A presentation by:

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Energy Savings Opportunities in General Closed Area

Rough International Figures (Rules Of Thumb)

- **Stairwell – Energy cost reduced by**

In a 16-storey apartment block. Before installation the lights were switched on 24 hours per day; after installation they were switched on for around three hours per day. This gave an energy saving of 73%. The total energy consumption for the stairwell decreased from 64.3 kWh to 17.4 kWh per day (73%.)

- **Public toilets – Energy cost reduced by**

Before new installation for lighting control was done, the lights were left on 24 hours per day, but after installation they ran for just six hours. The result was a 75% saving in energy costs.

- **Garage - ENERGY REDUCTION by**

Calculations for a typical garage predicted that lights would run for four hours compared to the previous 24 hours per day. Actual measurements showed an even better result of 3.1 hours, in other words an energy saving of 87%.
Payback time around six months

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HOW MUCH IT COSTS?

- **Is the investment cost high?**

  Saving energy and improving convenience sound great, but what's the catch? Is the investment cost high?

  – No, there is no catch; there are only winners. Presence-controlled lighting systems are relatively simple and inexpensive. Installation is also easy, even when retrofitting to existing systems. This means that the payback time is often very short, sometimes less than a year.

  – Experience shows that presence detection is an energy-saving method that gives the highest saving to investment ratio!

Additional savings

- As well as the energy savings that presence-controlled lighting makes possible, further savings can be made by reducing the need for air conditioning in the work place. Lighting and other electrical equipment in the work place give off large amounts of surplus energy in the form of heat. This heat often needs to be removed to maintain a comfortable working environment. The cost of cooling air is almost twice as high as the cost of heating it.
- Presence-controlled lighting reduces the amount of surplus energy in the form of heat, and thus reduces the need for air conditioning.
- This means that a large saving can be made in cooling costs.
- Ventilation fans can also be coupled to the system so that they only operate when people are present, permitting a further saving.

Other Savings

- Maintenance time, tools, labour costs
- Lamp costs/year
- Extra Air Condition & ventilation Costs since the lighting fittings unnecessarily naturally raises the temperature in the premises

