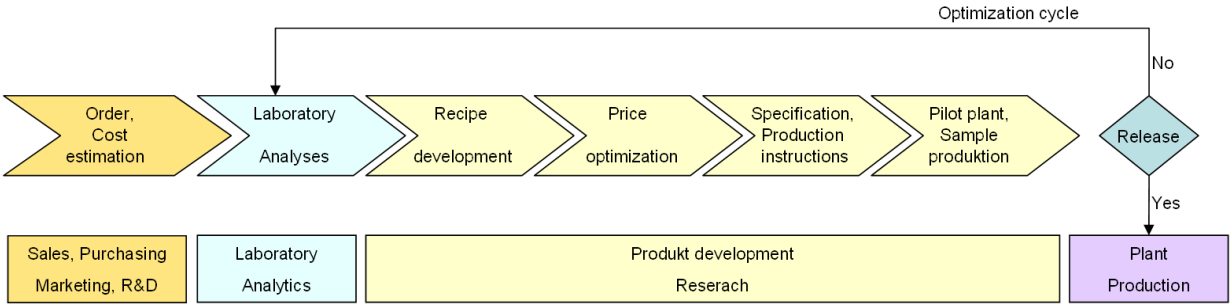
More Efficiency in Product Development

Introduction

The development of a new fat blend that meets today's requirements, requires a high level of development effort:

- Consumers become more demanding and expect products which are tailored to their needs.
- The food regulations must be considered.
- The cost pressure increases, at the same time, commodity prices fluctuate strong in the stock market.
- The sales department will always open up new sales channels wirh new products, etc., etc.

The list could still continue, but these four point are sufficient in order to demonstrate the foreseeable huge development effort. In the product development process several departments of a company are involved. The following diagram illustrates the relationships.



The product development process starts either with a new product idea (R&D, marketing), a customer inquiry (sales department), a new product of competitors (marketing -, sales department) or with changes in the prices of raw materials on the market (purchasing). After generation of produkt development order, the realization starts. In contrast to the traditional procedure - blending, analyzing, improving the results - the product development with *Oil-Expert.net* runs virtual. What has long been standard in the automotive industry and many other industries - virtual product development by PC simulation - is now also possible with *Oil-Expert.net*. Since the major part of product development runs on the PC - only the analysis of samples and raw materials and the production of samples is executed in the laboratory - this leads to significant time savings and thus to a significant increase in the efficiency of product development.

In this newsletter, the high efficiency of product development with *Oil-Expert.net* is shown on a concrete example in six steps.

1. Step: Creating Project Order/Cost Estimation

At the beginning of each product development there is alwasy an order which can come from various sources as described previously. *Oil-Expert.net* features a complete approval management, however, this is optional and need not to be used. The use depends on the organizational structure of the company. The approval management allows access from different departments (sales, managing, R&D manager) on the approval forms. But it is also sufficient to enter only some rudimentary description data in order to find the project again by querying and reporting.

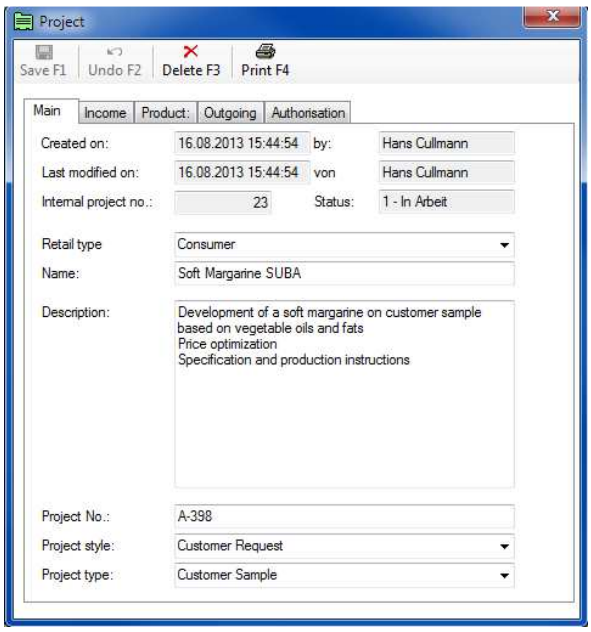
The example is based on the following assumptions:

