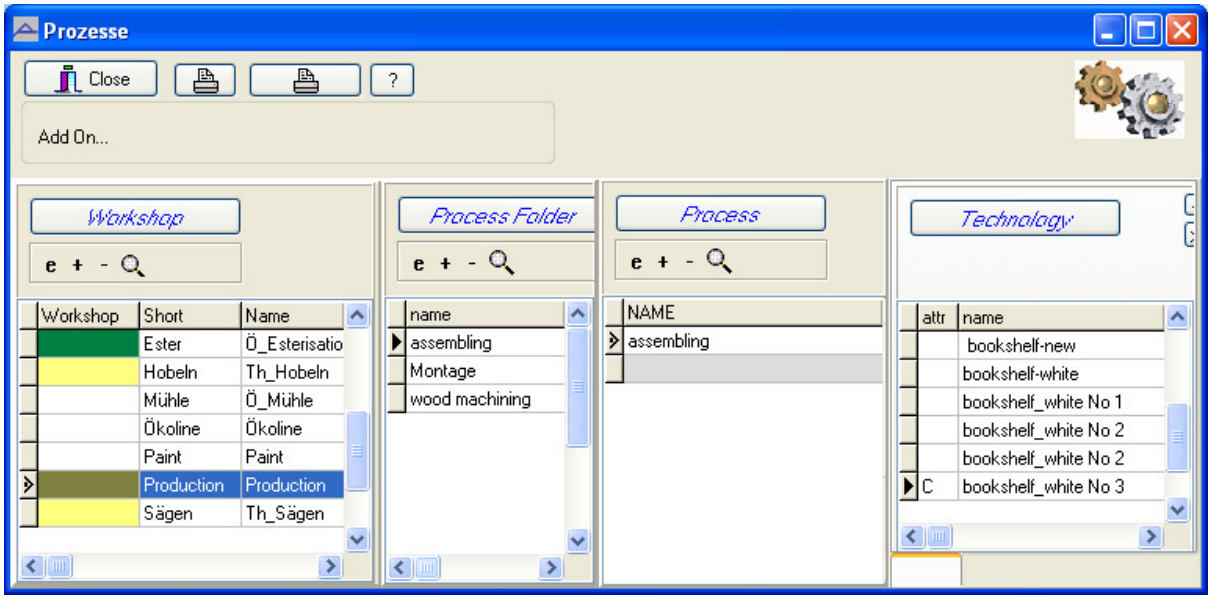


Figure 1: List of Processes

4.3.1 General Process Information

Each process determines one or more **workplaces** or **machines** as resources:

The process is only valid within a machine group or a machine. The target machine is selected from this range called **process validity**. As an alternative, you can select one or several special machines from other areas called **qualified machines**. This might be a borrowed machine.

As long as the field *target machine* is not filled out, **ProcFlow** itself will choose the optimal machine from the process validity or from the qualified machines.