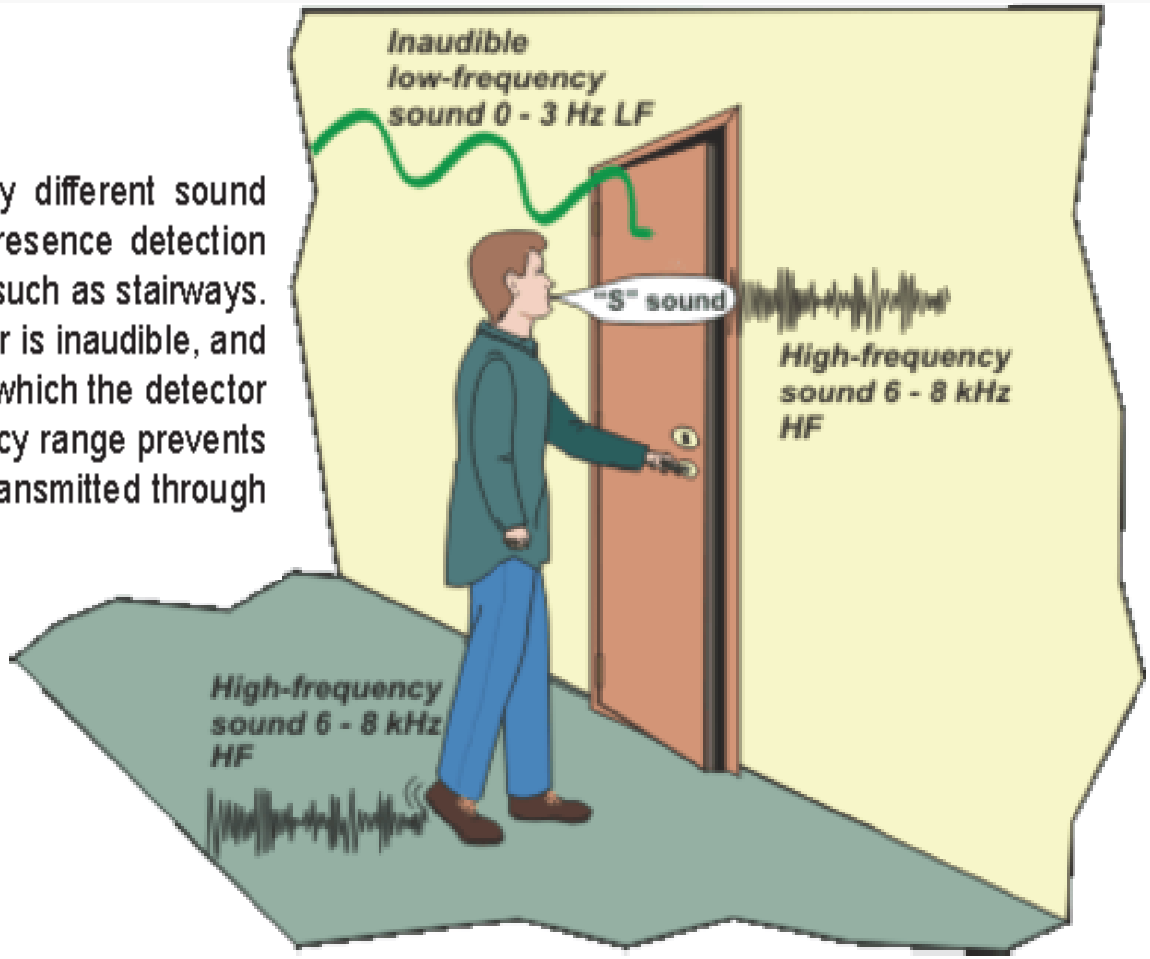
Other concerns

- More appreciated by many clients who appreciate the environmental issues
- Can help on green building certificates in two ways:
  - Direct Points for using lighting control systems
  - Decreasing total energy consumed for the same area.
- To be prepared for the raising of electricity charges.
- Saving our environment

Using the Acoustic-sensing Technology

Operation of acoustic detector

By listening to and analysing two completely different sound frequencies the acoustic detector provides presence detection that is suitable for controlling lighting in areas such as stairways. One of the frequencies is audible and the other is inaudible, and the two are separated by a frequency band in which the detector is very insensitive. This low-sensitivity frequency range prevents spurious detection of structural noise that is transmitted through the framework of the building.



The acoustic detector detects both low-frequency and high-frequency sound. It is almost deaf to the intermediate frequency range.

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Suitable Applications of Acoustic Detectors

- Stairwell
- Changing Rooms & Shower Rooms
- Hospital, Hotel Corridors
- Public Toilet
- Garages
- Class Rooms & Conference Halls
- Warehouses
- Open-plan Offices
- Libraries

Overview on Changing Rooms & Shower Rooms

Changing rooms are an excellent example of areas where the acoustic technology is superior. The acoustic detector has an excellent capacity for detection of presence behind clothes and around cupboards that an IR detector would have missed. With a correctly mounted microphone the same detector can detect presence in both changing rooms and the shower section.

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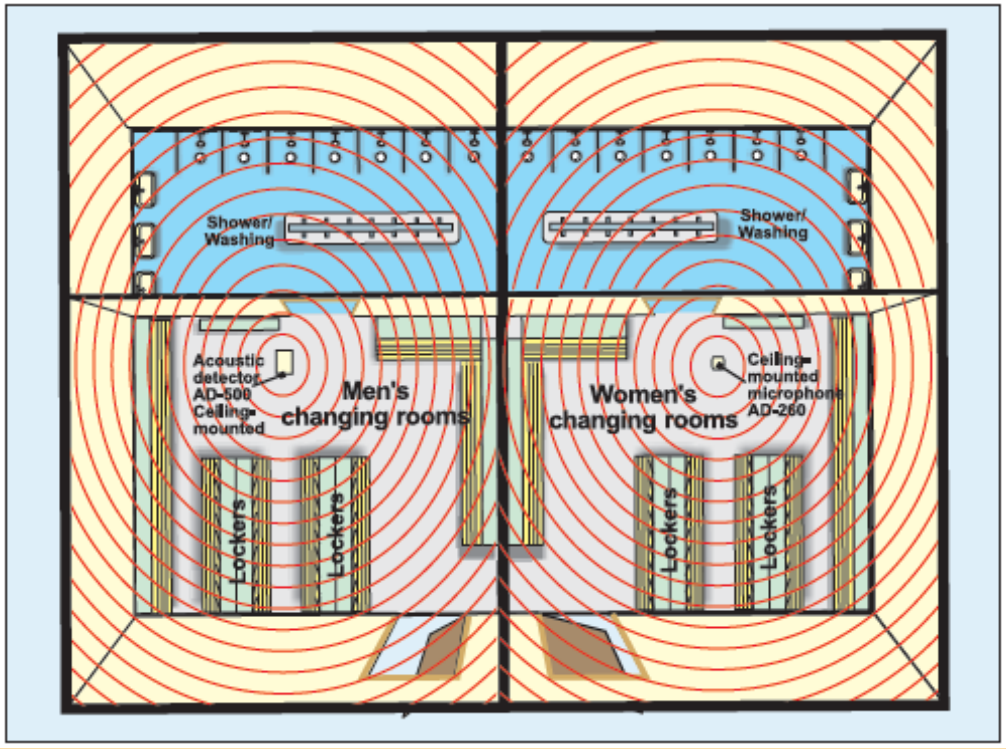
Overview on Changing Rooms & Shower Rooms

An AD-500 acoustic detector with an extra microphone can be used for detection in two separate changing rooms, e.g. men's and women's sections.