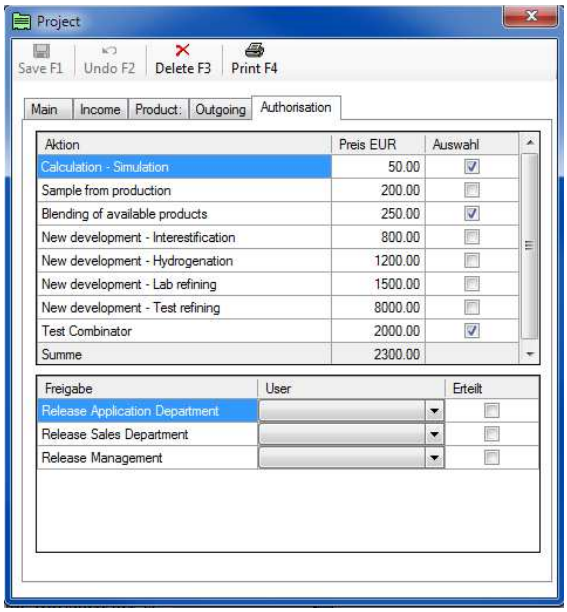
- Input
  - Margarine sample of a customer declared as 'Soft Margarine with Butter Fat'.
- Objectives
  - Determination of the chemical and physical parameters.
  - Determination of a formulation based on vegetable oils and fats with the same melting behaviour as the customer sample.
  - Price optimization by variation of raw materials.
  - Generation of specifications.
  - Creation of production instructions
- Output
  - Sample of 20 kg in 500 g cups, produced on the pilot-combiner.

The absolutely necessary project data are entered quickly. Some of the possible entries are shown in the figure below.

The data associated with each project are quite extensive. It is decided by the user, whether he uses the default options or not. A lot of data are generated automatically by the software, such as date and time data, user data, internal administrative informations like project number, etc.

In order to have sufficient indications for searching and reporting, it is usefully to enter the following data (Please see figure at right): Product type, project name, kind of project, and project type. But only the project name is absolutely necessary, all others are optional.





An interesting feature should be mentioned - the approval management. Although this function can be disabled. Nevertheless it is possible to estimate the cost of the project, which makes the decision easier to perform the project or not.

If the approval management is enabled the project can be initiated only when, as in the present case (Please see figure at left), all three decision makers have given their OK. Previously no data sheets can be created.

2. Step: Analysys

Starting point for a calculation with *Oil-Expert.net* is either an analysis, a fat recipe, or both. The analysis usually comes from a specification or from the analysis of a fat sample in the laboratory. A fat recipe comes in general from a customer or results from an 'idea' eg the idea to offer the existing customers a new product with very specific properties.

This example is based on a customer sample - a cup of margarine - from which, after isolation of the fat, the analysis is performed. For the calculations fatty acids and SFC values are required. Only with fatty acids or with SFC values even calculations are possible, but the number of recipes that fit to the analysis values are much larger and the melting behaviour of a fat blend can not be reproduced without SFC values.

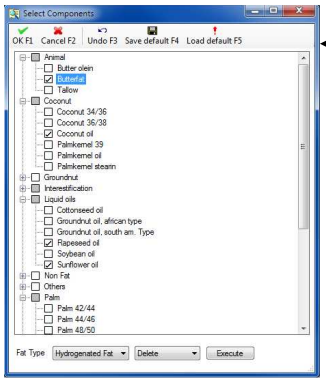
As a reference:

- As many analytical values for the recipe calculation (Please see step 3: Recipe Identification), that is to say a complete spectrum of fatty acids and the SFC values of 10 - 40 °C.
- As few as possible analytical values or specifications for the price optimization. The more specifications, the smaller the scope for optimization.

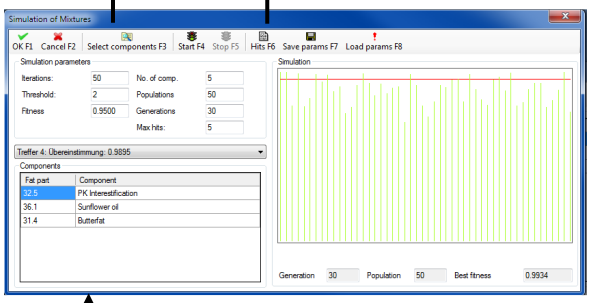
After the analytical data are put into a datasheet, the calculations can start. The data can be transferred from one datasheet into a new sheet by copying, so that the input of the analysis and other parameters has to be done only once.