Machine qualification determines the qualified staff

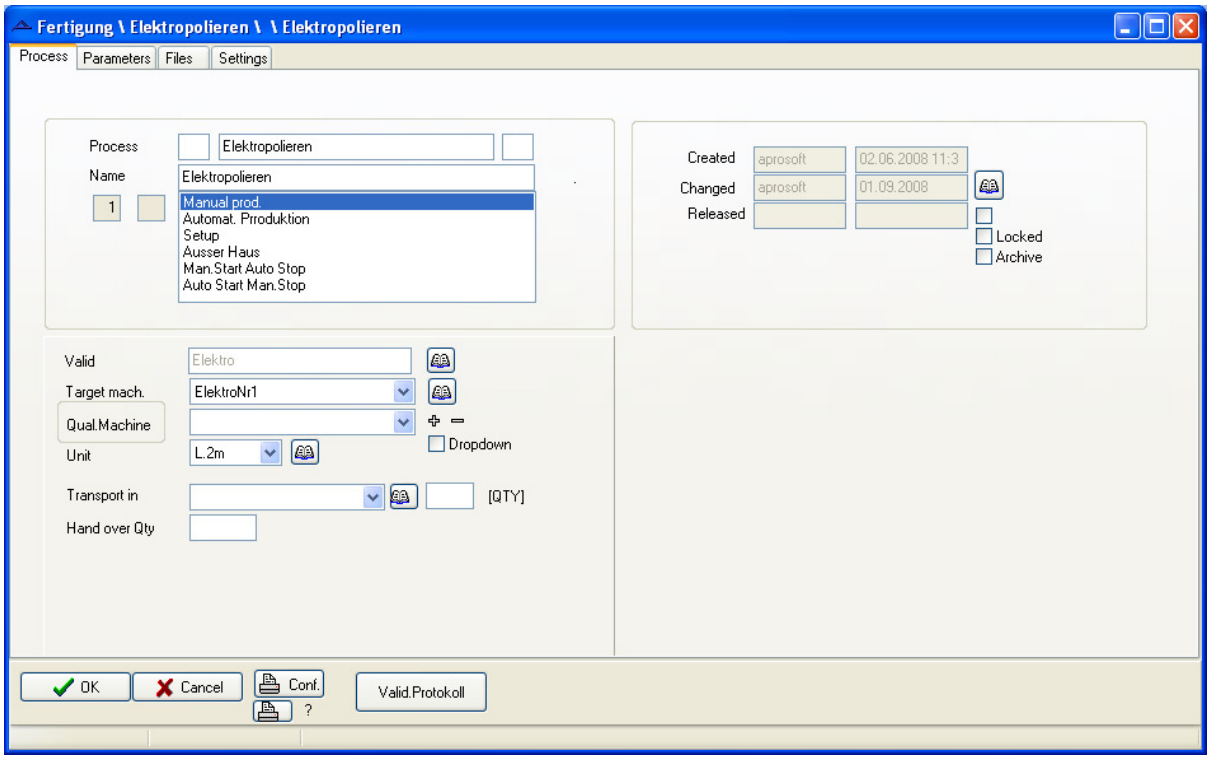


Figure 2: Process Template

Below, you select the machine(s) as explained above. If you don't select a target machine then all valid machines receive the production request: the first free machine can start the production or parallel manufacturing is possible.

The setup and operating costs depend on these machines.

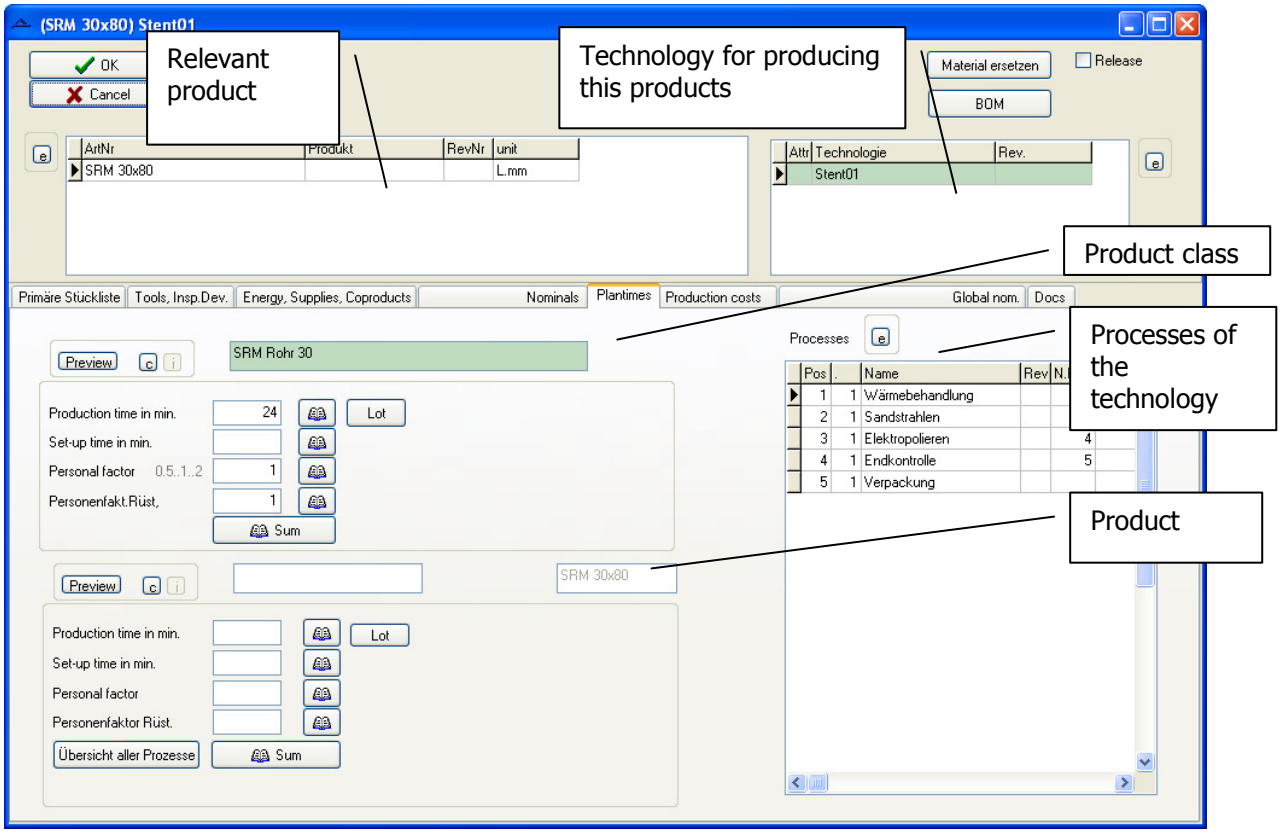
4.4 Product-Dependent Process Information: Product-Configuration

All products belonging to the common product class are displayed in the upper left-hand corner.

