

ECO

FOR SUSTAINABLE DESIGN



No 3 2010

ACOUSTIC SOLUTIONS IN OPEN-PLAN OFFICES
SOUND MEASURES FOR SCHOOLS
SPORTS HALL WITH GOOD ACOUSTICS
AVOID HEARING PROTECTION IN THE INDUSTRY
HEALTH CARE SOUND ENVIRONMENT

People – a resource we need to look after

A lot of people believe that nothing can be done about high sound levels indoors. Unfortunately this makes it all too easy to shrug our shoulders and accept noise as a necessary evil – when nothing could be further from the truth. Using relatively simple means we can help everyone feel better, hear each other better, become more productive and create a safer work place.

Consider the magazine you hold in your hands as a tool that helps you improve the acoustic environment in offices, schools, care premises, restaurants and any other buildings where people work and spend time together. In this issue we strike a blow for everyone who works in industry, where sound levels are directly harmful in many cases. Maybe you're one of them?

Are you an architect or involved in the planning of indoor environments? Then this is where you find the advice and know-how you need to create more humane environments.

Sustainable design breeds sustainable people

ECO – For Sustainable Design is a magazine that describes indoor acoustic solutions with the focus on practicality and aesthetics.

Sustainable design is a key factor in the way that people perceive their environment and how it affects them over time. A carefully planned and executed indoor environment that performs hour after hour, day after day and year after year, helps make us all sustainable. When we feel good at work or at school we find our work easier to do, thus improving well-being and efficiency – important requirements for a better and more sustainable life.



The know-how you need

For fifty years Ecophon has been informing and educating architects, builders, property owners, administrators and anyone who uses premises. On our website we provide one of the largest collections of information on room acoustics available – a gold mine for those of you who feel that the indoor environment ought to be a great deal better.

Visit www.ecophon.com and look around. We promise you will find what you want to know about the acoustic environment for your particular application – whether you are looking for advice or technical solutions.

We organise seminars and courses to help you plan for a healthy acoustic environment. If you would like to take part just contact us to find out the dates of forthcoming courses. We can also arrange dedicated training courses to suit your particular needs. Creating a good acoustic environment is by no means impossible – in fact it is essential.

You can subscribe free of charge by registering with us. If you know anyone else who would be interested in the magazine please let them know about us too. See the back page.

Happy reading!

Staffan Nilsson
Chief editor

ECO – For Sustainable Design is a magazine that focuses on the sustainable design of indoor environments. Our aim is to highlight the indoor environment, both from a functional and an aesthetic perspective, through a continual dialogue with the reader. Don't hesitate to contact any of our companies through the website, www.ecophon.com!

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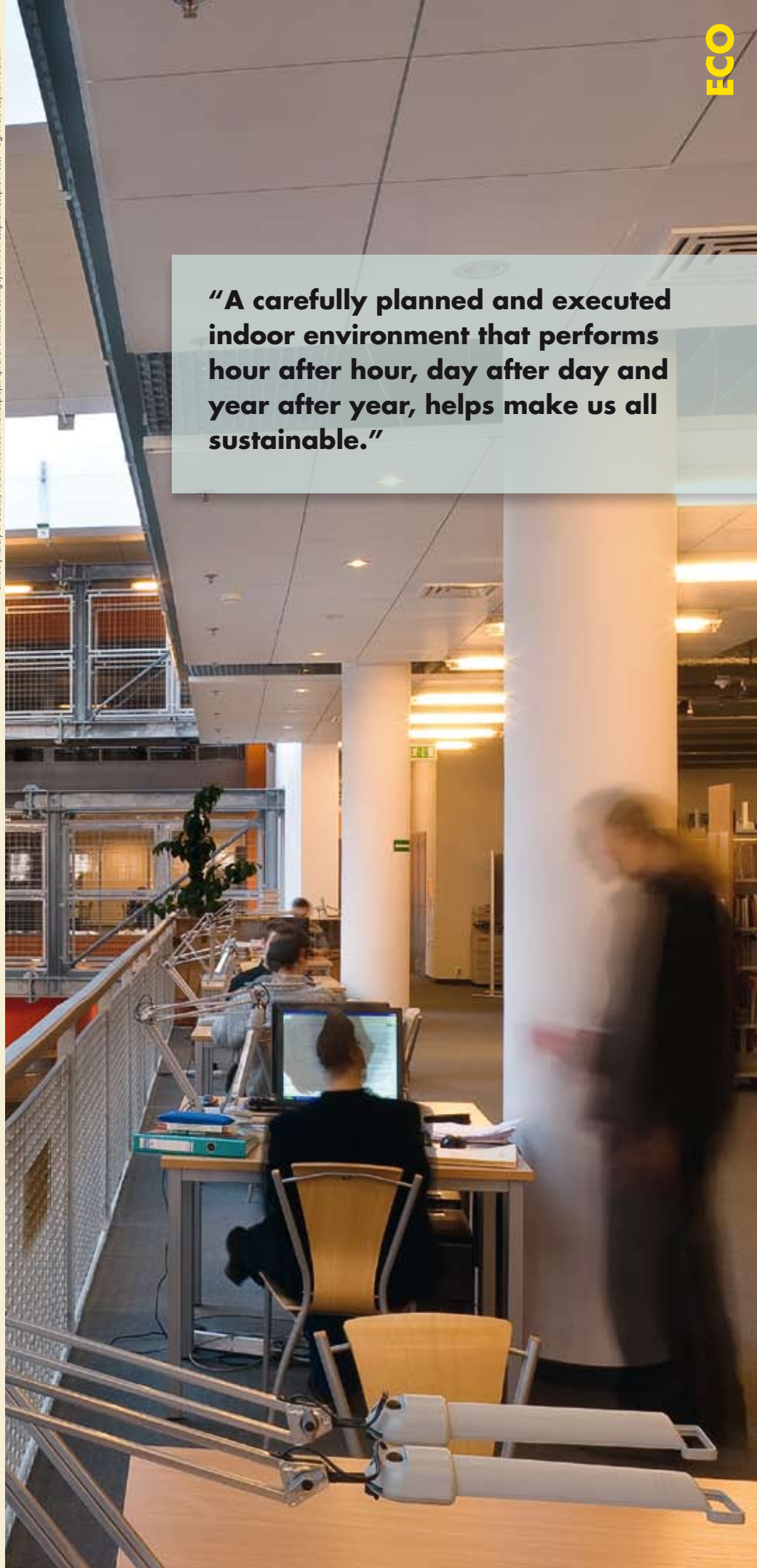
Cover photo: Vittra, an independent school in Sweden.
Photo: Ole Jais

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“A carefully planned and executed indoor environment that performs hour after hour, day after day and year after year, helps make us all sustainable.”

University library in Gdansk, Poland. Architect: ArchiCoprojekt sp. z o.o. Acoustic ceiling system from Ecophon. Ecophon Focus™ Dg. Photo: Szymon Polanski.



“So Jonas, is it possible to make open-plan offices work from the acoustic point of view?”

Photo: Åke Eison Lindman



Jonas Christensson of consultancy company ÅF Ingemansson. Jonas worked for ten years as a concept developer at Ecophon, a leading, global supplier of sound absorbing ceilings and wall absorber systems. During that time he asked over a thousand people what they think of the acoustic environment in their offices.

He has used his expertise to assist the Swedish Association of Hard of Hearing People and its efforts (see the article on page 9). Jonas and his colleagues are happy to share their expertise with anyone who wants to improve room acoustics at work.

“Many people perceive sound as disturbing in an open-plan office,” says Jonas Christensson at the Swedish acoustic consultant company ÅF Ingemansson. “But are there any sounds that people like and find useful? This is a question I’ve asked repeatedly over a thousand people I’ve met around our offices.

What people find most irritating is other people talking. But at the same time, we have to talk to communicate and pass on information. So it seems there’s a paradox, right? In fact there isn’t. The voice of a person sitting nearby is often perceived as information, while the sound of people a little further away in the room is often perceived as distracting.

That’s what I’ve been told.”

Sound from nearby is usually welcome

For the past ten years Jonas has been asking people about their attitudes to sound in open-plan offices – positive or negative. It turns out that sound

from people who are close to the listener, up to around four metres, is welcome, while the voices of people who sit further away in the room, around ten metres, are almost always perceived as distracting.

Why do company managers want open-plan offices?

1. People work frequently on project teams. The organisation therefore has to be flexible, so that the people who are currently involved in the same project can sit close together. This requires flexible premises.

2. Efficient use of space. In an open-plan office more people can share the same premises. This saves space and hence money.

3. Information can be communicated faster. The better the communication, the quicker employees will get results.

4. An open office communicates openness to customers and other

stakeholders. It simply permits an attractive layout.

