

Industrial Alliance for Reducing Energy consumption and CO₂ emissions (IND-ECO)

Leather and footwear industries

Work Package 2 - Inventory and benchmarking Task 4: Energy audit and benchmarking

Energy Audit template

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Foreword

The “Energy audit template” is a guided index of a complete and sound “energy audit” in an industrial plant.

The “Energy audit template” is aimed to:

- Provide an index of a complete audit of the energy management
- Provide suggestions and recommendations to allow auditors to completely and soundly fill in the audit report
- Establish a shared audit report structure suitable to compare results of different energy audits, focusing the reporting to detailed energy performances indicators to be investigated during the audit

The “Energy audit template” herewith presented is part of the deliverable D2.1 “Inventory plan and resources”:

The “Energy audit template” can also be used as a training supporting tool addressed to companies management and staff to “update companies management and staff” (see point “1” of the deliverable D2.1).

Definitions

EN ISO 50001:2011 "Energy Management Systems – Requirements with guidance for use"

- Energy: electricity, fuels, steam, heat, compressed air, and other like media
- Energy consumption: quantity of energy applied
- Energy efficiency: ratio or other quantitative relationship between an output of performance, service, goods or energy, and an input of energy

EXAMPLE Conversion efficiency; energy required/energy used; output/input; theoretical energy used to operate/energy used to operate.

NOTE Both input and output need to be clearly specified in quantity and quality, and be measurable.

- Energy management system: (EMS) set of interrelated or interacting elements to establish an energy policy and energy objectives, and processes and procedures to achieve those objectives
- Energy management team: person(s) responsible for effective implementation of the energy management system activities and for delivering energy performance improvements.

NOTE The size and nature of the organization, and available resources, will determine the size of the team. The team may be one person, such as the management representative.

- Energy objective: specified outcome or achievement set to meet the organization's energy policy related to improved energy performance
- Energy performance: measurable results related to energy efficiency, use and consumption

NOTE 1 In the context of energy management systems, results can be measured against the organization's energy policy, objectives, targets and other energy performance requirements.

NOTE 2 Energy performance is one component of the performance of the energy management system.

- Energy performance indicator EnPI: quantitative value or measure of energy performance, as defined by the organization

NOTE EnPIs could be expressed as a simple metric, ratio or a more complex model.

- Energy review: determination of the organization's energy performance based on data and other information, leading to identification of opportunities for improvement

NOTE In other regional or national standards, concepts such as identification and review of energy aspects or energy profile are included in the concept of energy review.

- Energy target: detailed and quantifiable energy performance requirement, applicable to the organization or parts thereof, that arises from the energy objective and that needs to be set and met in order to achieve this objective

- Energy use: manner or kind of application of energy

EXAMPLE Ventilation; lighting; heating; cooling; transportation; processes; production lines.

- Significant energy use: energy use accounting for substantial energy consumption and/or offering considerable potential for energy performance improvement

NOTE Significance criteria are determined by the organization.

- Tonne of Oil Equivalent (TOE): is a unit of energy: the amount of energy released by burning one tonne of crude oil, approximately 42 GJ

EN 15900:2010 "Energy efficiency services – Definitions and requirements"

§3.3 "Energy audit"

- Energy audit: systematic inspection and analysis of energy use and energy consumption of a system or organization with the object of identifying energy flows and the potential for energy efficiency improvements.

Note: "Energy audit is the normal expression in English but can cause confusion when translated due to the word "audit" having multiple meanings. Suitable expressions can be used when translating into other languages, for example "diagnosi" in Italian, "diagnostic" in French.

EN ISO 19011:2011 "Guidelines for auditing management systems"

§3.8 "auditor":

- person who conduct an audit

§3.9 "audit team":

- one or more auditors conducting an audit, supported if needed by technical experts

§3.10 "technical expert":

- person who provides specific knowledge or expertise to the audit team

§3.11 "observer":

- person who accompanies the audit team but does not audit

Note: an observer is not part of the audit team and does not influence with the conduct of the audit

§3.13 "audit programme":

- arrangements for a set of one or more audits planned for a specific frame and directed towards a specific purpose

§3.14 "audit scope":

- extent and boundaries of an audit

Note: the audit scope generally includes a description of the physical locations, organizational units, activities and processes, as well as the time period covered

§3.15 "audit plan":

- description of the activities and arrangements for an audit

1 Dates and duration of the audit

Suggestions and recommendations

Specify:

- *The total audit duration in man-days or man-hours*
- *The number of auditors involved and the distribution of the audit time among the members of the audit team*
- *The calendar dates of the audit*

2 Audit scope

Suggestions and recommendations

Specify the locations (City, address) where the audit has been carried out:

- *Main factories, facilities, plants, installations*
- *Any related minor warehouse, plant, etc.*

Specify the organisational units / company's departments audited, such as: production; storages/warehouses; purchasing department; design/technical office, etc.

Specify the period of time covered by the audit; typically, an energy audit covers one or more years.

3 Audit objectives

Suggestions and recommendations

State the Energy audit objectives.

Examples of possible energy audit objectives are provided below:

- *Identify and quantify energy uses and consumptions.*
- *Identify opportunities for improvement.*
- *Assess changes in energy uses and consumption after a period of time compared with an energy baseline.*
- *Assess effectiveness of selected improvement projects.*
- *Check the effectiveness of corrective actions.*
- *Define the degree of conformity of the Energy Management System to the ISO 50001:11 standard.*
- *Assess the degree of implementation of the Energy Management System.*
- *Assess the degree of knowledge of the applicable legislation*
- *Identify and quantify energy uses and consumptions of selected suppliers.*

The organisation may define any audit objective suited for its aims.