All product configuration details (like BOM, nominals, operation times, process costs) belong to the product class (or product, below) and to one of the processes of the technology (right hand).

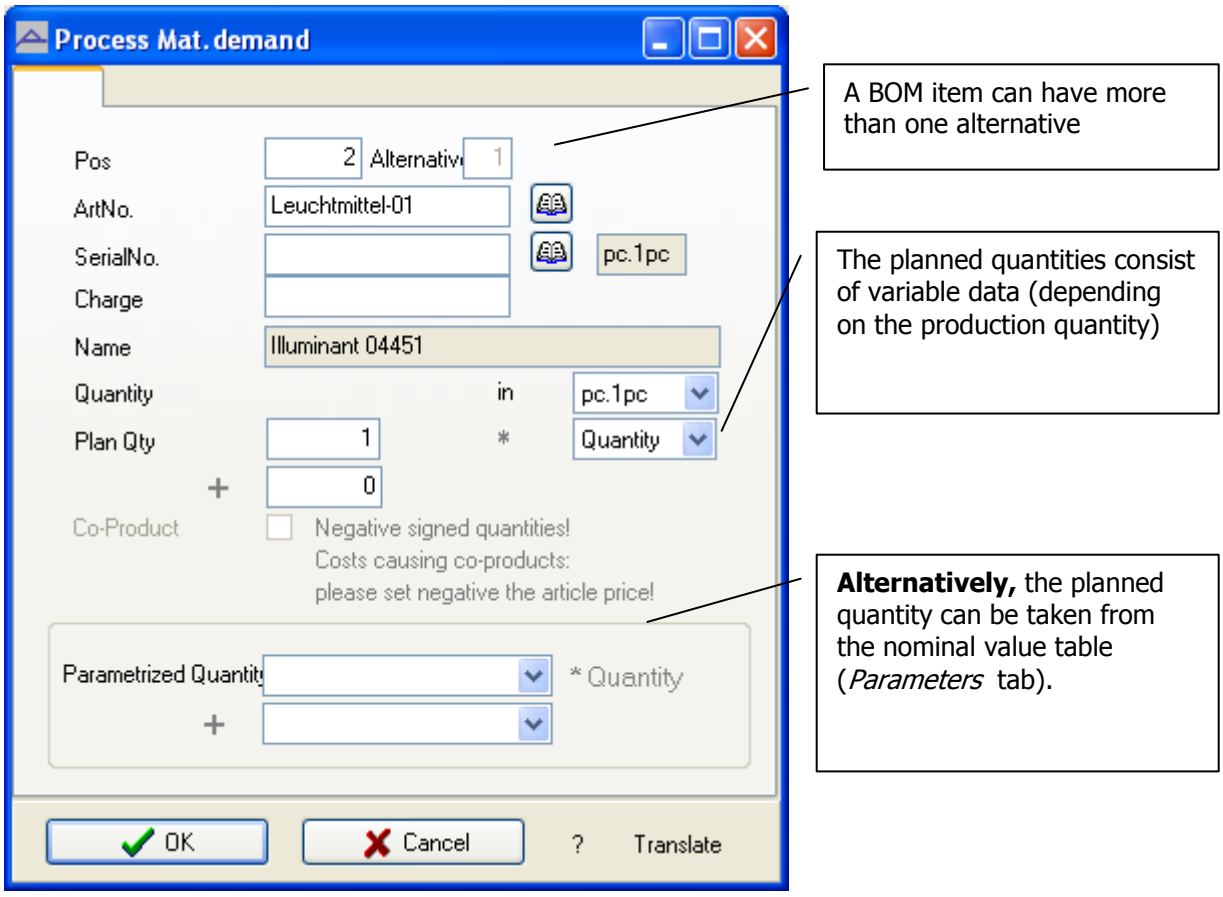
If possible, you can enter the features according to the product class or below the product. They always refer to a particular process highlighted in the list on the right-hand side.

