




Field Benchmarking and Market Development for Audit Methods in Air Conditioning

Intelligent Energy  Europe

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AUDITAC

- **Long name:**
 - "Field Benchmarking and Market Development for Audit Methods in Air Conditioning".
- **Frame work:**
 - Energy Performance in Buildings Directive , Article 9: Inspection of air conditioning systems
 - ECCAC Study: high energy saving potential (about 35.000 GWh/a)
 - [http://www.energyagency.at/\(de\)/projekte/aircondbig.de.htm](http://www.energyagency.at/(de)/projekte/aircondbig.de.htm)
 - Team (7 countries, one European Organisation)
- **Periode of the project:**
 - January 2005 to 12/2006 (24 months)
- **Project website:**
 - [http://www.energyagency.at/\(en\)/projekte/auditac.htm](http://www.energyagency.at/(en)/projekte/auditac.htm)
 - UK Web-page:
 - <http://www.cardiff.ac.uk/archi/research/auditac/index.html>
- **Available information on the Web**
 - Newsletters
 - Press release
 - papers presented on congress
 - technical guidelines



Project Team



France (Project coordinator)
Armines - Mines de Paris



Austria
Austrian Energy Agency



Slovenia
University of Ljubljana



Belgium
Université de Liège



UK
Association of Building Engineers



Italy
Politecnico di Torino



BRE
(Building Research Establishment Ltd)



Portugal
University of Porto



Welsh School of Architecture

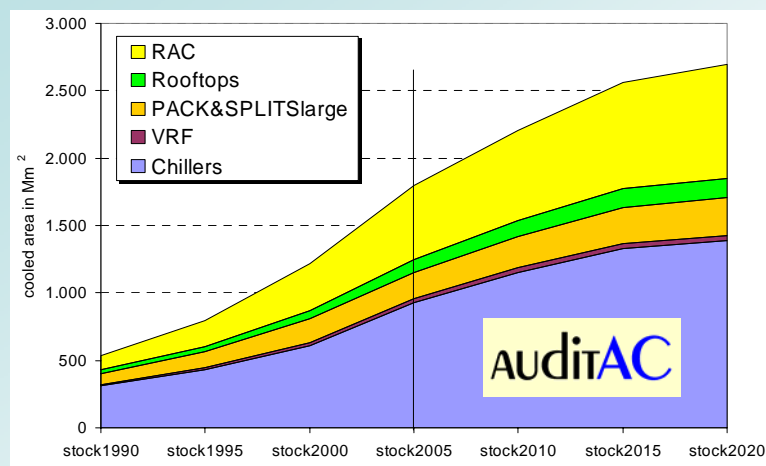


Eurovent-Certification



Overall situation of AC-Systems in Europe (EU 15)