The A-D500/600 is a presence detector for energy-saving lighting control.



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Public Toilet In An Hotel

- Lighting Loads:

Usually it is a combination of halogen lighting for better colour rendering, and CFL as general lighting, with decorative fixtures, which usually uses incandescent or halogen bulbs.

Case Study

Public Toilet In An Hotel

Incandescent bulbs

Lighting with incandescent bulbs is particularly suited to premises where people are present for short times and lighting is switched on frequently, such as in stairways. Presence detection allows the run time to be reduced to the point where it is almost negligible.

Advantages: switching on and off does not shorten the lifetime of incandescent bulbs, and bulbs and light fitting are inexpensive.

Disadvantages: lower efficiency and shorter lifetime.

DECORATIVE

Suitable for
SWITCHING

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Case Study

Public Toilet In An Hotel

Acoustic detection technology can be successfully combined with incandescent lighting. Because of the poor light output of incandescent bulbs it is even more important to limit run times.

By installing effective lighting control it should be possible to improve the energy efficiency of some incandescent lighting installations to the point where there is no economic advantage to be gained by switching to more energy efficient light sources. Incandescent bulbs can also cope better with frequent switching on and off!

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Public Toilet In An Hotel

- Typical Loads

Light Source	Power Consumed	Qty.	Total Power
50 W 12V halogen lamp	10 W loss in transformer	10	(50+10) x 10 = 600 W
18 W CFL (1x18W Fixture)	3 W in low loss ballast	10	(18+3) x 10 = 210 W
20 W 12V GY6,35 Halogen Capsule	5 W loss in transformer	30	(20+5) x 30 = 750 W

TOTAL WATTAGE = 600 + 210 + 750 = 1560 W

Public Toilet In An Hotel

- Loads Profile

For this type of applications; usage profile is ON for 24 hours / 7days

Therefore, the total power consumed per year:

TOTAL Energy per year = 1560 W x 8760 hours

= 13665.6 KWH

Therefore, the total cost of energy

per year per one public toilet

= 13665.6 KWH x 0.5 L.E.

= 6832.8 L.E.

Public Toilet In An Hotel

- Energy Savings
  - With the right acoustic sensor configuration, it is expected to have only 3-4 hours daily of ON periods. (Annual ON Hours = 1460 hr)
  - Therefore, the yearly energy cost can be calculated to be: 1138.8 L.E.
  - Therefore, the annual energy savings will be 5694 L.E.

Public Toilet In An Hotel

- Lamps-costs :

Light Source	Lamp Life (Hr.)	No. of lamps to be changed yearly	Total Cost
50 W 12V halogen lamp	3000	(8760 / 3000) * 10 = 29.2	29.2 x 20 L.E. = 584 L.E.
18 W CFL (1x18W Fixture)	8000	(8760 / 8000) * 10 = 10.95	10.95 x 40 L.E. = 438 L.E.
20 W 12V GY6,35 Halogen Capsule	3000	(8760 / 3000) * 30 = 87.6	87.6 x 15 L.E. = 1314 L.E.

TOTAL Annual Lamps Costs = 584 + 438 + 1314 = 2336 L.E.

Public Toilet In An Hotel

- Lamps-costs Savings (using Acoustic Sensors) :

Light Source	Lamp Life (Hr.)	No. of lamps to be changed yearly	Total Cost
50 W 12V halogen lamp	3000	(1460 / 3000) * 10 = 4.87	4.87 x 20 L.E. = 97.4 L.E.
18 W CFL (1x18W Fixture)	8000	(1460 / 8000) * 10 = 1.83	1.83 x 40 L.E. = 73.2 L.E.
20 W 12V GY6,35 Halogen Capsule	3000	(1460 / 3000) * 30 = 14.6	14.6 x 15 L.E. = 219 L.E.

TOTAL Annual Lamps Costs using Acoustic Sensors = 97.4 + 73.2 + 219 = 389.6 L.E.

Therefore, Annual lamps-costs savings = 1946.4 L.E.

