Sistrade ECO Manager

SisTrade®
Software Consulting, S.A.

Sistrade® EcoManager

ECO-EFFICIENCY

The new eco-efficiency software - Sistrade® EcoManager, appears within the mobilising project PRODUTECH-PSI: New Products and Services for the Manufacturing Industry, in the activity PPS 5 - Energy and Environmental Efficiency of Production Systems. The purpose of this activity involves developing a tool to characterize and improve the eco-efficiency of production systems, where SISTRADE is involved in terms of development and results as well as software programming and sale.

Eco-efficiency unites two "eco" dimensions - economy and ecology, to relate the product or service value to environmental influence. The primary goal of eco-efficiency is to increase the net value of the company/process/product "Do More With Less".

Eco-efficiency can be performance metrics of sustainable companies and organisations, in order to show the economic and ecological progress, translated by contribution (value) for the welfare and corresponding more or less efficient use of environmental, economic and human resources.

MAIN FEATURES

:: Facilitates the analysis/evaluation of mass balance and production systems energy (Inputs/outputs);

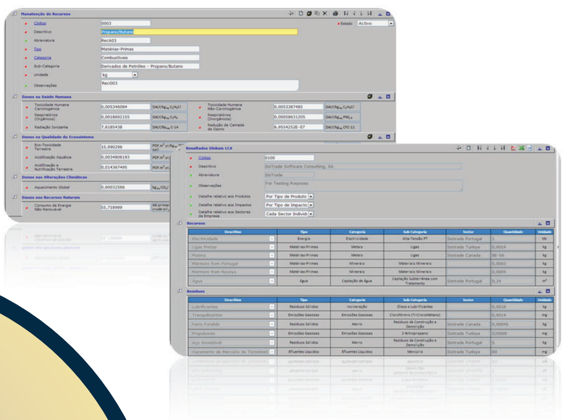
:: Includes methodologies for defining indicators of economic and environmental performance (KPI and KEPI);

:: Allows the integration of economic performance with the company's environmental performance (or processes) and generates the information necessary for the evaluation of eco-efficiency ;

:: Presentation of results as Dashboards (summary tables) of charts and tables based on the key variables for the user;

:: Generation of economic and environmental profile of the company or process under study;

:: Depending on the results obtained, the user can set priorities and measure the most significant inefficiencies, which also allow the implementation of the improvement actions focused on reducing costs, on the more efficient use of resources and raw materials, and reducing the environmental impacts of the activity.



ERP | MIS
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SQL Server

INNOVATIVE FEATURES

:: Simulation of scenarios and definition of economic and environmental goals:
With the results, the software will allow the user to simulate changes in the manufacturing process or in company processes and evaluate the gains that may result from those changes. The simulation scenarios can also help the user to understand what changes/improvements should be performed to achieve certain goals/objectives.

:: Inclusion of performance benchmarks for various lines of activity (benchmarking):
The software foresees the inclusion of reference and average values of the most representative resources typically consumed by a given line/sector as well as the (solid, liquid or gas) emissions. With the inclusion of reference values the user can compare the performance of process or company with the reference values of the lines.

:: Incorporation of listings of the best practices and techniques by line
The listings of the best practices will allow the user support and guide to lessen the typical inefficiency problems and situations of the line. These measures are meant to help the user to improve the performance of the process or the company.

ECO-EFFICIENCY PERFORMANCE CHARACTERISATION

Sistrade® EcoManager software is a decision support tool that combines environmental performance with economic performance. The aim is to quantify the eco-efficiency of a company or process/service, and the assessment of its progress compared to objectives and targets set.

This decision support tool is also an improvement scenarios simulator allowing iterative convergence of the decision with the objectives and targets and the management of alternative hypotheses.

In Sistrade EcoManager, the presentation of results is adjustable by the user and uses a language fully integrated in the company management control, in the fields: environmental, economic and social.

SOFTWARE

Sistrade® EcoManager presents results for decision support in four "modules":
:: Analysis of Mass Flow and Energy (AMFE);
:: Environmental Performance Evaluation (EPE);
:: Model of Environmental Impact Calculation (MEIC);
:: Value Calculation Model (VCM).