Source: EECCAC project

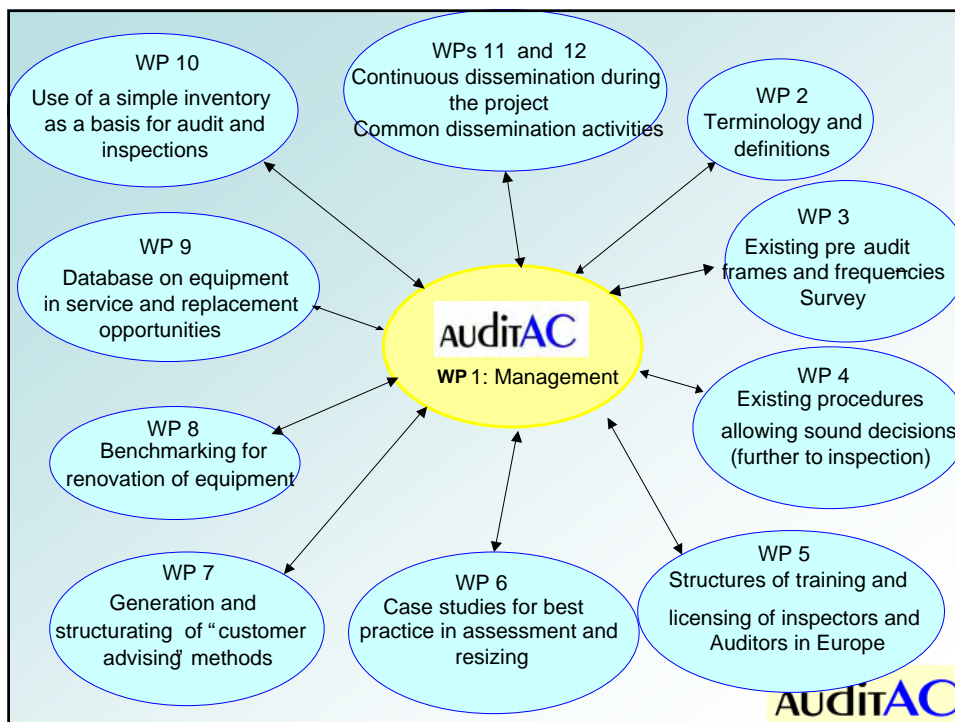


European air conditioning market: forecast for 2020



Core aim of AUDITAC

1. To provide tools and training that will enable air-conditioning system owners and operators to confidently identify energy saving actions.
2. Substantial potential savings have been identified, but it has been proved difficult to persuade owners and operators to invest in improvements.
3. The project offers a starting point (the regulatory requirements of the EPBD “inspection”) to improve and set up an A/C “audit” that is likely to result in appropriate action for effective savings.



WP 2

Terminology and definitions

1. Establish a common language about AC systems and a common frame of work
2. Preliminary definitions of preliminary audit, detailed audit and their consequences
3. Underline the difference with inspection and maintenance

WP 2

Terminology and definitions

1. Define an accepted classification of AC systems and comfort levels definitions
2. Define the opportunities of improvement on the European AC market
3. Define the AC systems degradation of operation and efficiency and establish a terminology for defects intervening in a air conditioning system life
4. Define the aspects should be considered in an audit

WP 3: Prerequisites

- Terminology agreed in work package 2
- Pre-Audit: Discovering of the actual building, its actual HVAC system, its actual use and its actual occupancy. Determination of the existence or not of faults or possible improvements within the following limits: 1 day on-site, visual verifications, analysis of as built records, system manual, possible complaints and operating costs. Potentially room for short tests of functional performances, but without, or with very limited additional instrumentation (may be just a few checks in order to verify that the main equipment is in “normal” use and that the control system is “normally” active)
- Terminology derived from **CEN drafts**:
 - Building Research Establishment will add knowledge of CEN standards

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WP 3: Survey

- Bibliography of the existing pre-audit frames and frequencies through survey
- Links with CEN standards about inspection of A/C systems
 - About prEN 15240: We thought that three directions of progress are possible in the present draft of standard, already an acceptable basis for discussion and we made proposal of possible improvement of the standard to CEN body
- Eurovent experts from all working groups will contribute to survey

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WP 3: Report content

- Collection of research references related to pre-audit scheme and other references that should be considered as source material for the reference guide
- Determination the nature and effectiveness of the inventory and inspection schemes already on the market for the EU countries not involved in the project
- Collection of information dealing with implementation of Article 9 of EPBD for EU countries
- A Pre-audit procedure is proposed (pre-audit steps) with checklist for data collection and list of Energy Conservation Opportunities (ECOs, collaboration with WP4)

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WP 4 Report contents

- An **Energy Conservation Opportunities (ECOs)** list for air-conditioned buildings
- Improvement through actions aimed at Envelope and loads
- Improvement through Operation & Management
- Improvement through BEMS
- Performance enhancement through adequate improvement works

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WP 4 Report contents

- **Envelope and loads**
- This chapter explains how ECOs implying improvements to building envelope or lighting systems may positively affect the energy performance of the AC system
- **Operation & Management**
- O&M diagnosis and assessments
- Inclusion of proper clauses in O&M contracts
- Classification of O&M ECOs

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WP 4 Report contents

- **Improvement through BEMS**
- Methods usually programmed in BEMS
- Evaluating the current BEMS
- Detailed description of BEMS functions (in Annex).
- **Performance enhancement through adequate improvement works**
- Classification of plant ECOs
- Methods for cost-effectiveness evaluation

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WP 5

Structures of training and licensing of inspectors and auditors in Europe – how to integrate Energy Efficiency in structures in place