More audit objectives as proposed above may be combined in more complex objectives.

4 Audit planning

Suggestions and recommendations

Before the energy audit is performed, an audit plan shall be prepared and delivered to the audited subjects. In the audit report, you should make reference to the applicable audit program and/or audit plan:

Confirm if the audit program/plan has been complied with.

Detail any changes if existing.

Confirm if the changes in the audit program/plan affected the audit objective.

5 Audit team

Suggestions and recommendations

List the members of the audit team

Detailing the role of each of them (e.s.: Lead auditor, auditor, auditor in training, technical expert, observer, etc.).

6 Interviewed persons

Suggestions and recommendations

List the persons that have been met and interviewed during the audit.

Specify the role of each of them.

7 Reference documents

Suggestions and recommendations

Provide the list of the documents that have been analysed and/or assumed as source of information during the audit.

Examples of reference documents for an energy audit are:

- *Energy review*
- *Energy Policy*
- *Energy Management System manual*
- *Organisational charts, job descriptions*
- *Energy objectives and targets*
- *Records of energy consumptions and performances*
- *Invoices of energy consumptions*
- *Standard operative procedures, instructions*
- *Manuals and technical descriptions of plants, installations, etc.*
- *Contracts with providers of energy, suppliers, etc.*

Always mention the revision and/or the date of each reference document.

8 Energy baseline

Suggestions and recommendations

Mention the energy baseline adopted as reference for the energy audit.

Specify the reference time period.

Describe any limitation to the use of the energy baseline.

9 Calculation or estimation methods

Suggestions and recommendations

Mention all the calculation or estimation methods that have been agreed upon

Specify if methods have been contractually defined

10 Audit findings

10.1 Energy performances indicators (EnPI)

Suggestions and recommendations

Provide the list of the EnPI adopted as reference for the energy audit.

A list of recommended EnPIs are provided below.

| EnPIs for tannery audits | | |
|------------------------------------------------------|----------------------------------------------------|------------------------------|
| Energy use / factory area | Variable influencing energy consumption | EnPI |
| Lighting | Square meters | kWhel / m ² |
| Process vapour / heat production – Total consumption | Production of web blue (m ²) | MJ methane / m ² |
| Process vapour /heat production – Total consumption | Production of finish hide (m ²) | MJ methane / m ² |
| Electric power | Production of web blue (m ²) | kWhel / m ² |
| Electric power | Production of finished hide (m ²) | kWhel / m ² |
| Electric power – total | Production of finished hide (m²) | kWhel / m² |

| EnPIs for tannery audits | | |
|-------------------------------|---------------------------------------------------|----------------------------|
| Energy use / factory area | Variable influencing energy consumption | EnPI |
| Lighting | Square meters | kWhel / m ² |
| Electric power – total | Production of finished pairs of shoes (n°) | kWhel / n° of pairs |

10.2 Strength points

Suggestions and recommendations

It is recommended to point out strong points of the energy management identified during the energy audit.

Strength points may include:

- *Good energy performances*
- *Good competence of the energy team or of the energy manager*
- *Good monitoring systems*
- *Good organisation*
- *Others*

10.3 Areas for improvement

Suggestions and recommendations

This part of the energy audit may include any recommendation for improving the Energy Management System, such as:

- *Better definition of roles and responsibilities*
- *Improvements of the metering plan and data analysis*
- *New and more suited EnPIs*
- *Improvements of operational procedures*
- *Improvements in maintenance*
- *others*

10.4 Unconformities

Suggestions and recommendations

This section of the audit report should point out any situation where an established requirement, such as a procedure or an operational criteria, has not been fulfilled.

When listing "Unconformities", always mention the specific requirement that has not been fulfilled and describe the situation in such a way that no misunderstanding is possible.

10.5 List of the possible energy efficiency improvement actions

Suggestions and recommendations

All the possible actions identified during the energy audit should be listed.

It may be the case to describe economical and technical difficulties for each of them.

The degree of detail of the description of actions may be defined by the audit client when defining the audit objectives.

10.6 List of energy efficiency improvement actions

Suggestions and recommendations

When included into the audit objectives, all the energy efficiency actions agreed upon after the energy audit shall be listed.

It may be the case to describe economical and technical difficulties for each of them.

The degree of detail of the description of actions may be defined by the audit client when defining the audit objectives.

Provide the definition of roles and responsibilities to achieve objectives, as well as resources, single tasks and deadlines.

11 Difficulties encountered during the audit, included any lack of agreement on the audit conclusions

Suggestions and recommendations

This part of the audit report may be useful to prevent any conflict and to grant transparency in the audit conclusions.

12 Not covered areas

Suggestions and recommendations

Describe areas (parts of the energy scope) that were originally included into the audit scope and that have not been audited.

Provide justifications for any occurred exclusion.

13 Non-disclosure claim

Suggestions and recommendations

The audit team members shall subscribe a declaration of commitment to a non disclosure agreement, such as "according to limits set up by the law, the audit team shall hold any classified information received in confidence during the audit and shall not disclose it to any third party without the approval of the audit client".

This commitment – or an equivalent one - may be included onto the audit contract.

14 Distribution list

Suggestions and recommendations

The audit report should include the list of persons to which the audit report will be sent.

This will grant transparency and a correct sharing of information.

15 Date and signature

Suggestions and recommendations

The audit report shall be signed at least by the team leader.

The date of the audit report may be different from the dates in which the audit has been carried out on site.