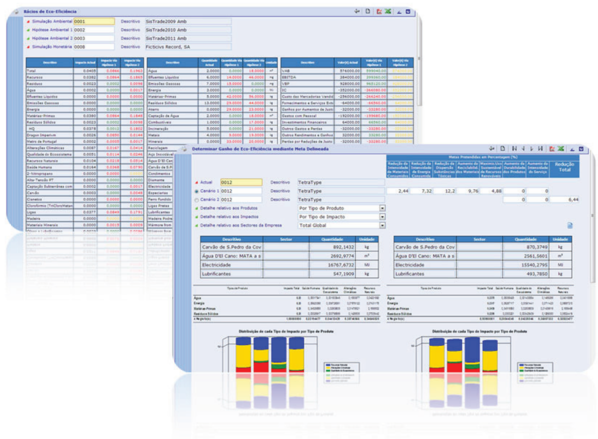
During eco-efficiency process quantification, the tool allows the integration in management control by the means of standard procedures:

:: Consumption and emissions inventory;
:: Mass and energy balance for each area of study;
:: Identifying environmental aspects;
:: Evaluating the significance of environmental aspects;
:: Setting goals and objectives;
:: Identifying the eco-efficiency principles for improvement;
:: Evaluating environmental impact;
:: Setting value of functional feature;
:: Calculating value according to Accounting Standardisation System;
:: Identifying and quantifying the performance indicators;
:: Calculating eco-efficiency ratio;
:: Parameterising company process/service;
:: Determining eco-efficiency development;
:: Simulating and comparing the alternative improvement measures.

The users of this tool can choose between three versions that differ in the level of details of the required information, regarding the processes and consequently in presenting more or less aggregated results.

The simplest Sistrade® EcoManager version is suitable for a user with no experience in the application of methodologies: AMFE, EPE, MEIC or VCM, but who knows and holds information on operational control of processes and the definition of objectives and goals. In this version, the study is limited to the processes identified by the user. For example, material consumption is accounted, but the environmental influence of the process upstream, resulting from the extraction/production/transport of materials is not taken into account. As for the waste, only the influence of environmental waste treatment is considered, downstream of the process, when the destination is incineration or landfilling.

The intermediate version is dedicated to the user with expertise in process analysis and who is familiar with the application of methodologies: AMFE, EPE, MEIC or VCM. As for to information about the process, it should be possible section and detail the consumption and emissions of process activities and to know the features of resource origins, as well as destination of emissions. In this version, the determination of environmental influence is broader, considering the processes upstream and downstream of the object process of the study. Finally, the user can apply the advanced version which consists of a customized product that incorporates knowledge and specific information about the manufacturing system to map/review, and details of possible improvements to be made.



The customisation requires substantial software changes that can be made only with the intervention of the technical team of Sistrade® EcoManager.

ANALYSIS OF MATERIAL FLOW AND ENERGY

Often there are difficulties in quantifying the environmental aspects, especially when a solid structure of information on the use of resources, namely materials, water and energy is not implemented, for this reason Analysis of Mass and Energy Flows (AMFE), is crucial for the planning of environmental management activities.

The aim of AMFE is to propose the basic guidelines for determining critical resource flows, as well as their potential in terms of economic savings and environmental improvements. It is also necessary to draw attention to the need for data communication and monitoring of selected environmental aspects which registration is essential for continuous improvement in pollution prevention, this evolution will be quantified by eco-efficiency ratios.

The data necessary for this step is the same as the periodical evaluations by the companies, listed in monitoring reports on the company performance, particularly in the following aspects:

:: Variation/trend of consumption of raw materials, energy, water, packaging, etc.;
:: Variation/trend of consumption of dangerous substances products;
:: The increase or decrease in production volume;
:: Variations in the waste quantities of generated emissions and effluents;
:: The implementation of environmental programs.

In this context, the determination of eco-efficiency, depends on the effort that the user intends to develop in AMFE and installed monitoring infrastructures. For examples, in the table there, are shown some sources of the most common data.