•THE SUCCESS PATHWAYS

- Better O&M as a source of Energy Efficiency
- Renovation on the grounds of EE
- Combination of EE with reliability improvement or comfort improvement
- Combination of EE with general retrofit
- Various links between EPBD and audits

•EDUCATIONAL ISSUES

- Bodies in charge of educational system and technical training
- Which contents are to be passed to which target groups
- Feedback of use of our training package

•QUALIFICATION AND ACCREDITATION ISSUES

- Definitions about qualification, certification, accreditation
- Relationship between Auditors, Inspectors and O&M



WP 6

Case Studies

- Computer Centre - VFR close control system



- Classroom – Comfort (acoustic) & Energy ! CO2 control



- Library – Control & ventilation!
- Absorption system



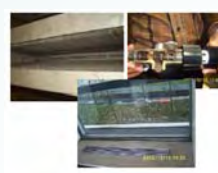
- Lab HVAC – Dirty filter
- DX system

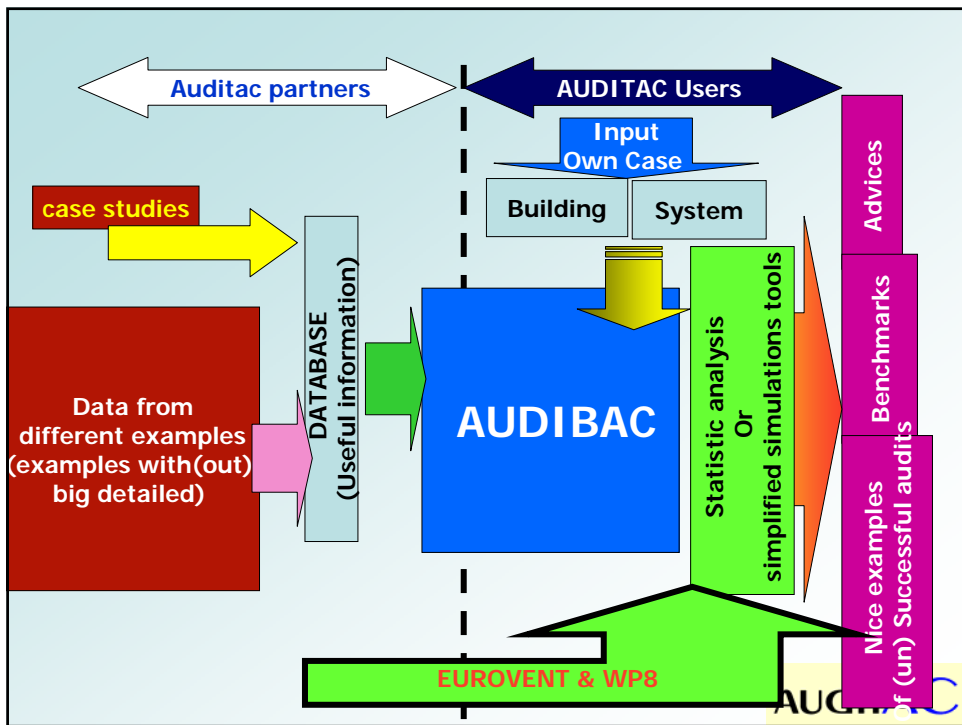
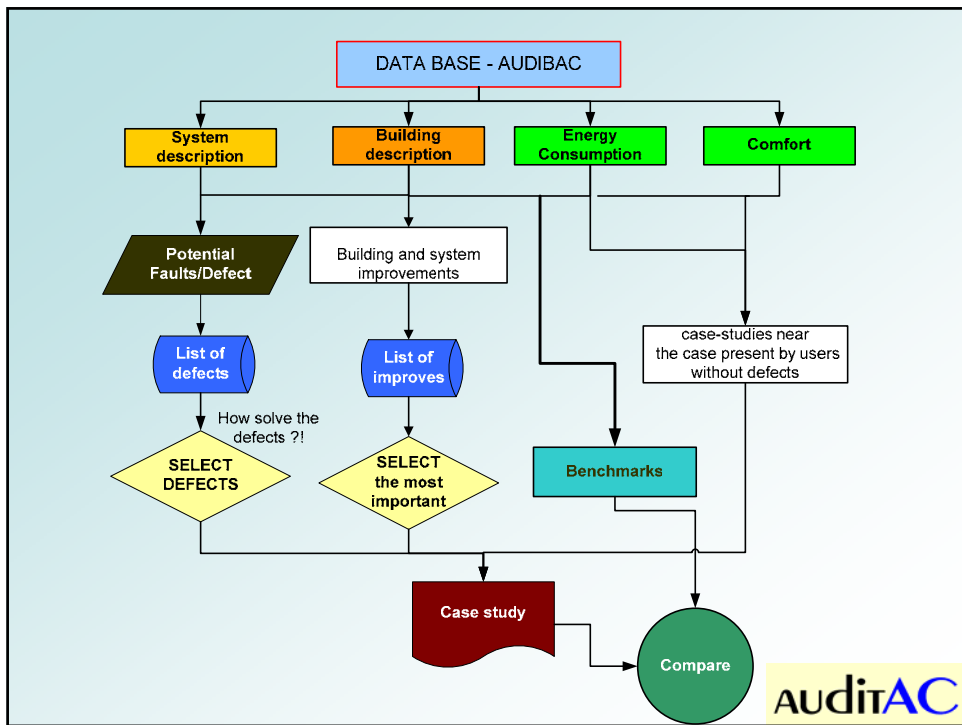