Suggestions for a successful open-plan office

1. Inform employees why an open-plan solution has been chosen. Point out the benefits of improved opportunities for communication, but also the problems with the acoustic environment and how they will be dealt with. Install a wireless network and cordless telephones.

2. Minimise sound propagation so that other project teams are not disturbed. It is possible to measure how far a voice carries in premises. This is an important parameter when it comes to designing an open-plan office.

3. Give people the opportunity to communicate or to concentrate on a task – by providing “quiet rooms”. Staff can use these rooms to work undisturbed, for meetings or conversations that require privacy. There

must be sufficient quiet rooms and preferably close enough that they are within view. The perception that everyone can influence their acoustic environment should not be underestimated. In Sweden, the rule of thumb is that there should be one quiet room for every ten work spaces. The rooms must have good acoustic insulation and working IT systems.

4. Provide training in “acoustic behaviour”. Teach staff how sound spreads in an open-plan office and how they can influence their acoustic environment themselves.

A. Don’t talk across the office if you want to communicate with someone a little further away. Go over to the person instead.

B. If a conversation is likely to take a while and doesn’t concern others in the office, go to a quiet room.

Ecophon Master Solo™ lets heat soak through roof

What do you do when a contemporary arched concrete roof regulates the indoor climate well but causes problems with the acoustic environment at the same time?

Stephenson Research Associates, an executive recruitment company, was the first tenant to move into the newly built Solstice Park business park in southwest England. The park is part of a £250 million investment initiative to kick-start economic growth in the county of Wiltshire.

The concrete roof on the company's new premises soaks up heat from the sun during the day and carries it into the building at night.

The indoor climate was not a problem for Stephenson Research Associates, but they were dismayed by the acoustic environment. Echoes and other sounds reverberated uncontrollably around the building.

Simon Stephenson, director at Stephenson Research Associates, says:

“As a head-hunting company, it's important that we are able to hear telephone conversations clearly and

our concentration is maintained. When we first moved into the suite, it was difficult to hear when talking on the phone and in an open-plan office with confidential conversations taking place on a daily basis, it was difficult to maintain a level of privacy that our clients would expect.”

Unacceptable reverberation time

Inspection measurements carried out by acoustic consultants showed a high reverberation time* of 1.68 seconds.

The unacceptable reverberation time was caused by the arched concrete roof and large windows in three of the four walls.

The office is one example of a depressingly large number of modern, minimalist buildings that are designed without considering how the working environment and acoustics are affected by concrete and glass.

The solution chosen in Solstice Park was free-hanging Ecophon Master Solo™ S sound absorbers.

The result was that the reverberation time fell to a more acceptable 0.7 seconds.

“A typical suspended ceiling would not have worked in this instance as the roof is also a thermal mass which heats and cools the building, so if it's covered, this function is restricted,” said Phil Robinson, an acoustic consultant with BRC Ltd.

“We therefore recommended the installation of Master Solo rafts, which would follow the curve of the roof and create an aesthetically pleasing finish in keeping with the building's high-end specification.”

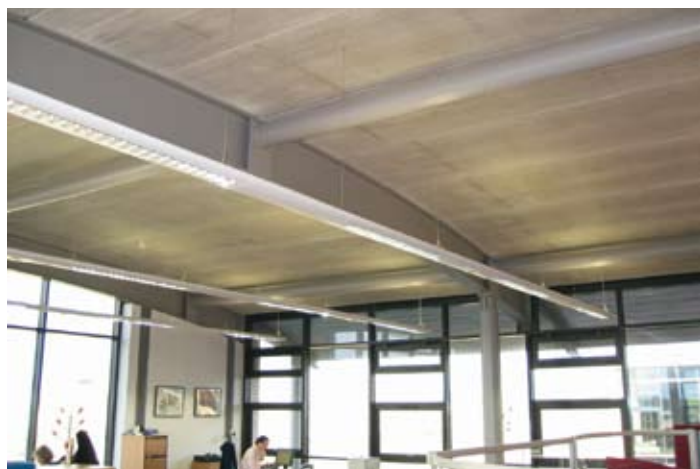
Now, two years after they moved in, employees at Stephenson Research Associates are able to concentrate better on their work, without distractions

“We're delighted with the results as the acoustics are now greatly improved and we are able to hear clearly when talking on the phone without being distracted,” concludes Simon Stephenson.



One of the buildings in The Crescent, the office quarter in Solstice Park. The large business park covers an area of 160 acres (650,000 square metres) and is intended to boost employment in the region.

* Reverberation time is a measure of the time it takes for a sound created in a room to fall by 60 dB once the source of the sound has stopped. In other words it is the length of time it takes for the echo to fade away.



Before: the raw concrete roof and large areas of glass create a contemporary look, but unfortunately lead to poor acoustics. This was how the interior looked when Stephenson Research Associates moved in, but they quickly realised that something had to be done to improve the distracting acoustic environment, which interfered with their work and job satisfaction.



A total of 26 free-hanging sound absorber panels were installed, reducing the reverberation time from 1.68 to 0.7 seconds.

Acoustic system from Ecophon
Ecophon Master Solo™



Ensinger GmbH manufactures injection-moulded plastic parts for a massive variety of uses.

THE FLEXIBLE OFFICE WITH FLEXIBLE SOUND ABSORBERS

“By using an open-plan solution we were able to meet requirements for **effective communication** between people in the work place,” says Stefan Fehse, architect.

A combination of **free-hanging sound absorbers and wall absorbers** was found to give a **good acoustic environment and good clarity of speech*** in the offices.

Ensinger GmbH in Germany is a high-tech manufacturer of advanced polymer components and injection-moulded plastic parts.

The new plant has an area of over 21,000 square metres, part of which is used for offices, laboratories, areas for meeting and relaxing, plus a cafeteria.

To create a good acoustic environment in the open office area and in the laboratories, free-hanging sound-absorbing units were suspended from the ceiling and sup-

plemented by wall absorbers where necessary.

Free-hanging sound absorbers meet requirements better.

A full acoustic ceiling, which is the most effective solution for acoustic performance, was naturally an alternative, but according to the architect, Stefan Fehse, free-hanging sound absorbers offered several other benefits:

- The ceiling units could be installed to suit the needs of different activities in the building.
- Ease of installation and removal.
- Flexibility – ability to make changes in the future.
- Good combination possibilities with utility services such as lighting, cooling, ventilation, etc.



Architect Stefan Fehse

Architect

Stefan Fehse, Dia179

Acoustic solution from Ecophon

Ecophon Master™ Solo

* Clarity of speech. Measuring how well the listener hears speech is an important tool for assessing a room's ability to contribute to good interpersonal verbal communication. Direct sound, along with early sound reflections, provides good clarity of speech, while background noise, long reverberation times and echoes disrupt speech. Clarity (C_{50} , unit dB) and STI (index from 0–1) are measurements of the room's ability to contribute to clarity of speech.



Room acoustics matched to the application. Free-hanging sound-absorbers and wall absorbers were installed as required to suit the type of activity in each area. Industrial architects Dia179 designed Ensinger GmbH's new plant in Cham in eastern Bavaria.

Photo: Gunnar Almberg



Stylish acoustic ceiling enhances image in conference room

The suspended acoustic ceiling was created using Ecophon Master™ Solo, and ensures a good acoustic environment in the high-ceilinged premises as well as enhancing the visual appeal. Note the subtle but distinctive height changes between the circles and the rest of the ceiling!

Companies are increasingly using stylish conference rooms to bring a distinctive look to their offices.

Swedish company Smörjteknik began at the top and chose to make an acoustic ceiling a striking element of its new interior design.

The company that installed the acoustic ceiling had to start with a rectangular area, which was then divided into circles and other shapes that were extended in each direction.

Slight changes in level between shapes were used to create a natural look and create a more intimate atmosphere.

The contrast between the black and white sections of the ceiling

gives the conference room a distinctive visual appeal.

Sheet metal roof would ruin acoustic environment

With a sheet metal roof alone, the room acoustics would have been so poor that they would have limited possibilities for effective communication.

Smörjteknik's premises were originally a garage for trucks, which was converted with the aid of architect Lennart Hagljung.

One of the people who installed the acoustic ceiling was Peter Fyhr from Gävle Undertak. He enjoyed the challenge of putting together the

stylish ceiling:

"It's great to work on unusual jobs!"

Smörjteknik was established over 100 years ago and supplies companies with lubricants.

Architect

Lennart Hagljung, Arkitektbyrå

Acoustic ceiling from Ecophon

Ecophon Master™ Solo

HEARING IMPAIRED ASSOCIATION MAKES A NOISE

Disruptive sound is one of our most overlooked environmental problems. The **“Hear and be heard” campaign** takes this problem seriously and **gives advice on what needs** to be done at work, in schools, restaurants and other public places. **Communication is essential** to us all.