3. Step: Recipe Identification

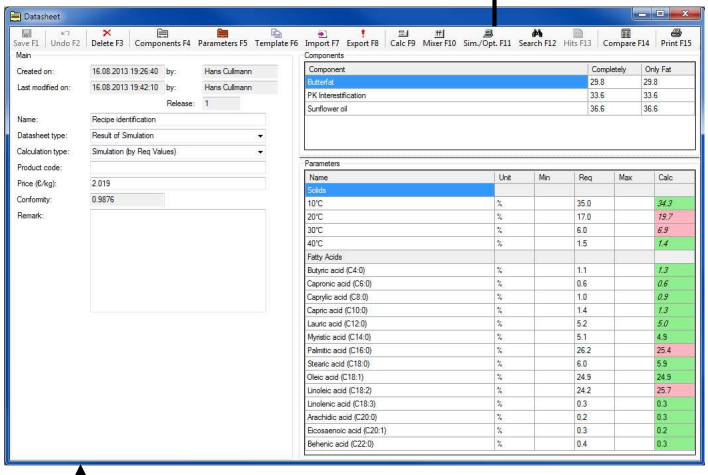
Subsequently, the sequence of the recipe identification is described schematically step by step:



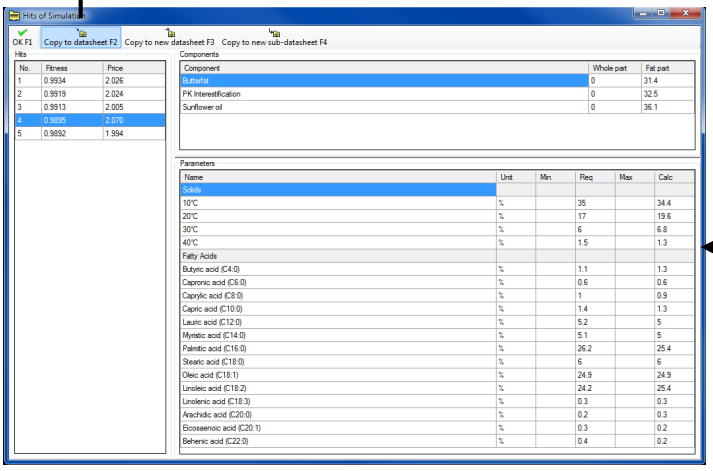
Selection of Components



Simulation



Data Sheet 'Recipe Identification'



Hit List

Although the process of recipe identification looks complicated, the work off can be done in a short time, anyhow after the simulation parameters are defined. The simulation parameters are already pre-set to reasonable values. They can be saved as user-specific template.

As well as the components with which the recipe identification is to be performed. The selection of the components is made once and then also saved as a user-specific template. Before each run, of course, a change in the component portfolio is possible. In the example we add butter fat to the portfolio but don't save it in the template. Because butter fat should not be included in the standard portfolio of raw materials.

The identification of a recipe from given analytical values is as follows (Please see also page 4):

- Copying of the analytical values to a new data sheet with the name 'Recipe Identification'.

