EINSTEIN – The Thermal Audit Tool Kit

EINSTEIN is a methodology that works out energy efficient solutions for your production process based on energy saving and renewable energy sources.

- Therefore EINSTEIN calculates the total thermal energy demand from consumers of complex heat and cooling energy and breaks it down into different components.
- It evaluates process optimisation possibilities and indicates demand reduction through the use of efficient technologies.
- It analyses the production processes by a Pinch Analysis to assess saving opportunities through heat exchange between various process streams.
- Based on a reduced heat demand EINSTEIN shows the technical alternatives for the integration of energy efficient and renewable energy supply systems and evaluates them in a detailed cost calculation.

Main characteristics of the thermal energy audits realised with the EINSTEIN tool kit:

- → **Easily affordable for SMEs.** Data processing is optimised and allows quick proposal elaboration.
- → **High quality.** Provides quantitative figures on energy and economic saving potentials achievable by renovated heat supply systems. Generated alternative proposals will integrate all the most relevant energy efficient technologies (e.g. process optimisation, heat recovery, renewable energy sources).
- → **Comprehensive evaluation.** Preliminary designs of the most cost-competitive options will be generated, including the evaluation of environmental impact and economic performance through a total cost analysis.
- → **Help for data estimation.** Estimation tools searching for not explicitly available information help to already carry out a first fast assessment with very few data.
- → **Reliable.** An internal data cross-check procedure is foreseen.
- → **User friendly.** Easy to handle interface among the different energy and economic modules.

Elements of EINSTEIN Toolkit

MODULES IN EINSTEIN

Data Acquistion and Analysis Module
Consistency Checking and Benchmarking

Process Optimisation Module
Technological Optimisation by Pinch Analysis

Heat Recovery Module
Calcuation of Optimized Heat Exchanger Network

Energy Supply and Renewables Module
CHP, Heat Pumps, Solar Thermal, Biomass

Evaluation Module
Economic, Energetic and Environmental Evaluation

Reporting Module
Automatic Report Generation

EXPERT SYSTEM FOR AN INTELLIGENT SUPPLY OF THERMAL ENERGY IN INDUSTRY

PROJECT COORDINATOR
JOANNEUM RESEARCH, Austria

INTERNATIONAL CONSORTIUM OF PARTNERS
Austrian Energy Agency, Austria

DMA, Sapienza University of Rome, Italy

Cestec Spa, Italy

University of Maribor, Slovenia

Enviros s.r.o., Czech Republic

Steng-National Cleaner Production Centre Ltd., Slovenia

KAPE S.A., Poland

EnergyXperts, Spain

Cámara Madrid, Spain

Sabadell City Municipality, Spain

COGEN Europe, Belgium

Contact:
Christoph Brunner
JOANNEUM RESEARCH
christoph.brunner@joanneum.at

National contacts and further information:
www.iee-einstein.org

Supported by
Intelligent Energy Europe

IMPRINT
Editor: Austrian Energy Agency,
Mariahilfer Straße 136, 1150 Vienna
The production of this brochure was financially supported by the European Commission under the „Intelligent Energy - Europe" programme (Project: EINSTEIN, EIE/07/210/SI2.466708).
The sole responsibility for the content of this brochure lies with the authors. It does not necessarily reflect the opinion of the European Communities. The European Commission is not responsible for any use that may be made of the information contained therein.

Photo: BilderBox Bildagentur Gmbh.com
Design floorfour, Vienna

www.iee-einstein.org

EINSTEIN thermal energy industry audit

THE TECHNICAL GUIDELINE

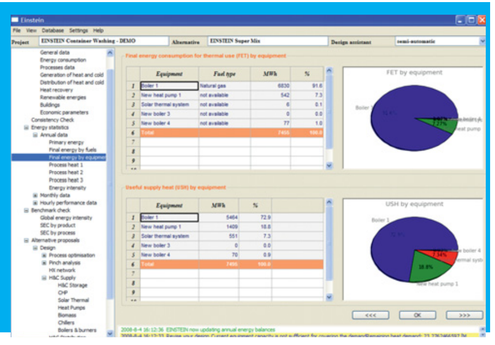
THE THERMAL AUDIT FOR COMPANIES WHO WANT TO REDUCE ENERGY CONSUMPTION

Data Acquistion and Analysis Module Consistency Checking and Benchmarking

The fast and easy to use data acquisition with automatic elaboration of a questionnaire includes a procedure for estimation of non-available data. With a benchmarking database the current energy consumption of the company is compared with the typical standard values of similar processes.

Tools

- Questionnaire for the data acquisition
- Consistency checking
- Procedure for estimation of non-available data
- Processes benchmarking



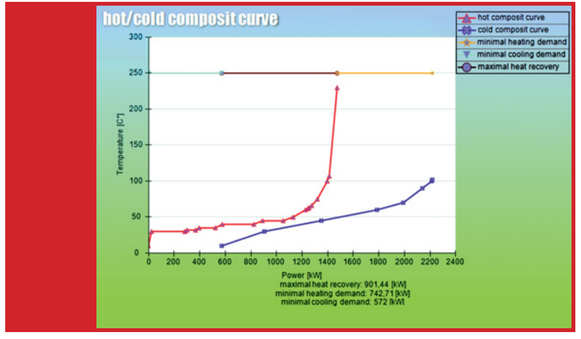
Breakdown of present state energy consumption: heat supply by equipment

Heat Recovery Module Calculation of Optimised Heat Exchanger Network

The heat recovery module helps designing and optimising an appropriate heat exchanger network for heat recovery and process integration. Therefore EINSTEIN analyses process streams and waste heat/cooling demand and identifies the potential for heat recovery by Pinch Analysis. It takes into account energy demand and availability including the time schedules of processes.