A good acoustic environment helps everyone – whether we are hard of hearing or have normal hearing – by aiding communication, lowering stress, improving efficiency and job satisfaction, and reducing the risk of isolation. Any acoustic improvements that are good for people with impaired hearing are also good for the rest of us!

The Swedish Association of Hard of Hearing People (HRF) believes that the acoustic environment in most premises where people work and spend time together is generally poor. The acoustic environment in places such as schools, sports halls, offices and other work places should be sufficiently good for people who are hard of hearing. This is a requirement set by the authorities in Sweden, although according to HRF it is poorly applied.

In most other premises, however, there are no clear requirements for the acoustic environment – eg in cafés, restaurants, pubs, music clubs, restaurants, railway stations, shopping centres and the like, unfortunately.

HRF, a Swedish association that works for the interests of people who are hard of hearing, aims to improve the standard of living of the 1.3 million people in Sweden, one in seven of the population, who are hard hearing or have some other hearing-related ailment.

Wide-reaching campaign in Sweden

HRF is one of the largest organisations in the world for the hearing impaired. Through its wide-reaching “Hear and be heard” campaign,

HRF aims to highlight how important it is for people to get the chance to communicate – to hear and be heard. This particular campaign does not focus primarily on the physical harm that high noise levels can cause.

It is more concerned with the everyday sounds in public premises that cause problems for almost half of all Swedes, according to HRF’s surveys. HRF is currently taking part in a round of conferences that include exhibitions and various activities, and is visiting 22 locations around Sweden to gather publicity for the problems, as well as their solutions.



“There is a great need for better acoustic environments and smart acoustic solutions. It’s our intention that this environmental issue is taken seriously now!” says Jan-Peter Strömngren, chairman of HRF.



“The biggest offender in the sound arena is premises that are often unfit for their purpose,” says Ingvild Falkenhaus, information manager at HRF. “Employers, governments and local authorities don’t get the performance expected from employees, teachers and pupils – which costs society. A good acoustic environment benefits everyone.”

**befr!a
samtalet**

The HRF campaign symbol



One in three guests have left cafés and restaurants because of a poor acoustic environment.

Some examples of the results of HRF/Novus Opinion surveys:

- Half of Swedish employees experience difficulty hearing and conversing at work. Around 57 per cent of those who work in offices are distracted by the acoustic environment. As many as two-thirds of journalists are disturbed by noise while working.
- Two out of three teachers feel that the acoustic environment at work is a problem every day or every week. 57 per cent of teachers frequently find it difficult to hear what pupils are saying in the classroom.
- Every second person finds it difficult to hear and converse when they go out to a restaurant or café, and 47 per cent avoid cafés and restaurants with a poor acoustic environment. One in three guests (between the ages of 30 and 60) have left cafés and restaurants because of a poor acoustic environment. Nine out of ten feel it is important that hearing and conversing should be easy in these locations.
- HRF also reports that nine out of ten people want the acoustic environment to be given high priority when designing indoor environments.

A number of studies have been conducted to find out what people feel about their acoustic environment, and the results are often surprisingly negative. The situation can be improved, however. In this year's report HRF gives tips and advice on how the acoustic environment can be improved – to benefit communication, health and job satisfaction.

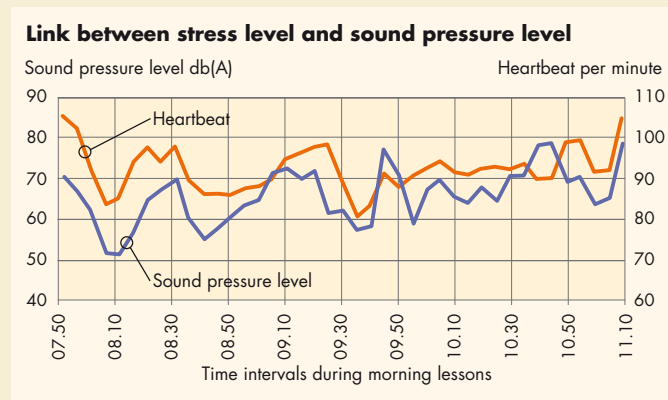
Photo: Georg von der Weiden

The first three pieces of advice that HRF gives for a better acoustic environment in offices and cafés:

1. An acoustic ceiling that absorbs sound throughout the room. Should be suspended from the original ceiling.
2. Free-hanging sound absorbers that “soak up” noise from work spaces nearby (or order/service counter).
3. Wall absorbers eliminate distracting sound reflections. These are available in various colours and designs, including some in the form of notice boards. They should cover as large an area as possible at “speech height” (from 0.9 to 2 metres above the floor).

Teachers are stressed by high noise levels

The HRF report presents the results of a German survey of teachers (G.Tiesler/M.Oberdörster 2006), which shows that when the sound level in a classroom rises, so does the teacher's heart rate (stress level). Depending on the type of activity, the sound level can vary markedly during classroom hours in a school. It can be seen here how the heart activity (heart beats per minute) of a teacher varies as the sound level rises and falls over the course of a working day.



The same survey also shows that an improvement in the acoustic environment leads to significantly lower stress levels. The researchers compared the heart rates of teachers before and after acoustic improvements were made. It turned out that in premises with a shorter reverberation time – resulting in less echoes and better speech perception – the teachers' heart rates were slower than in premises with a poorer acoustic environment. In other words, their stress levels fell.

Would you like to read a brief version of the study?

Download a pdf file via the link:
www.acousticbulletin.com/EN/INT_Modern_School_Acoustics.pdf



Children with normal hearing and those who have hearing problems **must be able to attend the same schools.** A unique hearing project in the UK has been instrumental in leading to new regulation measures of compliance, requiring new schools to test **room acoustics** and ensure they are **suitable for all children.** The project, known as the Essex study, produced some surprising results.

In the English county of Essex it was noticed that parents were not keen to place children with hearing impairments in mainstream schools.

The quality of room acoustics in such schools is often not good enough to allow children with impaired hearing to get the most out of teaching.

Research shows that pupils with hearing problems are less likely to get good grades compared with classmates who hear normally.

This was seen as an unacceptable situation in Essex, and a project was

set up to find out what acoustic environment was required in classrooms to allow all children to enjoy school and perform well.

The project was simply called the Essex study and it led to the British government agreeing to calls for all new schools to obtain acoustic approval before being built.

The demands were made by the National Deaf Children's Society, which helped carry out the study, along with the county council, at Sweyne Park School, a secondary school (ages 11–18) with resources to take care of 24 children with

impaired hearing.

The study led to a number of surprising conclusions.

Alleviated throat problems

“When we began the study the main priority was to ensure that classroom acoustics were also good enough for children with hearing problems,” comments Alan Knibb, senior engineer with Essex County Council.

“But it quickly became clear to us that there were several other benefits as well. For example, the teachers were able to set pupils work in

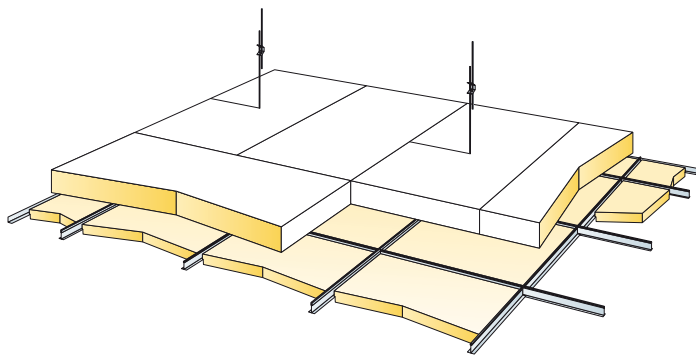
groups, which had previously been impossible, and the staff reported that they had fewer voice and throat problems.”

In the Essex study, teachers and pupils were asked to test four identical classrooms. Three of them were “treated” with sound absorbers of differing grades, while the fourth remained “untreated”. The teachers and pupils did not know which classroom had been given the best quality acoustic treatment or which ones were of a lower quality. The “treated” classrooms met different standards and the sound absorbers

Photo: Simon Smith



The test group perceived speech in a much better way in a classroom with effective sound absorbers compared to “untreated” rooms or even rooms with less effective sound absorption.



An acoustic ceiling is covered with a strip of thick sound absorbers at the junction between the ceiling and the walls. This absorbs sounds in the lower frequency range very effectively and significantly improves speech perception, especially for people with impaired hearing.

were switched between the rooms at regular intervals.

As far as possible the study was intended to provide general guidelines for the acoustic design of classrooms.