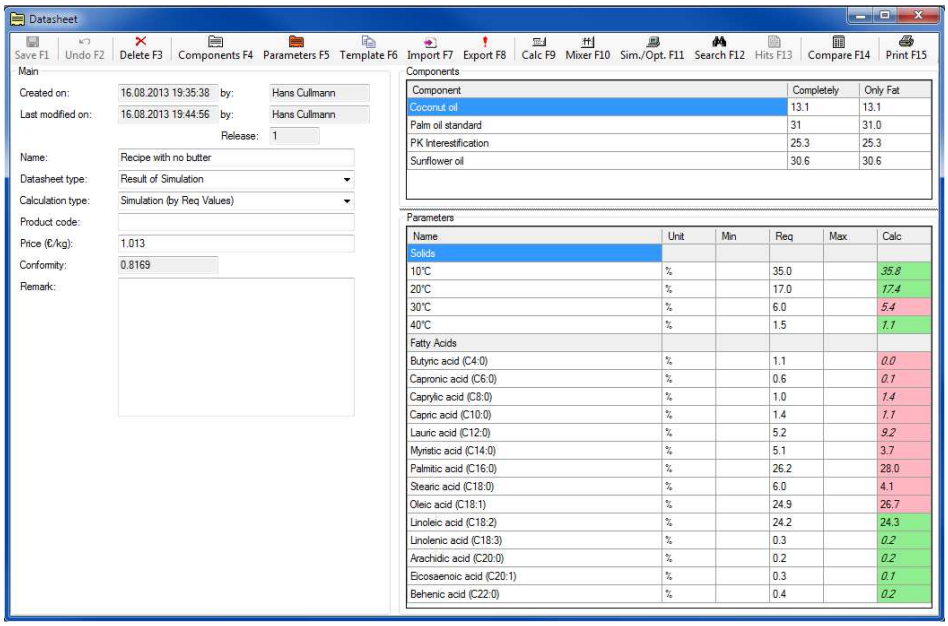
- Opening the dialog 'Simulation'. The first time working with the simulation, the raw materials have to be selected and saved as a template. In our case butter fat is temporarily added after saving the template. The butter fat is now in the raw material portfolio until we deselect the butter fat or the program is terminated.

  After these preparation steps the simulation is started and after a few seconds, the hit list is displayed containing all the recipe possibilities matching the analytical values. The software works with so-called genetic algorithms so that always multiple solutions were found under which the user can select the best matching fat blend.

- For further processing, we choose the solution number 4 from the hit list because it contains only three components at 99% similarity. By the way, the hit list is still available after selection. The hit list is assigned to the data sheet from which it was generated.

- Now we start a second simulation run without butter fat. Anyway the fat blend should have the same melting curve as the analysed sample. Before starting the simulation, we have to decrease the fitness in the simulation dialog from 0.95 to 0.80 because some fatty acids, which are typical for butter fat, no longer occur.

  From the results we select the entry number three with four components and a very good conformity of the melting curve. For further processing we copy the data from the hit list into a new data sheet named 'Recipe with no Butter Fat' (Please see next page).



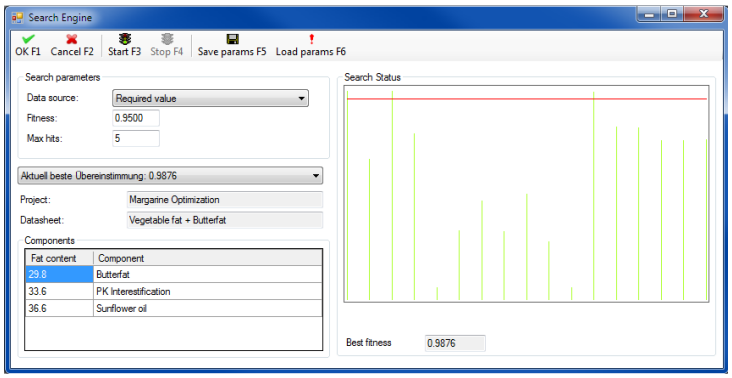
Data Sheet 'Recipe with no Butter Fat'

- Of the above data sheet we generate preliminary specifications which are the basis for price optimization. The data are copied into a new data sheet named 'Specification: Preliminary' and the data sheet type is set to 'Specification'. Now the min/max values are defined, not required analytical values are deleted (for example, fatty acids < C8) and possibly new parameters added.

Sake of completeness it should be pointed to another source of recipe identification, namely searching in already existing recipes. For this, the search function is opened from the data sheet 'Recipe Identification'.

If the search was successfull, a hit list is displayed. The further procedure is similar to the simulation.

The number of search results varies with the defined conformity or fitness. The greater the fitness is defined, the fewer results will be found and vice versa.