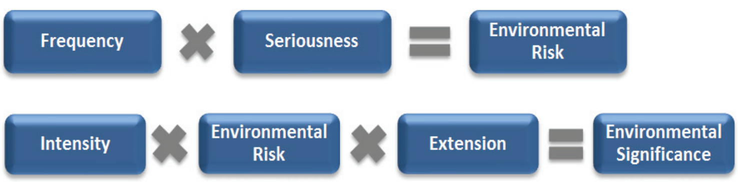
Table 1 – Data sources for AMFE

Data	Source
Waste	Monitoring Notes of SIRAPA waste of previous year Storage volumes and weighing on production sites
Water	Records of counters Water bill
Raw materials	List of suppliers (purchases) Record of consumptions
Electric power	Records of counters by process or sector Energy power supplier bills
Fuel	Supplier invoices Records of consumption by equipment
Emissions	Monitoring reports SIRAPA records – Annual Report

ENVIRONMENTAL PERFORMANCE EVALUATION

The methodology of Environmental Performance Evaluation provides the characterization of environmental performance in terms of the intensity of environmental aspects in each of the seven aims of eco-efficiency.
The result will be an environmental performance of the study unit, characterized by significant environmental aspects, not the environmental impacts, but the environmental risk they pose and the contribution to the aims of eco-efficiency.
The determination of the significance of the environmental aspects is determined by the following variables:

:: Intensity of aspects is determined by the relations/affinity of each environmental aspect, with seven aims of eco-efficiency;
:: Frequency of occurrence of environmental aspects;
:: Seriousness of environmental aspects, depending on the need for prevention;
:: Expect extension, assesses the spatial dimension affected by the environmental aspect.



The user assigns a classification for each aspect (1, 3 or 5) for the Intensity, Frequency, Severity and Extension criteria. Analysing the evaluation of significance of aspects, environmental aspects responsible for the implementation of eco-efficiency aims are identified.

Significant environmental aspects arising from EPE, are the engine of eco-efficiency improvement and serve as the basis for the establishment of comparisons of eco-efficiency ratios. Therefore, at this stage, starts the selection of the ratios and the principles of eco-efficiency covered by the improvement process.

MODEL OF ENVIRONMENTAL INFLUENCE CALCULATION

Eco-Efficiency calculation implies the quantification of environmental influence's value of the process or product/service under analysis. In order to achieve this calculation the software uses an approach based on Life Cycle Assessment (LCA).
LCA is an internationally standardized methodology, through ISO standards, which allows obtaining detailed information related to the environmental influence's value of a product, process or service. Through this methodology, it is possible to set the key aspects and/or potential environmental impacts associated to each one of the stages of a life cycle from the acquisition or extraction of raw materials till their production, use and end of life.

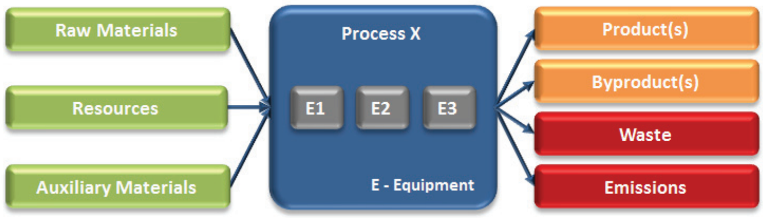
Regarding the LCA standardized methodology it is present on 14040 ISO series as follows:

:: ISO 14040:2006 – Environmental Management – Life Cycle Assessment – Principles and Framework
:: ISO 14041:1998 – Environmental Management – Life Cycle Assessment – Goal and scope definition and inventory analysis
:: ISO 14042:2000 – Environmental Management – Life Cycle Assessment – Life Cycle Impact Assessment
:: ISO 14043:2000 – Environmental Management – Life Cycle Assessment – Life Cycle Interpretation
:: ISO 14044:2006 – Environmental Management - Life Cycle Assessment - Requirements and Guidelines
:: ISO 14047:2003 – Environmental Management – Life Cycle Impact Assessment – Examples of application of ISO 14042
:: ISO 14048:2002 – Environmental Management – Life Cycle Assessment – Data documentation format
:: ISO 14049:2000 – Environmental Management – Life Cycle Assessment – Examples of application of ISO 14041 to goal and scope definition and inventory analysis

Based on this methodology the Model of Environmental Influence Calculation implemented on this software is of universal application and depends of the scope, the boundary of the study and the established inventory (AMFE – Analysis of Mass Flow and Energy). According to a Life Cycle perspective, in order to calculate Environmental Influence all system input and output flows must be identified (AMFE). By system we mean the interaction between all unitary processes connected with each other by a flow of intermediary products, which constitute one or more defined functions.