Pupils and staff were interviewed, they completed questionnaires and the acoustic measurement data was collected from each of the rooms. The work was managed by Hear2Learn, an independent audiological consultancy.

Effective sound absorption pays off

It turned out that the classroom that

had been fitted with the most effective sound absorbers provided the best environment for both listening and speaking.

The reverberation time in this room was 0.4 seconds in the frequency range 125 Hz–4 kHz.

“The British government standards for room acoustics aren’t just inadequate for children with special hearing needs, they’re also unsuitable for teaching and education in general,” says David Canning from Hear2Learn, which ran the study.

“Although it only ran for a short period, the study demonstrated that good room acoustics can make a very noticeable improvement in

teaching environments.”

At a time when budgets are tighter than usual there is a risk that acoustic makeovers for classrooms could be given low priority. But Alan Knibb gives reassurance in that respect.

“We found a solution that gives big improvements but only costs marginally more than the basic solution.”

Continued on next page

Acoustic systems from Ecophon

- Ecophon Gedina™ A**
- Ecophon Master™ A alpha, combined with Ecophon Master™ Extra Bass**
- Ecophon Wall Panel™**

Ecophon Gedina™ A suspended acoustic ceiling and Ecophon Master™ A alpha, combined with Ecophon Master™ Extra Bass (used in the classroom which had the shortest reverberation time and was given the highest score). Ecophon Wall Panel™ was fitted to the walls in all the “treated” classrooms.

The Essex study in brief:

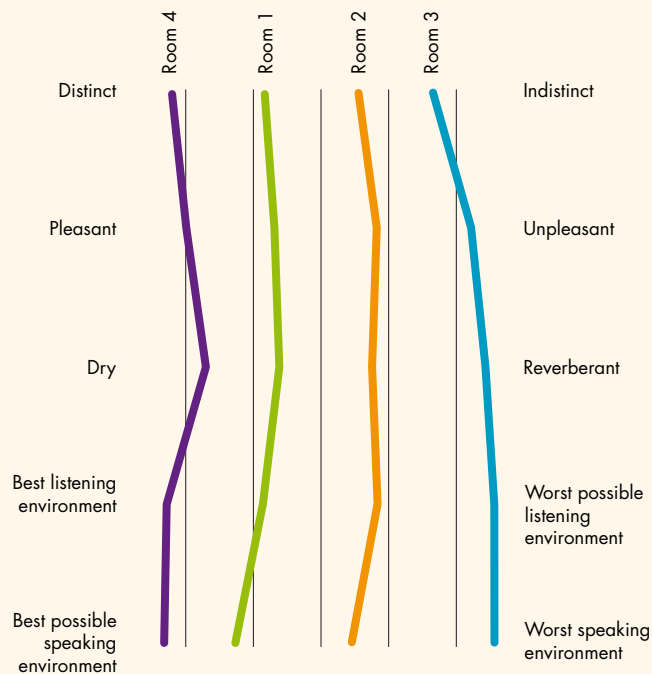
- 400 children and 13 teachers took part in the study.
- The duration of the project was six months.
- 0.4 seconds is sometimes regarded as too short a reverberation time in an environment where speech is the main priority. But according to the study this was not the case – the classroom with low reverberation time including the low frequencies was considered the best.
- The Essex study shows that differences in reverberation times at frequencies below 500 Hz have a major effect on the way we hear and on ease of speech in a classroom.
- Teachers reported dramatic improvements in behaviour among pupils, and in some cases they reported that problems with discipline were eliminated.

The diagram to the right

The coloured lines show how a test group perceived speech in the various classrooms. The blue line shows the “untreated” classroom, while the violet line shows how room acoustics were perceived in the classroom with the most effective sound absorbers. The other two lines represent the other classrooms, where less effective sound absorption measures were taken.

Learning Environment Leader, Simon Smith coordinated and managed the study internally.

Semantic differences



- Room 1 – BB93 classrooms specifically for use by deaf pupils (less than 0.4 s Tmf 500–2000 Hz)
- Room 2 – BB93 regular secondary school classroom performance standard (less than 0.8 s Tmf 500–2000 Hz)
- Room 3 – Untreated control room
- Room 4 – Room with requirements set by BATOD, the British Association for Teachers of the Deaf (less than 0.4 s Tmf 125–4000 Hz).

Welcome to ORGATEC 2010 – Modern Office & Facility

Ecophon Germany took part in ORGATEC – the European leading office and object design fair – for the first time in 2008. Acoustics was one of ORGATEC’s five focal topics.

500 visitors – entrepreneurs, architects, interior designers, facility managers and planners – appreciated Ecophon’s presence and discussed room acoustic topics.

Don’t miss the leading international fair on 26–30 October 2010 in Cologne. Please contact Ecophon in Germany for more information: www.ecophon.de



Facts 2008: 62,500 visitors from 113 countries, 673 suppliers from 39 countries. www.orgatec.com

Photo of the Ecophon exhibition in 2008

Photo: Koellmeise



A school for the eyes and ears

Design was an important consideration in the construction of the Albert Edelfelt school in Borgå, Finland. So were the internal acoustics, and great attention has been given to the acoustic environment of the school.

The school is named after the great artist, Albert Edelfelt, who was born in the city and died long ago. His presence is strongly felt in this modern school, however. Among other things his signature adorns the glass rail around the school hall, and fragments from some of his familiar paintings are reproduced in artistically shaped concrete on the exterior walls.

The assembly hall also doubles as a dining hall. It is triangular in plan and matches the fan shape of the school, which was chosen to make maximum use of the available site. The roof forms a triangle that slopes in two directions, and presented a considerable challenge when the time came to install the acoustic ceiling in the hall.

“It required some careful thought,” explains Arto Huhtanen, divisional manager with Rakenne Tikka Oy, who fitted the acoustic ceiling.

When needed, the assembly hall also serves as a concert hall. A stage is shared with the adjacent sports hall, which is normally concealed behind heavy, acoustically insulated doors.

The sports hall itself was also the subject of careful acoustic design, along with the music room on the other side of the hall.

Creative acoustics

As you would expect of a school that bears the name of a famous artist, there are also special areas for art and handicrafts. The art room has a genuine studio window, which faces north of course.



A music room worthy of the name. The room is acoustically insulated from the rest of the building. There are plenty of instruments, a stage, and even a podium for the choir.

Facts

- Albert Edelfelt school can accommodate 600 pupils between seven and 16 years of age.
- The school opened in 2009.
- The school was designed by the architectural firm of Leena Yli-Lonttinen Ky. The head architect was Jani Ristimäki.
- Janne Hautsalo from Akukoni acted as acoustic consultant.



“Acoustics are also important when you create and listen to music,” stresses Anna Talvitie, a music teacher. “You can easily mix electronic instruments in our music room and it also works well for acoustic instruments. The school as a whole is tremendously adaptable.”



The triangular hall is also used as a dining room and has been fitted with Ecophon Focus™ Ds. The red stairs glow like arteries and lead up to the classrooms. The premises have been designed to stimulate activity and movement.

Acoustic systems from Ecophon

- Hall and classrooms: Ecophon Focus™ Ds
- Sports areas: Ecophon Super G™

HAGASKOLAN'S SPORTS HALL – PROOF THAT GOOD ACOUSTICS CAN BE ACHIEVED

“Thank goodness – at last **a sports hall with good acoustics**. Fabulous! The noise level is not only lower. **It’s also softer and doesn’t feel as damaging** as in other halls where I’ve worked.” Åke Grundberg, physical education teacher.

“You’re forced to shout yourself hoarse when the noise comes from all directions in noisy sports halls,” says Åke Grundberg, a physical education teacher at Hagaskolan school in Sundsvall, Sweden. “Students wanting your attention, shouting, balls bouncing – it all mixes together into a mishmash of loud, disturbing noise. It’s worst of all during basketball matches or competitive events like district tournaments with lots of cheering supporters. Ideally, I’d like a sports hall to be completely silent when I give instructions.”

Hearing problems

Åke is sure that his hearing has deteriorated over the years, and suspects this is due to all the noisy sports halls he’s worked in. He has to ask, “What did you say?” many times during a working day. He also gets migraines more often...

“After a day working in a noisy environment I become hypersensitive to noise. I want to turn off all noise when I get home, and I feel really tired.”

Fabulous working environment

“Thank goodness – at last a sports hall with good acoustics. Fabulous!” says Åke. He has no doubts. “The noise level is not only lower. It’s also softer and doesn’t feel as damaging as in other halls where I’ve worked.”

The physical education teachers prefer not to wear hearing protection devices. Åke says that in order to hear what students say and give instructions in a poor acoustic environment, you need to wear custom-made earplugs. But it would cost the school a fortune to buy them for all the school’s six PE teachers.