4.4.1 Bill of Materials, Tools and Inspection Devices, Supplies and Energy



Form 9: Process Features for 'Venezia-weiß-12' / *BOM* tab

Each single process can have a list of materials attached: **BOMs**, **tools/inspection devices** and **energy/auxiliary supplies.**



Form 10: Record of the BOM

Each material is defined as a single record (BOM item) with its quantity. The material price results of the article list price and the indicated quantity.

To get an overview of the complete BOM with all items and across all processes, use the print function (**single-level bill of material)**.

Defining tools and inspection devices is done by applying the same instructions as for BOMs with some specialiti

For tools are the number of tools is to enter. The wear lifespan can be confgured time or (product) quantity dependent.

4.4.2 Planned Production Times

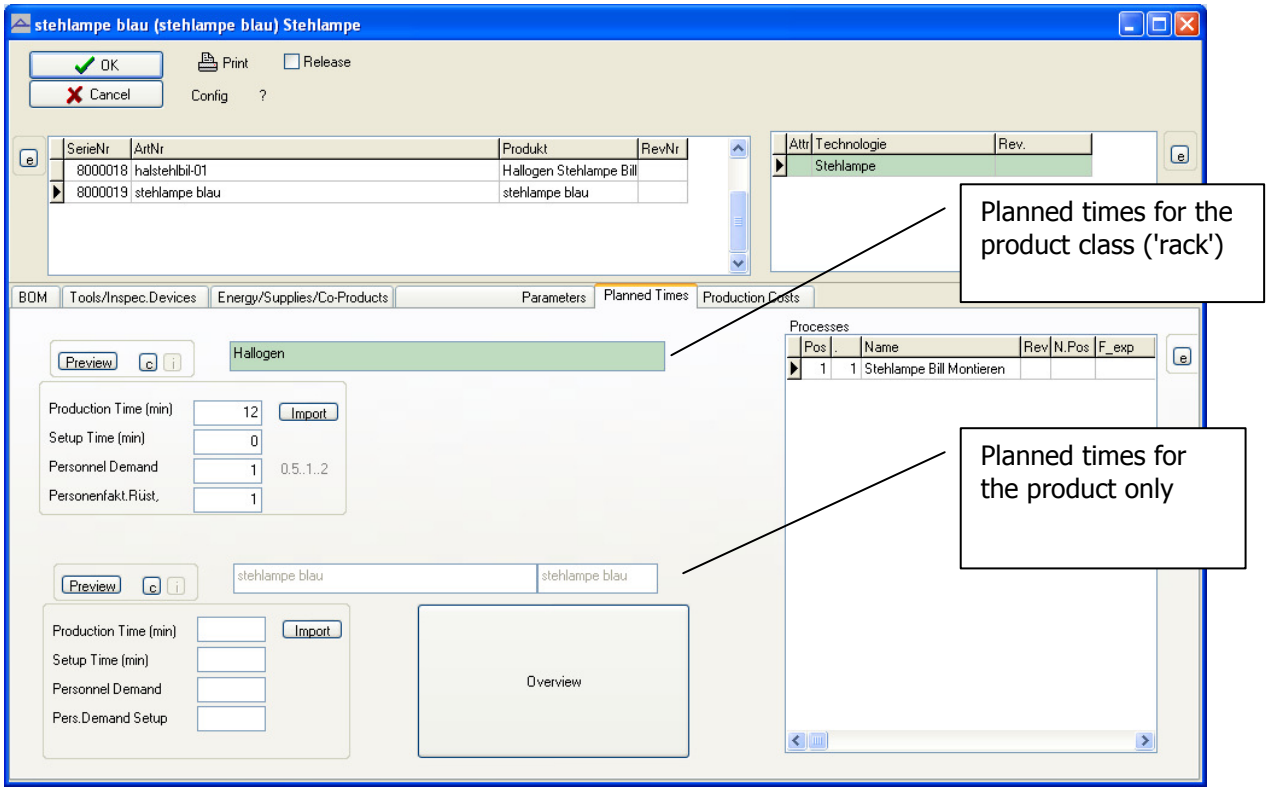
You can manage exact lead times for the product and the product class. The planned times which are currently valid, result from the three-stage hierarchy:

1. Product
2. Product class
3. Process

If there is special data for the **product**, it has top priority. Otherwise the data of the **product class** applies.

The planned times of the **process** (*Settings*-tab) apply only if there is neither data for the product nor for the product class.

The function *Overview* shows the data currently valid.



Form 11: Planned Times in the Process Features

You must indicate the planned times for each highlighted process. They are referred to in minutes.

The processing time always refers to one unit (te), the set-up time is a fixed date not depending on the production quantity (tr).