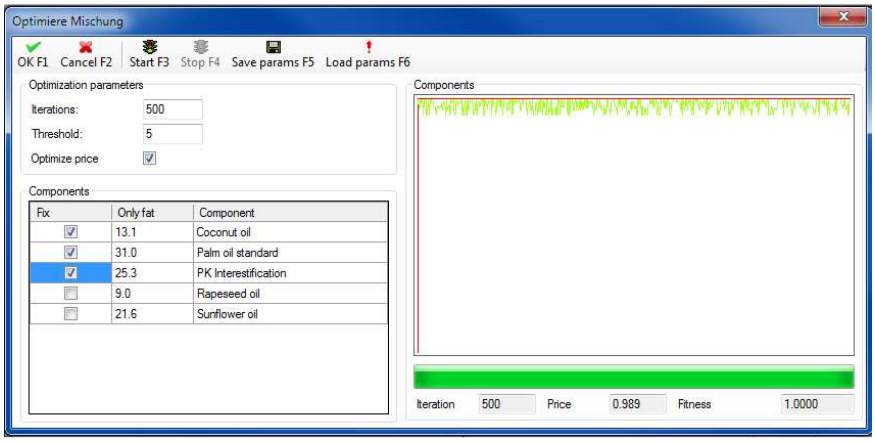
Search for existing recipes

Again, the search parameters can be saved user-specific.

4. Step: Price Optimization

We now have a fat recipe consisting of three fat components and with about 30% sunflower oil. The melting behaviour is corresponding to the customer's sample. The very expensive butter fat we have already eliminated. The question now is, can we substitute a part of the sunflower oil through the cheaper rapeseed oil? Of course, in accordance with all specifications already defined, especially for the fatty acids C18:1, C18:2 and C18:3.

For the price optimization the data sheet 'Specification: Preliminary' is copied into a new sheet and saved using the name 'Price Optimization'. After adding the component rapeseed oil, first with 0%, the dialog for price optimization is opened.



Price optimization by substitution of sunflower oil

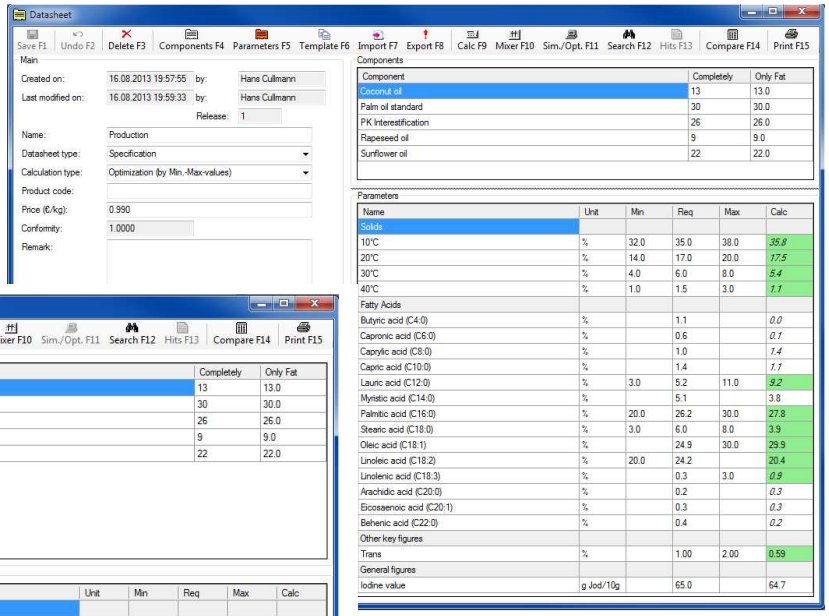
To obtain the physical characteristics of the fat blend , the proportions of the three fats are fixed, ie not changed during optimization. In this case, only the ratio of sunflower to rapeseed oil is changed, the ratio of fat to liquid oil remains constant. The results of the optimization are taken with 'OK' in the sheet 'Price Optimization'. As a result for the present data constellation only about 1/3 of the sunflower oil can be replaced by rapeseed oil because of the fatty acid specifications.

The current raw material prices can be entered manually, but also via an interface by pressing a button or automatically from a provided electronic data source.