“Our sports budget is limited,

and we don’t want to take such a large amount away from the actual sports activities, which take priority,” he says.

Hagaskolan’s sports hall is large enough for playing various ball games, such as volleyball and handball. It has an area of 23 x 43 metres and a ceiling height of roughly 8 metres.

According to Head Teacher Gunilla Eriksson, Hagaskolan – a school with a strong sports and health orientation – now has a better working environment for both PE teachers and pupils.



Acoustical engineer Anders Westin analysed the need for an acoustic makeover in the sports hall at Hagaskolan, and measured the acoustics afterwards. He comments:
“It’s like being on an outdoor football pitch instead of inside a sports hall with walls and a ceiling. The result is excellent.”

Photo: Lina Weller/Sandwalks Tidning



The problem was solved by a wall-to-wall acoustic ceiling and wall absorbers on three of the walls, at the height of the room occupants. All these components were in Class A, the best sound absorption class. Physical education teachers Johan Berman, Daniel Jonsson and Åke Grundberg are delighted with their new working environment.

High impact demands on corridor acoustic ceilings

Photo: Gunner Ahlberg

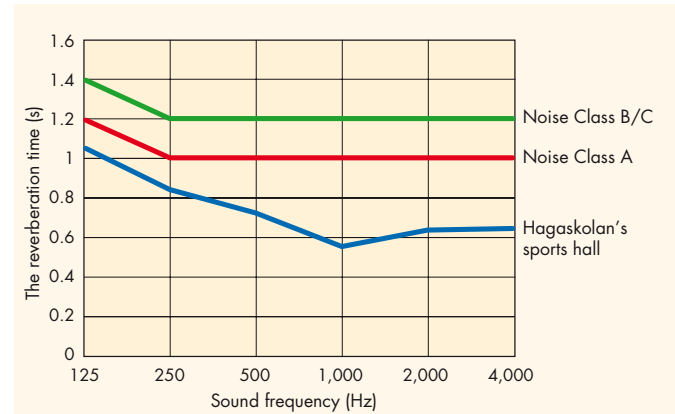


The corridors in Hagaskolan's new sports building now have a sturdy acoustic ceiling designed to withstand impact, shock and other damage in school corridors etc. It would be difficult for balls, bags and other objects thrown at the ceiling to move or damage the acoustic ceiling. The panels remain securely in position. The use of spring brackets ensures a hard-wearing ceiling, and allows the panels to easily be assembled or dismantled when work needs to be done above the acoustic ceiling.

This solution is highly appreciated by building administrators and maintenance staff in our schools.

At the advice of ceiling contractor Sundisol, the municipal authorities and the architectural firm Tema in Sundsvall chose the Ecophon Super G™ Dp XL acoustic ceiling for installing in the corridors. The system is available in lengths up to 2,400 mm.

The reverberation time in Hagaskolan's sports hall compared to Swedish standards.



According to the Swedish SS 25268 standard, Noise Class A denotes an excellent acoustic environment, while Class B/C corresponds to the minimum acoustic requirements in the requirements of the Swedish National Board of Housing, Building and Planning (Boverket). The measured results were far below the noise classes mentioned above. Perhaps this case study will serve as inspiration to raise the bar for acoustic standards in sports halls in future.

Architect

Hans Anders Kempe, Tema

Acoustic systems from Ecophon

- Ecophon Super G™ Plus
- Ecophon Modus™ S
- Ecophon Wall Panel™ Super G
- Ecophon Super G™ Dp XL

Effective sound absorbers on ceilings and walls can reduce sound levels by up to **10 dB**. This means **a halving of the perceived sound level** in a room and usually makes it **unnecessary to wear hearing protection**. But there are many other benefits...



Photo © Shutterstock Richard Pearson

Choosing sound absorbers and acoustic ceilings in the best absorption class is always a profitable investment in industrial premises. Staff work more efficiently and feel better in a good acoustic environment, as shown by numerous surveys. Improving the acoustic environment can increase productivity, reduce absence through sickness and lower the risk of accidents in the workplace.

Hearing in focus

Hard surfaces such as floors, walls and ceilings reflect sound, raising the general sound level and reflecting sound in every direction. In many industrial applications, catering and other open-plan premises, the sound level is unhealthy and sometimes directly harmful to hearing.

Eliminate the need for hearing protection

Even in situations where the sound level is not physically harmful, noise contributes to discomfort and stress

that have a negative effect on us. The electronics industry, pharmaceuticals industry and hospitals are all examples of such work places.

Employers in many countries are obliged to ensure that their employees wear hearing protection, but also have to present a plan to reduce noise if the equivalent noise exposure is 85 dB(A) or above. In other words the aim is to eliminate the need for hearing protection, as the threshold for compulsory use of hearing protection is set at 85 dB(A).

Sound absorption means everything

Most industrial premises, catering kitchens and indoor swimming pools consist of large premises with high ceilings. The reverberation time can be so long that it becomes distracting, and sound bounces around the room creating echo effects and raising the general sound level. It is therefore recommended that sound absorbers with the best absorption performance are installed.

An acoustic ceiling, possibly sup-

plemented with wall absorbers, can reduce the sound level by up to 10 dB(A), which represents a halving of the sound level. Sound is often in the high-frequency range, 1,000–3,000 Hz, especially in the food and drink industry. This is the frequency range to which our hearing is most sensitive.

If it is not possible for practical or technical reasons to install a full acoustic ceiling, there are alternative solutions in the form of wall absorbers or ceiling baffles. Any effective sound absorption that is installed in the premises has a benefit.

Improving staff efficiency and doing better business

Studies have shown that a good acoustic environment can reduce staff turnover and absence through sickness, as well as improving employee performance at work. It also makes the workplace safer. People hear signals, unusual sounds and warnings much better, and can detect the source of the sound much more easily. Effective communica-

tion also creates a more enjoyable work place.

The reputation and image of the company are also improved at the same time – the brand is strengthened and credibility improved thanks to the more positive impression given by the working environment. Customers and other stakeholders get a more “humane” image of the business when they visit. Business opportunities improve and it becomes easier to recruit skilled staff.

The best and most economical approach is to plan for good room acoustics right from the stage when new premises are being planned. Adding sound absorption afterwards is more complicated and more expensive – although it is possible, necessary and profitable in noisy premises.

Need to comply with hygiene requirements ...

Many companies manufacture products that require extremely high standards of hygiene in the pro-



Photo: ©Stümpel/erler

75% of all occupational injury complaints are due to high sound levels

According to the UK Health & Safety Executive (HSE), 75 per cent of all occupational injury complaints in industry relate to hearing damage. Being exposed to high sound levels throughout the working day (equivalent sound level for eight hours) entails a high risk of hearing damage and tinnitus. Even at 80 dB(A) the risk rises markedly, and at 85 dB(A) hearing protection is essential. Sound levels in the food and drink industry in particular are excessively high.

Surveys by the HSE show that equivalent sound levels in industry can be as high as 95 dB(A), which is a doubling of the perceived sound intensity over the 85 dB(A) level, which requires the use of hearing protection.

Photo: Fandrey, Fotographic



duction areas. The food, drink and pharmaceutical industries are good examples. The electronics industry and catering are others.

Everything must be kept clean here, and even in damp environments there should not be any microbial growth or corrosion on building materials. Sometimes it is also required that the air should not contain any foreign particles.

... and absorb sound effectively

Only resilient materials have the ability to absorb sound, in contrast to hard, smooth surfaces, which unfortunately reflect sound but have traditionally been the easiest to keep clean.

Nowadays, thankfully, there are acoustic ceilings and sound absorbers that combine both characteristics.

The surface of modern sound absorbers can be washed, sprayed and withstands detergents and disinfectants, while at the same time allowing sound waves to pass

through to the underlying absorber.

Acoustic systems to suit every need

Choose an acoustic ceiling that meets all your requirements, based on your application. The Ecophon Hygiene family offers acoustic systems for a wide variety of production environments.

You can find more information at www.ecophon.com.

The clattering of conveyors, bottles and other hard packaging in the drink industry creates an irritatingly high level of noise that is a risk to both health and safety. High demands for ease of cleaning have meant that hard materials have become the obvious choice for ceilings and walls over the years.

There are now acoustic ceilings and sound absorbers that can meet all requirements.

Continued on next page

Choose an acoustic system which meets strict hygiene requirements according to your specific production demands



Stress and increased blood pressure, difficulty holding a conversation, fatigue and a greater risk of making mistakes are some examples of the effects of a poor acoustic environment. In the electronics industry in particular, where accuracy and process control are paramount, room acoustics have a major influence on efficiency and profitability.

So use the ceiling and walls for sound absorption!



The pharmaceuticals industry is one of the most tightly regulated production environments. Manufacturers must demonstrate that they meet the requirements of various authorities in areas such as particle emissions and hygiene.