Public Toilet In An Hotel

- Maintenance Costs & Savings :

Assuming 10 minutes only for changing each faulty bulb

Therefore, annual maintenance time needed

= 127.75 (faulty bulb) x 10 m = Approx. 20 Hours

Using Acoustic Sensors:

The annual maintenance time needed

= 21.3 (faulty bulb) x 10 m = Approx. 3.5 Hours

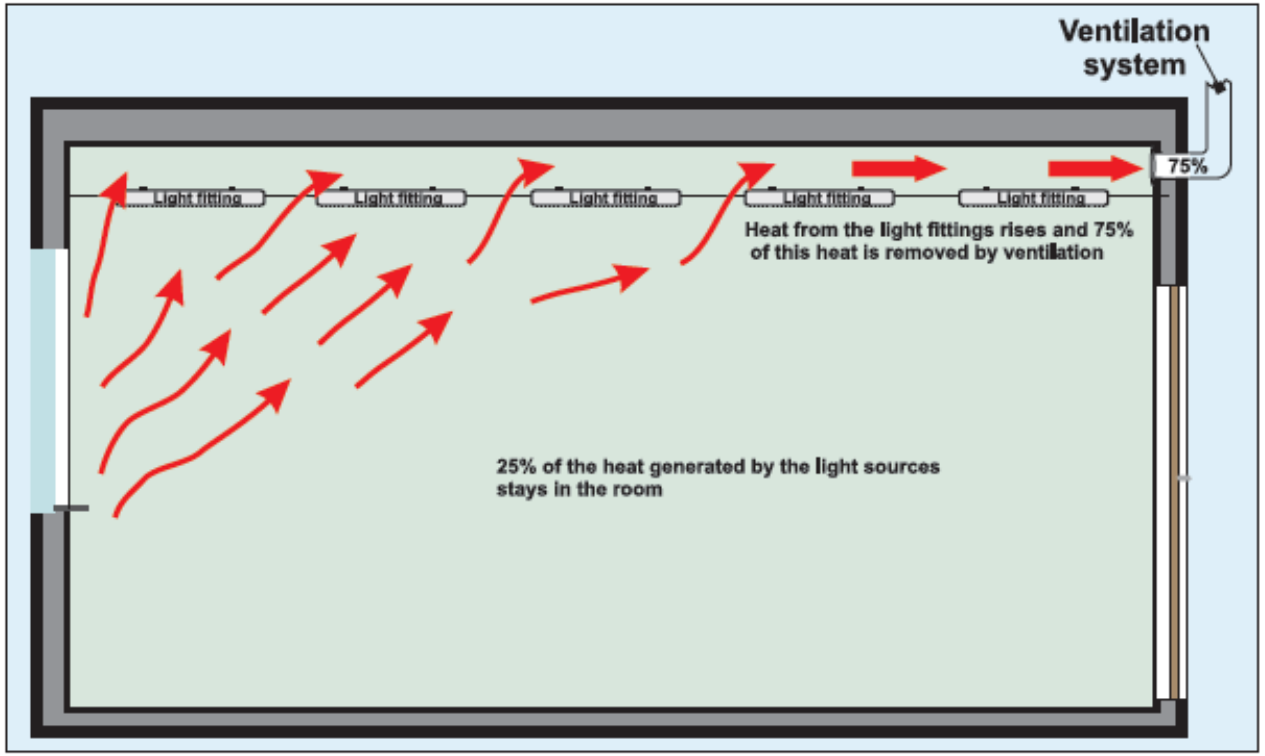
Assuming the cost of one hour maintenance is 100 L.E.

Therefore, Annual maintenance-costs savings = 1650 L.E.

Public Toilet In An Hotel

- Other Considerable savings (not included in our study):
  - Ventilation & Air Conditioning

Because the heat from lighting is supplied at the highest point of the room and is therefore mostly removed by ventilation, it does not make any major contribution to heating the premises, even in winter



Only a small proportion of the surplus energy (heat) generated by lighting is actually used. Most of it is removed by ventilation!

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Public Toilet In An Hotel

Adding savings of one public toilet in one year:

Type of Savings	Savings in L.E.
Energy Savings	5694
Lamps-costs Savings	1946.4
Maintenance Savings	1650
TOTAL SAVINGS	**9290.4**

Public Toilet In An Hotel

- Acoustic Detection System Cost :

Assuming the case of 2 adjacent toilets (men & women)

The needed components will be:

- 1 Control Unit
- 2 Microphone
- 1 Power Supply

Cost per toilet approx.: 3750 L.E.

Public Toilet In An Hotel

- Pay Back :

  Pay back will be

  = 3750 (New system cost) / 9290.4 (Savings due to using this new system)

  = 0.4 year

PAYBACK WILL BE LESS THAN FIVE MONTHS

Energy Savings Opportunities in General Closed Area

THANK YOU

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