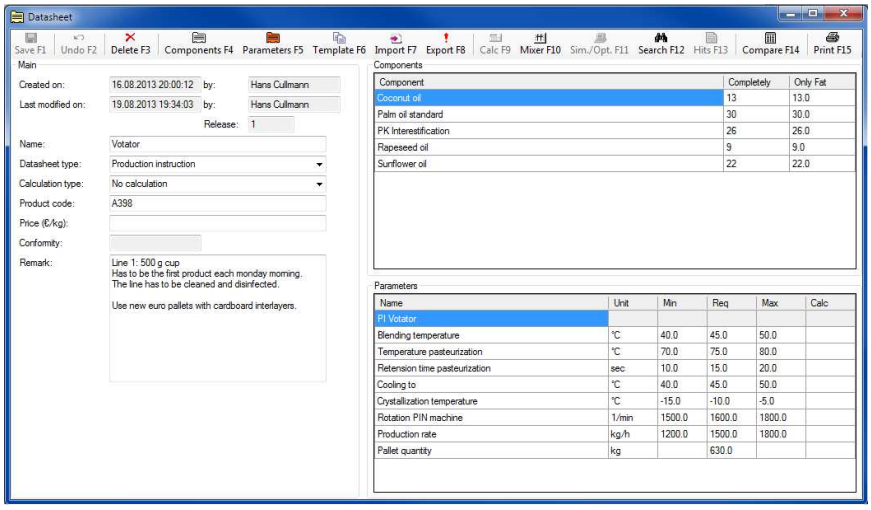
Again, the optimization parameters can be saved as user-specific template. Also of interest is the parameter 'Threshold'. This parameter indicates how much the proportion of an oil or fat must be at least to be included in the formulation. Smaller proportions are eliminated immediatelly.

5. Step: Specification, Production Instructions

Now we're ready, to define the final formulation, the final specifications for the anlytical values and the production instructions, in this case for the combiner. For the specification the data from the data sheet 'Price Optimization' are copied into the new data sheet 'Specification' and modified accordingly. For the production instructions, a new data sheet is created. Below an example of each:



Specification



Production Instructions

Specifications and production instructions can be supplemented as necessary. For example the recipe can be supplemented with ingredients and packaging data, the specification with SAFA, MUFA and PUFA, or any other parameters which are also be calculated. All data can be exported via a user-configurable interface in any other IT system, eg LIMS, ERP, Quality System, just to name a few.

6. Step: Production of samples

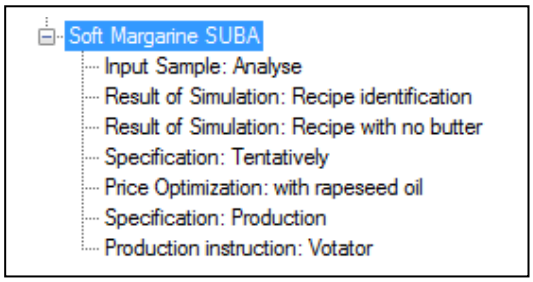
After specification and production instructions are defined, the first trial on the pilot-combiner can take place. The data generated by the combiner during the experiment can be saved also in a data sheet, preceded the master data has been defined for it.

The shipment of each sample can be documented within the project (eg shipping adress, contact person, contact details, customer feedback, etc.). The samples are numbered sequentially and can be easily found later and collected in a report. For example in an annual report or in a sales report with the respective costs.

Summary

The product development using a concrete example with *Oil-Expert.net* has shown what efficiency means in this context. The time frame for the complete development procedure with the exception of sample production is between one and two hours - depending on the experience. During this period, you can yust make one fat blend in the laboratory and analysing fatty acids and SFC values.

Additionaly all data related to the project can be kept together like in a container and can be found again at any time by a sophisticated searching algorithm.



'Projekt-Container'

By using the software solution *Oil-Expert.net* it is possible to increase the efficiency in product development by orders of magnitude. Often the product developers are working with paper documents, with complex EXCEL sheets or with self-developed ACCESS databases. With this procedures it is only a matter of time until the overview of previous work is lost, leading to multiple developments of the same fat blend and other errors. Simultaneous the development times should be reduced and the output should be increased.

By using *Oil-Expert.net* all these requirements are fullfilled and the disadvantages of the previous way of working can be prevented.

We would be glad to provide you with further information. Please feel free to contact us.

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