Sound absorbers are now available that can satisfy established standards, which means that noisy production environments can become a thing of the past.



The acoustic environment often comes top of the list when employees are asked which environmental factors they find most troublesome. The food industry is no exception – just the opposite, many people work in the same environment here and the noise is heard all over the premises.

An acoustic ceiling of the highest absorption class, possibly supplemented by wall absorbers, reduces sound to an acceptable level.



In catering and restaurant kitchens the noisiest areas are those used for dishwashing, vegetable preparation and cooking. A combination of hard floors, walls and ceilings, and the clashing of pots and pans, creates a high level of noise that is distracting and creates additional stress in what is already a hectic environment.

The right choice of acoustic ceiling and sound absorbers improves the working environment without compromising on hygiene requirements.

Chocolate giant combines hygiene requirements with effective sound absorption

Photo: Patrick Sobain



A modern chocolate manufacturing plant with the best possible acoustic environment in a production application that requires high standards of hygiene. The solution was a complete acoustic ceiling system of the highest absorption class with a surface that is easy to keep clean.



Stéphane Joubert, project manager at “Cémoi de Perpignan”, sums up the features that decided their choice of acoustic ceiling system:

1. Good acoustic environment.
2. A surface coating that meets hygiene requirements.
3. Good resistance to moisture absorption and good rigidity when cleaning ceiling, since acoustic tiles are firmly secured by clips.
4. Ceiling is light and limits the load on other construction components.
5. Solution is aesthetically very attractive.
6. Easy to integrate with other utility systems in the building.



A firm commitment to a better working environment has proven successful for Cémoi, one of Europe’s biggest cacao producers. The company’s 300 employees now have a new 30,000-square-metre workplace outside the town of Perpignan in southern France, close to the Spanish border. Renovation of the older parts of the factory also means

that “Cémoi de Perpignan” is now a modern plant throughout and is fully able to meet requirements for a working environment that is both efficient and healthy to work in.

First-class approval

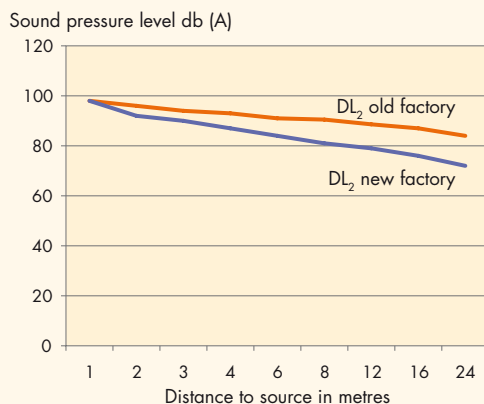
Despite the strict hygiene requirements in the plant, a solution has

been found that provides a good acoustic environment – an acoustic ceiling system with a surface that does not collect dirt, is easy to keep clean and does not encourage microbial growth. The acoustic environment was fully approved thanks to effective sound absorption that benefits employees’ hearing and communication, and lives up to the needs of the modern food industry.

The company now intends to continue on this path and has plans to improve the acoustic environment in other plants owned by the group. French company Cémoi, which traces its history to the 19th century, is one of the largest chocolate manu-

facturers in Europe, with a total of 3,000 employees. In addition to nine French factories the company has production facilities on the Ivory Coast, in Germany, UK and Poland. The family company supplies cacao products for industrial use, as well as selling a large range of chocolate under its own brand.

Exceptional acoustic measurement results. Cémois’ old and new factories.




The measurement results show that the sound level in the premises fell by 7 dB after the acoustic measures were taken. They also show that sound fades away faster as you move away from a source of sound, such as machinery. Before the measures were taken the sound decreased by just 3 dB with each doubling of distance. After the measures the sound decreased by 6 dB with each doubling of distance. This means that if a machine generates a sound level of 85 dB at one metre distance, the sound level at 16 metres distance would be 73 dB in the premises before the improvements, and 61 dB after the improvements. A figure of 6 dB for each doubling of distance is considered very good, and is comparable with the way that sound decreases outdoors.

**Acoustic system from Ecophon
Ecophon Hygiene Performance™ A**

HOW TO GET RID OF HEARING PROTECTION DEVICES

Is it humane to have people work in premises with unnecessarily high noise levels that put their hearing at risk – particularly now that **there are reasonable solutions to the problem?**

Oatly, a non-milk dairy, achieved a **healthier, more efficient** workplace where hearing protection devices are now just an unpleasant memory. **A wall-to-wall acoustic ceiling and wall absorbers solved the problem.**



Food manufacturer Oatly in southern Sweden realised that the noise levels from the factory's machines and conveyor belts needed to be reduced. Employees had complained about the loud noise levels in the packing room, and were having trouble relaxing and resting after work. Some showed symptoms of insomnia. However, hearing protection devices obstructed communication and posed a safety risk.

Wall-to-wall acoustic ceiling – the only right solution

"We concluded that effective sound

absorption would reduce the noise enough," says factory manager Benny Wraae. "But several alternative sound-absorbing solutions were proposed, such as ceiling-mounted baffles, free-hanging ceiling islands and a wall-to-wall acoustic ceiling complete with wall absorbers. As a food manufacturer, we have to meet strict hygiene standards. The sound absorbers mustn't collect dust or spread fibres, they must be resistant to bacterial growth, and they must be cleanable.

"For this reason, a wall-to-wall acoustic ceiling was found to be the only right solution. Combined with

the wall absorbers, this solution also produced the best acoustic values. We achieved acceptable noise levels and eliminated the need for hearing protection devices."

Target: under 80 dB

"And not least," adds Benny, "the noise levels dropped below an average 80 dB(A), the level considered harmful to hearing. That was our target. Can it get any better?"

After the sound absorbers were installed, employees were asked to comment on the results. The response was highly positive. Employees now

find it easier to communicate with each other, and are relieved not to have to use protection devices. It is also easier to hear the machines and determine where noises come from. Last but not least, the employees no longer feel tired.



As an extra measure to improve acoustics in particularly noisy parts of the room, wall absorbers were installed in the space between the long wall and machines. The absorbers were positioned at head height and mounted in a grid to protect against mechanical damage. The purpose of the absorbers is to reduce high noise levels caused by multiple reflections between the wall and machinery.



"What a relief not having to wear hearing protectors. They were heavy and strained my neck," says Annika Engström Håkansson, a machine operator at Oatly.

"The employees also find it much easier to communicate with each other now," says factory manager Benny Wraae.

Risk of hearing damage at 80 dB

Under international regulations, employers are obliged to ensure that employees use hearing protection devices, and must prepare an action plan to reduce noise if the equivalent noise exposure level is at least 85 dB(A). However, research shows that the risk of hearing damage increases considerably even at 80 dB(A). In the food and beverage industry in particular, noise levels are far too high and need to be controlled.



A wall-to-wall acoustic ceiling and wall absorbers on parts of three walls reduced the noise level by the 5 dB necessary to eliminate hearing protection devices.

Some spontaneous feedback from employees after the acoustics were adjusted:

- It's easier to hear what's being said
- It's easier to perceive where the sound is coming from
- It's a relief not to have to use hearing protection devices
- I'm less tired when I get home, I sleep better

Continued on next page

Acoustic systems from Ecophon

Ecophon Hygiene Performance™ A C3

Ecophon Hygiene Advance™ Protection C3

The room acoustic measurements at Oatly

The room acoustic measurements performed at Oatly focused on objectively defining the changes in sound level and speech perception in the premises after adjusting the acoustics. Table 1 shows the room acoustic parameters that were measured.

Summary of room acoustic measurements before and after adjusting the acoustics

Table 2 shows the average value of the room acoustic measurements for octave bands 500 and 1000 Hz before and after the acoustics were adjusted. According to the standard ISO 3382-1, the average measurement value for these octave bands is suitable for use as representative values.

Results

Table 2 shows that after adjusting the acoustics, the noise level (general noise) in the room had decreased by approximately 5 dB. According to previous measurements, the general noise level was approximately 81

to 84 dB(A) before the adjustment. After the adjustment, the general noise level had dropped to approximately 77 dB(A), bringing the noise levels below the limit values specified by the Swedish Work Environment Authority (Arbetsmiljöverket) (AFS 2005:16).

The speech clarity values also show a clear improvement. One reason for this is a reduction in the effects of delayed reflections in the room. This is also shown by a significant decline in reverberation times.

The noise level is still over 80 dB(A) close to certain machines. This is because the sound is dominated by direct noise from the machines. The direct sound is not affected by the ceiling and wall absorbers. Instead, it must be controlled through adjustments made directly at the noise source, such as installation of enclosures or screens.

