

Example of the screen of proposal formulas summary.

- Percentage range of both the raw material groups and each particular raw material.
- Temperatures or water absorptions in which the project works.
- Information from other projects or raw materials that can be used in the new development. This function allows the import of information from other projects in order to reduce laboratory tests to the minimum possible, increasing the speed of development.

2. Behavioral Algorithms.

It is the core of NeosAware. Its purpose is to know the behavior of the raw materials and their interactions with each of the properties that define the ceramic compositions. Hence, more than a hundred properties have been modeled, divided into: non-temperature dependent, dependent on the firing conditions using a fixed temperature and dependent on firing curve studying a range of water absorptions.

The research was initiated using simple mathematical resources, such as multiple regressions and other more complexes, such as evolutionary algorithms, neural networks, etc. In all cases, the data were not consistent, giving exotic results; these results have mathematical but non-ceramic sense, or did not reach enough degrees of accuracy to be acceptable to ceramic technicians. For this reason, Neos developed its own behavioral algorithms based on self-learning machines. Since it launched to the market in 2015 is reaching customer satisfaction.

The algorithm is rewritten every time new information is depending on:

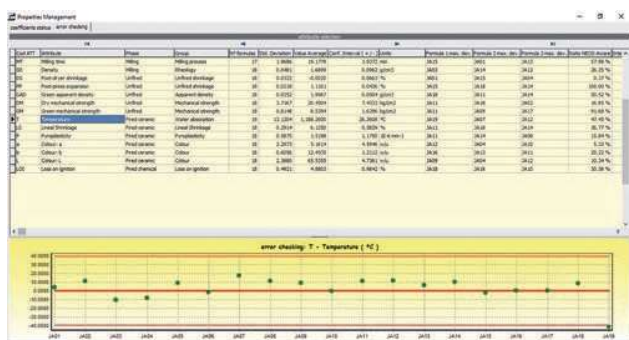
- Property analyzed.
- Units of measure used.
- Typology of raw materials.
- Interactions between known raw materials.
- Range of possible compositions.
- Range of known compositions.
- Introduced experimental data.
- In properties that depend on temperature. And their behavior is evaluated within a range of water absorptions; also the sintering curve is modeled.

3. Optimization Algorithms.

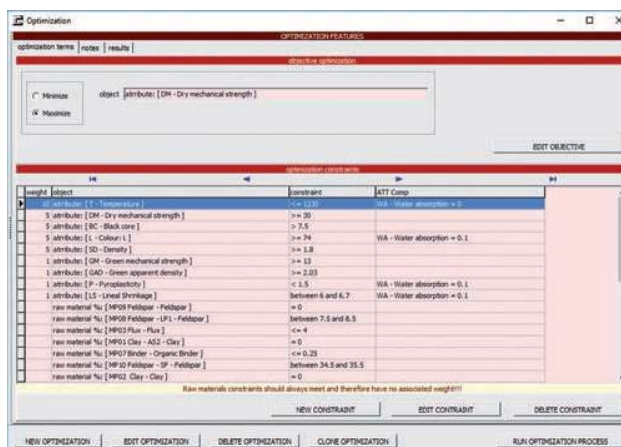
This tool is based on chains of selection algorithms developed by Neos, where millions of compositions are analyzed before presenting the optimized formula. It is designed to avoid the local optimum against the global optimum.

NeosAware in its optimization module allows the technician to define the objective functions, all constraints, attributes and raw materials of the project.

The objective function can be the maximization or minimization of an attribute or raw material. Defining restrictions are



Example of the screen to analysis the accuracy of the data.



Example of the screen where the constraints for optimization are collected

performed in a simple way, where the technician can determine the weight of each of them in the calculation of the optimal composition.

What advantages do we have when we use NeosAware?

- We create knowledge within our company. This learning is continues over time.
- Facilitates the characterization and control of raw materials and production compositions.
- Performance and optimization algorithms have been developed and are in operation in ceramic companies around the world, offering efficiency and effectiveness in their results.
- It allows simulating compositions using a very small number of tests, seeking maximum efficiency in laboratory work. In addition, it is possible to import information between different projects, in order to increase the speed in the development of projects or in the resolution of productive problems.
- It allows us to optimize our compositions at the lowest cost, attending to an unlimited number of production restrictions.
- Aids the development of innovative compositions “Thinking outside the box”.
- It gives us a global vision of composition within our company, from a financial, technical or energetic point of view.

It gives us a global vision of ceramic body formulation within our company, from a financial, technical or energetic point of view.

Who are using NeosAware?

Since the beginning of its commercialization, two years ago, they are using companies of all kinds of sizes around the world, which have a body composition preparation plant. In addition, mining companies are utilizing it to increase the add value of their raw materials.

For more information visit our website: www.neos-ceramics.com

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