- Office building
- Refurbishing



- Office building
- Induction system problems





WP 7 – Customer Advising Tool

The results of this work package will be presented as a website.

This is the interface to a searchable database populated by both real case studies and simulated forms.

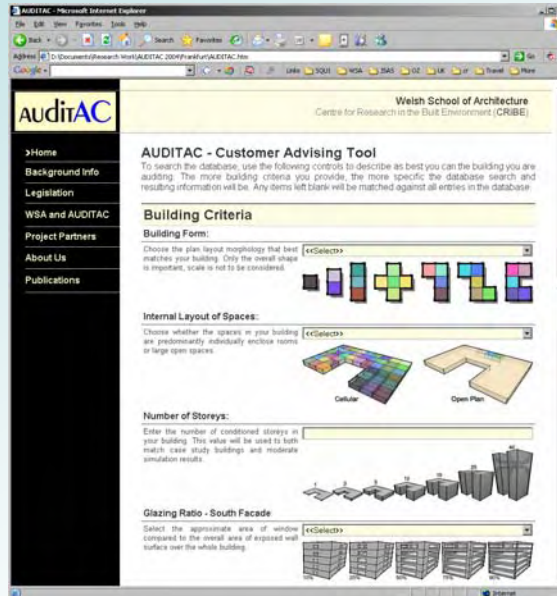
This will allow users to search on **building criteria** and see the potential savings on a range of building **parameters**.

Building criteria:

- Plan Layout
- Number of Storeys
- Internal Layout of Spaces
- Glazing Ratio (South & Other)
- Thermal Mass
- Plan Depth
- Location / Region

Building parameters:

- Fabric U-Value
- Window U-Value
- Shading (SHGC)
- Infiltration Rates
- Internal Gains

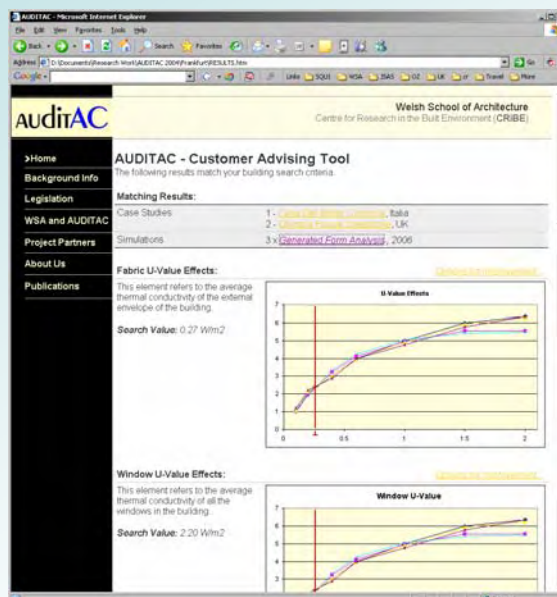


WP 7 – Customer Advising Tool

Search results show graphs of variation in energy use due to changes in each modeled parameter.