Table 1

Property	Measurement	Designation	Definition
Reverberation	EDT, T20	Early decay time (s), Reverberation time (s)	Measures the reverberation (echo) in the room. The shorter the reverberation time, the more muted the noise in the room.
Speech clarity	C ₅₀ , D, RASTI	Speech clarity (dB), Definition (%), RASTI	Measures how clearly speech is perceived in the room. The higher the measured value, the better the speech clarity.
Noise level	Noise level reduction	ΔL (dB)	Indicates how much the general noise level in the room has been reduced.

Table 2

Property	Measurement	Before adjustment	After adjustment
Reverberation	EDT (s)	2.4 s	0.63 s
	T20 (s)	2.4 s	0.62 s
Noise level reduction	ΔL (dB)	-2.4 s	5 dB
Speech clarity	C ₅₀ (dB)	-2.9 dB	3.7 dB
	D (%)	34 %	70 %
	RASTI	0.47 (poor/fair)	0.70 (good)

Photo: Ole Jais



Facts Oatly

Oatly, located outside Landskrona in southern Sweden, develops, manufactures and markets health-oriented products based on a patented oat drink.

The products are based on research at Lund University. In 1963, Arne Dahlkvist, a professor at the University, discovered the factors that cause lactose intolerance. Over the years, in collaboration with colleagues and industrial players, Dahlkvist developed a technology whereby the products can be given a consistency similar to milk, making them suitable for drinking and cooking.

Oatly products are popular among people with lactose intolerance, and are increasingly favoured by all consumers who want to increase their fibre intake and eat healthier. Oatly has almost 50 employees and sales throughout much of Europe. The company also has operations in other parts of the world. For example, China shows potential for becoming a successful market.

Pregnant women must not be exposed to excessive noise levels

According to the Swedish Work Environment Authority, employers must perform a risk assessment for pregnant women who may be exposed to workplace noise levels exceeding approximately 85 dB(A) on a daily basis.

This means that pregnant women must not enter working environments where hearing protection devices are required, particularly in the later stages of pregnancy (from at least week 26 of pregnancy), when the foetus's hearing organs are developing. Moreover, high noise levels cause stress that can lead to tiredness and high blood pressure and restrict blood flow in the placenta.

Failure to comply with these regulations is punishable by fine. The regulations follow EU directives (European Agency for Safety and Health at Work).



A ceiling that copes with everything

Photos: Studio-e



Engelsviken Canning A/S is a company that can boast 140 years of family history. In addition to production in Norway, the company has also had a factory in Skagen, Denmark since 2003.

Canned shellfish of various types – prawns, mussels, mixed shellfish, crayfish tails and crabsticks – are Engelsviken’s speciality and are sold under the company’s own brand and under the brand names of large supermarkets in the Nordic and Baltic markets. Engelsviken was the first company in Europe to start manufacturing this type of product without preservatives.

“Providing a decent work place for our employees requires a good acoustic environment,” says Anders

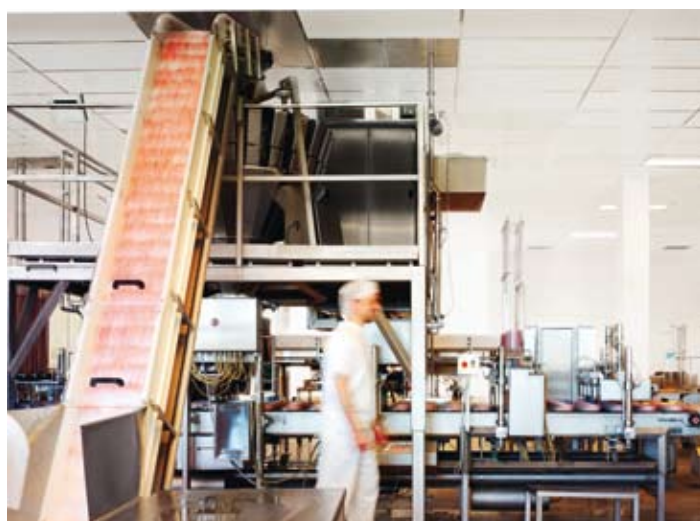
Jensen, site manager at the factory in Skagen. “The ceiling area is normally the best location for installing effective sound absorption, but because of the strict hygiene requirements that apply in a business like ours, which handles food, the ceiling has to be able to withstand regular washing and rinsing with disinfectant. We found a solution that can do both!”

C4 grid system resists corrosion

Previously the factory had an acoustic ceiling with grid that met corrosion class C3, the best available when the company moved into the factory. Eventually some of the grid began to corrode and the entire grid was replaced with a class C4 grid system, which has the highest corrosion resistance. The sound absorbers were still in good condition, however, so they were reinstalled on the new grid system.



Charming factory in a charming location. Engelsviken Canning is located in Skagen, Denmark, as close to the sea as you can get.



A smart interior with an acoustic ceiling that is hygienic and will last for a long time in one of the toughest production environments that exists in the food industry. Salt and high humidity, combined with strong detergents, give the interior fittings a hard time. The acoustic ceiling is supported by an acid-resistant grid system that meets corrosion class C4 and is designed to resist aggressive environments.



An acoustic ceiling ensures a pleasant acoustic environment, in the office too!

Acoustic ceiling from Ecophon

In production:
Ecophon Hygiene Advance™ A C4
In the office: Ecophon Focus™ F

ACOUSTIC CEILING SYSTEMS AND AGGRESSIVE ENVIRONMENTS

No rust, no corrosion
 – an acoustic ceiling
 that lives up to all
 hygiene requirements
 and continues to do its
 job for many years.

We revisited Abba Seafood 15 years after the first acoustic ceilings were installed there.

Even back then, in 1996, ECO magazine was on location in Kungshamn, a stone's throw from the tourist resort of Smögen in the Swedish coastal province of Bohuslän, to report on the changes that the new acoustic ceiling had made in the working environment at Abba Seafood. Göran Sjögren, real estate manager at the time, reported then:

“The acoustic ceiling is sound-absorbing and reduces the noise from the machinery. Our staff can hear each other's calls and warnings better – which means a clear improvement in safety. Everyone is very pleased with the ceiling and the whole working environment is clearly better. Light from the light fittings is now reflected from the white suspended ceiling and reaches

every part of the premises. Aesthetically speaking, the difference is like going from night to day, now that all the piping and wiring is hidden away. The ceiling makes up a large part of the area of the room, so it has a big impact on the atmosphere.”

A ceiling that saves money

Göran Sjögren continued:

“Where the new suspended ceiling has been installed we don't need to wash down as often, since there aren't any areas to gather dust. When we do need to clean the suspended ceiling it takes very little time because of the smooth, dirt-repellent surface. It saves a lot of money.”

Biggest challenge in the fish industry

We are back at Abba Seafood's factory in Kungshamn and get to meet Göran Sjögren again after almost 15



“It was like starting a new job the day the sound absorbers were installed.”

Lars Johansson, foreman at the time at Abba Seafood.

The newly installed acoustic ceiling system in the large production hall in 1996...



... and the same ceiling in 2010.

years. He is actually retired now, but does not want to give up work completely, so he spends one day a week helping out his successor, Jan Persson. We ask him how things have worked out with the acoustic ceiling after all these years.

“Yes, it’s coped well – better than expected, I reckon,” says Göran. “The sound absorbers themselves are mostly intact, and we’ve not had to do much at all with the ceiling in the big production hall. There are places in the factory though where we’ve had to replace the ceiling because the framing had corroded.”

“The fish industry is probably the most aggressive environment you

can imagine for building materials,” adds Jan Persson, the current site manager. “The main problem is the vinegar and salt used in the canning process, which forms a fine mist in the saturated air. We also use strong detergents to clean the ceiling. This combination eats through the protective paint on the grid and exposes it to corrosion.”

“It’s vitally important that we keep an eye on ‘vulnerable’ areas of the building, as these are difficult to keep clean and there is a risk of growth of microorganisms, or that contaminants could get into the containers of herring,” says Jan Persson. “As a result we’ve occasionally

had to replace the grid and ceiling panels in certain areas, particularly where the ceiling is a little lower or the machinery is tall and spray from production reaches the grid. This disrupts production and costs us money!”

Corrosion class C4 = acid-resistant steel

After many years of experience, Ecophon has found the long-term solution to be an acoustic ceiling that meets the demands of the most aggressive environments in the food industry. In Ecophon’s Hygiene Advance™ C4 system, every sin-

gle screw, clip and other component is made from homogeneous, acid-resistant steel (INOX) that meets corrosion class C4. In combination with newly developed sound absorbers that have a smoother, more durable surface, this eliminates the weak links in the chain.

