Review of EU airport energy interests and priorities with respect to: ICT, energy efficiency and enhanced building operation

Andrea Costa, Luis M. Blanes, Ciara Donnelly and Marcus M. Keane
National University of Ireland, Galway, Civil Engineering Department
Informatics Research Unit for Sustainable Engineering (IRUSE). University Road, Galway, Ireland
ICEBO 2012 - 23-26 October. Manchester
Overview

1. CASCADE: ICT for ENERGY EFFICIENCY
2. AIRPORT overview
3. EU AIRPORT SURVEY: Sample
4. EU AIRPORT SURVEY: Sources of Information and Data Availability
5. Energy and CO2 data ISSUES
6. GRAPHS: Energy figures and Normalisation
7. Energy Actions and Interests
8. Future Work
CASCADE: ICT for Energy Efficient Airports

- CASCADE will develop facility-specific measurement-based energy action plan for airport energy managers underpinned by systematic Fault Detection Diagnosis (FDD) Methods.
- CASCADE will develop a framework and methodology to underpin the execution of customised ICT solutions building upon existing ICT infrastructure. >>> LEGACY SYSTEMS
- CASCADE will enable transformation of FDD into actionable information by developing an energy action plan that links Actions-Actors-ISO50001 Standards through a web-based management portal.

WP1: Operation scenarios of the European airports and other like facilities >>> survey

PROJECT PARTNERS

This research was funded by the Irish Research Council for Science, Engineering & Technology (IRCSET), D'Appolonia s.p.a. and the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement No. 284920.
EU Airports: 1.5 Billion Passenger / Year

Images: https://maps.google.es/
EU Airports: Sample

ACI Europe
AIRPORTS COUNCIL INTERNATIONAL

93 busiest Airports 2010 by PAX

57 ACA Accredited Airports

Final SAMPLE 113 airports

ENERGY CONSUMPTION

ACTIONS

Sources of information

- Corporate Social Responsibility Report, 9%
- Sustainability Report, 37%
- Environmental Report, 46%
- Annual Report, 18%
- Others, 11%
• Cluster of airports: Aggregated figures
• Small airports benefit from general policies at large organisations
Carbon emissions by Scope
Source: http://www.ghgprotocol.org/
Scope 1: All direct GHG emissions.
Scope 2: Indirect GHG emissions from consumption of purchased electricity, heat or steam.
Scope 3: Other indirect emissions. (…)

Transport coming from/to airport?
Aircraft main engines in the LTO cycle? Aircraft emissions during cruise on flights to or from airport?

Carbon emissions by Activity
Energy Figures. Absolute Energy Use

Energy Consumption = [gas+electricity+district heating & cooling+fuel] − [sold energy]

PAX = [international passengers + domestic passengers + direct transit passengers]
Energy Figures 2: Normalised Energy

Number of passengers (PAX millions)

- 2009
- 2010
- PAX

Small airports
Energy Figures 3 Normalised Figures

Bubble size = PAX

Energy Consumption [GWh]
ENERGY ACTIONS and INTERESTS

Percentage from total number of Actions

- Energy management and operation: 35%
- Lighting: 20%
- HVAC: 17%
- Renewable Energy Technologies (RET): 28%
Energy Actions and Interests. 1

Energy Management and Operational Procedures

• Expansion of systems for central operations monitoring of boiler and power controls;
• Environmental training;
• Installation of additional metering for controlling major consumption points
• Integration of additional metering with existing Building Management Systems
• Replacing all oil vehicles with electric Powered vehicles
• Lower aircraft average taxiing time by 10% by 2015
• Power sources provided at Gate (400Hz) as opposed to using Aircraft APU
• Shutdown of Baggage handling systems when not in use
Energy Actions and Interests. 2

**Lighting**

- **Motion detection** for lighting
- **LED Replacements**
- Intelligent Lighting controls for areas of low occupancy. **Passive Infrared Sensors (PIR)**
- Retrofit of 65000 light fittings with Retrolux system (reduction of approx 20W per fitting)
- Roof glazing replacements

**Renewable Energy**

- Photovoltaic panels
- Biomass fuel production
- Geothermal
- Wind power
Project Pilots

No detailed energy use data monitoring:

- Thermal side are only at the overall airport level (utility bills) >>> identification of subareas
- MXP a daily energy consumption monitoring review is carried out to compare available electrical energy consumption with the consumption of the day before of the same day in the previous year.
- At FCO this is done only on monthly basis.
- Need of KPIs for benchmarking
Future Work

Linking Energy Figures >>> KPIs >>> Stakeholders >>> Energy Management System
Future Work

Linking Energy Figures >>> Airport Related DATA

- Airport size: (area and volume condit. Spaces / area of externally exposed building envelope)
- Shape factors:
  - Compact (One main Building with bus transportation)
  - Pier finger terminals
  - Pier satellite terminals
  - Remote satellite terminals
- Location-Climate: (Hot and cold degree days / HDD and CDD, solar radiation, humidity levels)
- Hours of Operation
- Building envelope (U-Value)
- HVAC Systems and Controls
- Level of maintenance at the facility
- Occupant / User behaviour and energy management
Thank you

This research was funded by the Irish Research Council for Science, Engineering & Technology (IRCSET), D'Appolonia s.p.a. and the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement No. 284920.

Andrea Costa, Luis M. Blanes, Ciara Donnelly and Marcus M. Keane
National University of Ireland, Galway, Civil Engineering Department
Informatics Research Unit for Sustainable Engineering (IRUSE). University Road, Galway, Ireland
ICEBO 2012 - 23-26 October. Manchester