Calculations are now underway on the generated configurations and modelling of the 14 existing case studies is progressing.

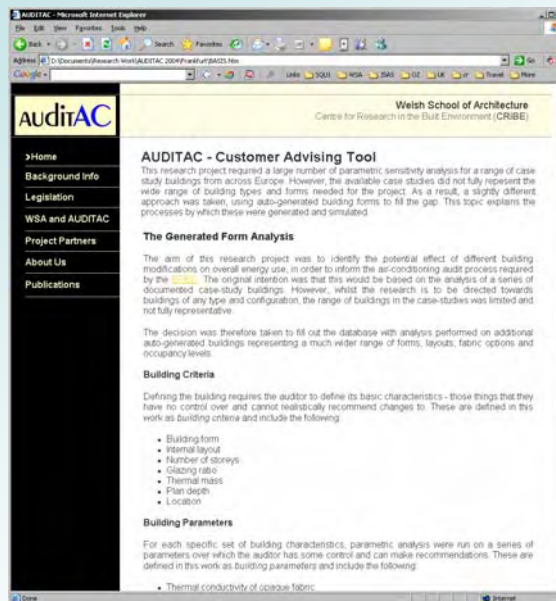
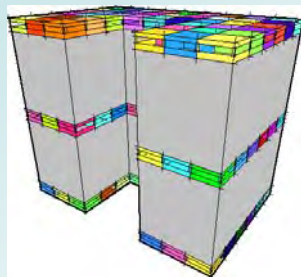
Search results include links to the WP 6 case study database as well as options for improvement developed as part of WP 4.



WP 7 – Customer Advising Tool

The theoretical basis of both the form generation and the calculation methods are available on the site.

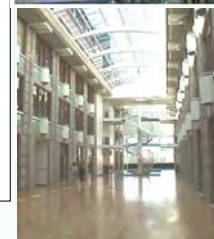
This includes a discussion of how factors such as multiple-storeys and self-shading were accommodated.



WP 8

Benchmarking for renovation of equipment

- Selection of some **case studies**
- Selection of **renovation measures (HVAC system variants)**
- Development/adaptation/validation of **simulation models**
- Use of models to establish **reference performance**
- Simulation of variants to assess **effectiveness of renovation measures: generation of benchmarks**



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WP 8 Deliverables

- Validated methodology
- «Audit-adapted » simulation models: executable files
- Applications to case studies and selected renovation measures

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WP 9 The Eurovent database for past equipment

EUROVENT-Cecomaf is a European Association of Air Handling and Refrigerating Equipment Manufacturers, actually includes fifteen National Associations from eleven countries.

EUROVENT-Certification develops a certification programme based on a voluntary initiative of the industry, which aim is to certify the performance ratings of refrigeration and a/c equipment by independent tests according to European and international standards.

Database of data on the equipment in service in an easy to use form.

The database allows comparing data and performances of old equipment (from 1990 certified products) with equipment in sale today, avoiding the waste of time often due to the leak of accessible information on old equipment and reliable information of new equipment.

Available at <http://www.eurovent-certification.com/>

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WP 10: Use of a simple inventory as a basis for audit and inspections

A simplified inventory method to rise awareness of owners about the AC plants, tools to prepare and make easier the audit procedure.

Two tools available:

1. Simple inventory method for AC systems that can be performed by non technical person, before audit
2. AC cost: a simple tool for running costs calculation and savings estimation for some energy improvement measure

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WP 11 & WP12 DISSEMINATION

- Webpage
 - <http://www.energyagency.at/auditac.htm>
 - <http://www.cardiff.ac.uk/archi/research/auditac/index.html>
- Auditac Poster
- Newsletter
 - 4 Newsletter already published
- press release and several articles (> 20) about AUDITAC
- several deliverables
 - EUROVENT-Certification
 - energy efficiency information about equipment back to 1995
 - www.eurovent-certification.com
 - technical guidelines
 - Vol. 2: Energy Auditing of Air Conditioning Systems and the Energy Performance in Buildings Directive: what does the new regulation say
 - Vol. 4: An AUDIATC proposed preliminary audit methodology for airconditioning facilities best practise cases
 - papers from different congress,
 - http://www.energyagency.at/projekte/auditac_publ.htm
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