Tools

- Generation of a mathematically optimised heat exchanger network
- Calculation of energy demand and availability curves for the production system
- Recalculation of proposed heat exchanger network according to the users' preferences



Hot and cold composite curve of meat processing company

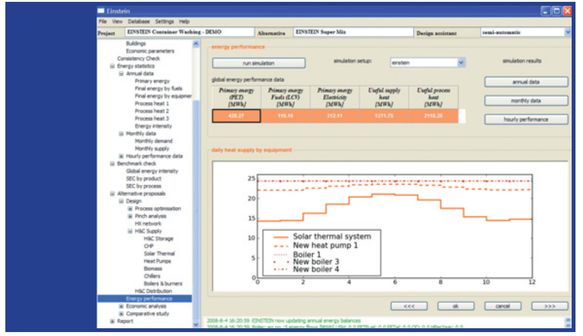
Evaluation Module Economic, Energetic and Environmental Evaluation

EINSTEIN calculates the energy performances of the designed supply systems and comprises a Total Cost Assessment for economic and financial evaluation. It is based on a cost analysis detecting all parameters that influence the economic performance of energy efficiency measures and of the supply system besides energy costs. Thermal energy and electricity costs, depreciations, fees for legal requirements, and additional maintenance costs are taken into consideration.

As a result the user gets a performance description of the project, including budget estimation, economical roadmap and possibilities of funding, e.g. for contracting.

Tools

- Dynamic calculation of the heat and cold energy supply system performances
- Automatic total cost assessment
- References for national funding for investments



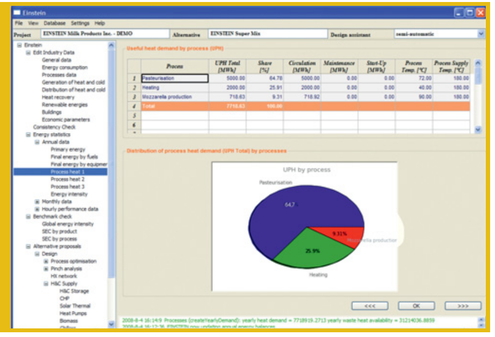
System simulation with EINSTEIN: contribution of different heat supply sub-systems to total demand

Process Optimisation Module Technological Optimisation by Pinch Analysis

As a first step after the data acquisition and analysis, the process optimisation module shows the variety of options which are available to improve the efficiencies of the processes and the equipment installed.
The module summarises new and best available technologies for important unit operations (washing, drying, sterilisation etc.) and enables the synergy between technologies used in different sectors.

Tools

- Database of best available technologies and process optimisation measures for different unit operations
- Identification tool for optimisation possibilities for the technology and equipment used in the processes



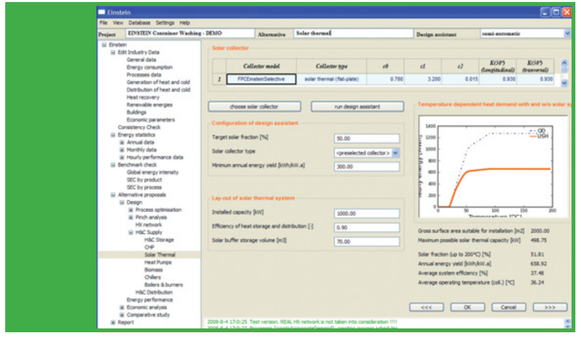
Breakdown of present state energy consumption: process heat demand by processes

Energy Supply & Renewables Module CHP, Heat Pumps, Solar Thermal , Biomass

The heat and cold supply modules help to select and design the most appropriate energy supply equipments and heat or cold distribution systems. EINSTEIN analyses the following supply-options: combined heat and power, heat pumps, solar thermal systems and biomass, standard heat and cold supply systems.

Tools

- System Design Assistant
- Databases on energy supply equipments

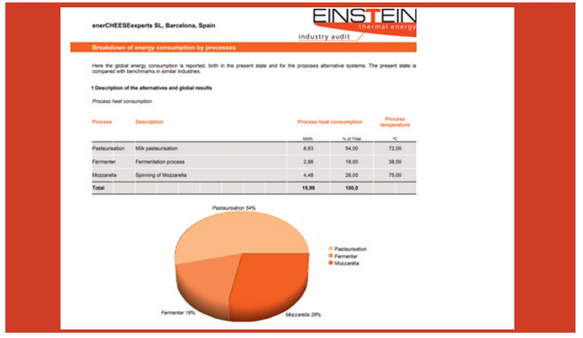


Design assistant for solar thermal systems

Reporting Module Automatic Report Generation

EINSTEIN automatically creates an exhaustive audit report that summarises the main results of the analysis on both the present state and the energy saving alternatives. The report can be printed and delivered to the audited company.

As a result the user gets a performance description of the project, including budget estimation, economical roadmap and possibilities of funding, e.g. for contracting.



Description of the alternatives and global result