A generic process should, from the start, have raw materials, resources and auxiliary materials as input flows, which can be defined as follows:

:: Raw Material – set of substances, materials or forms of energy essential to the manufacture of a product and who will make part of the final product.
:: Resources – set of substances, materials or forms of energy non-essential to the manufacture of a product, but who are fundamental for the correct functioning of the used manufacturing process.
:: Auxiliary Materials – set of substances, materials or forms of energy which aim to help on the used manufacturing process, but who are non-essential for the correct functioning of the used manufacturing process itself



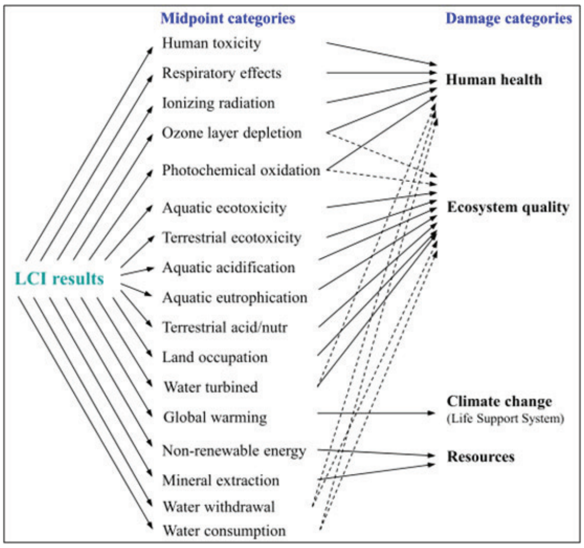
As main output flows, a process might include products, waste, emissions and, in some cases, by products:

:: Product – main substance or material resulting from the manufacturing process;
:: Byproduct – secondary products resulting from the manufacturing process which can be used, without suffering additional transformations, in another manufacturing process whether it is based inside or outside the company;
:: Waste – any substances or objects which the holder discards or has intention or obligation of doing so, namely those identified on the European Waste List;
:: Emissions – Direct or Indirect Flush of substances, materials or forms of energy into the atmosphere, water or soil, under a gas, liquid or solid form, respectively.

Considering the particularities of each flow on product's system, this model presents a multiple approach, always using IMPACT 2002+ as the evaluation method. This evaluation method is a methodology which proposes the implementation of a combined approach, based on conventional risk evaluations of chemical products selection's oriented regulation.

Regarding emissions, it is easy to identify key substances of gas and liquid emissions, mainly because they are covered by current legislation, being their monitoring mandatory. In order to generate the specific Environmental Influence results concerning these substances it was chosen to directly cross their concentrations and emitted quantities with the referred evaluation method. Concerning the remaining flows use has been made of specific databases adaptations, being their results merely indicative of the environmental influence value of the process, product or service under analysis.

IMPACT 2002+ method presents 14 impact categories (medium level categories) which allow a more detailed characterization of elementary flows and other environment interventions that can contribute to the same impact. Each of these categories is allocated, through conversion factors, into one of 4 damage categories (final level categories), namely Human Health, Ecosystem Quality, Climate Change and Resource Depletion. The sum of the obtained results in each of the above categories generates then the final environmental influence associated to the process, product or service under analysis.



ECO-EFFICIENCY RATIOS

Determining the eco-efficiency of processes or products, through the application of this software, is based on the level of accordance of the eco-efficiency principles upon the activities results above which users control or perform some kind of influence. Since the environmental influence evaluation phases, there was integrated the intensity measure of the environmental aspects for the evolution of greater conformity. In this context, the use of this software focuses, mainly, on the characterization and evolution of product value in respect to the wear of resources and environmental influence.
Eco-efficiency ratios can be found through the following expression:

$$\text{Ecoefficiency} = \frac{\text{Product Value}}{\text{Environmental Influence Value}}$$

PERFORMANCE/EFFICIENCY INDICATORS

Just like in determining the eco-efficiency ratios, as the final result of the software use, it is possible to quantify environmental performance indicators, namely KEPIs, based on the following expression:

$$\text{Performance Indicators} = \frac{\text{Product Value}}{\text{Environmental Influence Value (Physical Value)}}$$

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