Ecophon Hygiene Advance™ C4 is an acoustic ceiling system that will last for many years with minimal maintenance and without unwelcome, or expensive, surprises.



Former site manager, Göran Sjögren, and his successor, Jan Persson, talking about the importance of interior fittings in meeting the hygiene requirements of the fish industry.

Facts: Abba Seafood

Abba Seafood AB employs around 350 people and is Sweden’s biggest supplier of seafood. The product range includes marinated herring, soused herring, anchovies, fish roe, paté, fish balls, tuna, mussels and shellfish. Production takes place at the company’s factories in Kungshamn on the west coast of Sweden. Abba Seafood AB is part of the listed Norwegian group, Orkla.



Thanks to its wide range of MSC* and KRAV ecolabelled products and refusal to sell red-listed species in the WWF fish guide, Abba Seafood has received the WWF Green Fish award.

Abba Seafood is certified to comply with the British Retail Consortium’s standard for assessment of suppliers of products sold under retailers’ own brands, which aims to protect retailers’ customers and ensure that the requirements of certain authorities are met. Particular emphasis is placed on carrying out risk assessments and regular inspections of hygiene in production.

*The MSC (Marine Stewardship Council) ecolabel is a guarantee that produce comes from well-managed fish stocks and does not contribute to the environmental problem of overfishing. The KRAV ecolabel is Sweden’s best-known symbol of organically produced food.



An acoustic ceiling with corroded grid. A grid system of homogenous acid-resistant steel would have been unaffected.



With the new Ecophon Connect™ C4 grid system the ceiling would still be in good condition.

**Acoustic system from Ecophon
Ecophon Hygiene Advance™ C3**

“Before we planned the new central kitchen we made several visits to similar installations,” says architect Jürgen Busack. “What struck us **was the terrible acoustic environment and the high noise levels in kitchens.** We were convinced that it was possible to create a **more humane** work place by tackling **room acoustics seriously.**”

The modern catering kitchen at Rickling psychiatric hospital, north of Hamburg, produces 3,600 meals each day.

The widely accepted “standard solution” would have been to install a suspended ceiling with a hard surface that permits cleaning. However, metal utensils and pans, combined with hard surfaces on the floor, walls and ceiling, always lead to a hopelessly noisy and stressful working environment.

No compromise on room acoustics

Thankfully the architect, Jürgen Busack, found the answer to the noise problem – an effective, sound-absorbing acoustic ceiling system

that meets the relevant hygiene requirements. The secret lies in the ability of the acoustic ceiling to let sound waves pass through to the backing layer of sound-absorbing material.

At the same time the smooth surface repels dirt and grease, and can cope with regular washing with disinfectant, and even spray washing. The surface is also resistant to bacterial growth, which is very important in environments where food is handled. In combination with a robust grid system that is resistant to moisture and chemicals, the result is an acoustic ceiling system that will perform its task for many years.

“It was worth going the extra distance to make life easier for our 60 staff,” says Ralf Lenschow, who is

on the board of the catering business at Rickling hospital. “It’s amazing how quiet it is, even when the kitchen is busy. I guess that’s unusual for a kitchen of this size.”

The catering kitchen does not just supply catering services to the hospital in Rickling. Meat, which comes from the kitchen’s own EU-certified slaughterhouse, is prepared and butchered here, and the bread, which comes from the kitchen’s own bakery, is also distributed to other institutions in the area. An area totaling 2,700 square metres is now fitted with acoustic ceiling panels and sound absorbers.



“The noise that often dominates kitchen environments shocked me when I visited catering establishments, it’s an unreasonable noise level for employees. Effective acoustic ceilings and sound absorbers made a big difference to the acoustic environment in the central kitchen in Rickling,” says Jürgen Busack with conviction.



Photo: H.G. Esch

ECO



Continuous sound-absorbing panels on the ceiling are combined here with vertical sound-absorbing baffles. Dishwashing areas can otherwise be extremely noisy environments.



A continuous acoustic ceiling system of the highest absorption class covers the large catering space where meals are prepared.



Even the kitchen's own slaughterhouse has an acoustic ceiling.



The austere brick building that houses the central kitchen in Rickling matches its surroundings.



Architect
Busack+Göb

Acoustic systems from Ecophon
Ecophon Hygiene Performance™ A C3
Ecophon Hygiene Protec™ Baffle C3

USING THE CEILING FOR LIGHTING AND SOUND

Elineberg School in Helsingborg in southern Sweden has undergone a facelift. The old and tired-looking premises are now **light and modern, while energy consumption has been halved**. At the same time **the acoustic environment has been greatly improved** for the teachers and pupils.

“As school administrators we have succeeded in our goal of reducing energy consumption by reducing energy use for lighting by 50 per cent,” says Thomas Augustsson, a property manager with the municipal property management company, Kärnfastigheter. A large part of the saving is due to the white ceiling, which reflects and spreads light throughout the premises, combined with efficiently controlled uplighters. The uniform lighting makes the premises more flexible, and the spaces can be re-fitted and adapted to suit different needs. The interior is also smarter and more attractive than before.

Model for future renovation

Better acoustics, better lighting, lower energy consumption and a more attractive and efficient working environment are the biggest benefits, according to Thomas Augustsson. The new interior design for the

school will serve as a model for future renovation work on school premises in the municipality.

School gets a fresh lease of life

Elineberg School, which was built in the 1960s, has been renovated several times over the years. Today the school caters for modern teaching requirements. All the premises in the school – the classrooms, corridors, staff rooms, hall and stairways – meet the same high standard. They are well lit, have a good acoustic environment, and the aesthetic facelift has made the school an attractive place to work for everyone.

Anita Olsson, the school caretaker, who helped manage the project from the start, laughs when ECO magazine calls her.

“It used to look as if someone had stuck hay on the classroom ceilings. They were old and tired-

looking. Now there is more light in the classrooms, even when the controlled lighting is switched off when it’s light enough outside. The ceiling surfaces reflect daylight into the rooms. Before, we used to have the lighting switched on full all the time.”

Many people have commented favourably to Anita about the changes since the renovation work was carried out, and she feels that the school has become: “pleasanter, airier, warmer, brighter and modern-looking”.

Better acoustic environment for everyone

Special attention was given to five of the classrooms. In addition to carefully adapted lighting, extra-thick sound absorbers have been used to create an acoustic ceiling with exceptional performance in absorbing low frequency sounds. This is especially important for people who

have impaired hearing. The result is an acoustic solution that benefits everyone, so that pupils and teachers hear each other better.

Benefits of collaboration

The new working environment at Elineberg School is the result of collaboration between specialists in two of the most important environmental areas in schools – lighting and sound. Ecophon has developed a range of acoustic ceilings with a coating that reflects lighting without glare and spreads daylight and artificial lighting throughout premises. Ecolux, who are experts in lighting, offer a range of efficient light fittings for indirect lighting as well as a complementary selection of direct light fittings.

Collaboration between these specialists in lighting and sound is an example of how good room acoustics can be combined with an efficient lighting environment.



“It’s now much lighter and the acoustic environment is better than before,” comments Frida Wirén, who is seen here teaching year seven pupils. The acoustic ceiling combined with wall absorbers on the right provides the ideal conditions for communication and speech perception.



Before. Direct fluorescent light fittings in a wood wool ceiling that has limited sound absorption and does not reflect light effectively around the premises.



“The old sixties premises have been transformed like magic into a modern school,” says Anita Olsson, school caretaker. “What a difference!”



After. Quite a transformation. The uplighters spread uniform light throughout the classroom thanks to the acoustic ceiling’s ability to reflect light without glare. The ceiling meets the highest absorption class, class A, which makes it easier to communicate effectively and allows everyone to hear each other much better.

Acoustic system from Ecophon
Ecophon Master™ A
with Ecophon Master™ Extra Bass
Ecophon Wall Panel™

Intelligent and attractive joins between ceiling levels



A flexible, attractive and elegant solution for creating level changes in ceilings and hiding ugly piping and wiring, as in the reception area of Svenska Finans & Försäkringsteamet. Sound-absorbing Ecophon Fixiform™ is integrated here with a complete Ecophon Fokus™ Ds acoustic ceiling – all installed on the same grid system. Svenska Finans & Försäkringsteamet is an independent insurance broker with headquarters in Helsingborg, Sweden. The insurance broker serves companies and individuals who are looking for solutions to their finance, insurance and savings needs.

Ecophon Focus Fixiform™ has arrived – a much-awaited solution for creating multilevel false ceilings with optimal sound absorption and an attractive appearance.

Until now, the points where the different levels of an acoustic ceiling meet the vertical have usually been aesthetically unattractive due

to different surface materials and angle solutions. Moreover, the room acoustics were compromised because the joins between the different levels usually lacked sound absorbing properties.

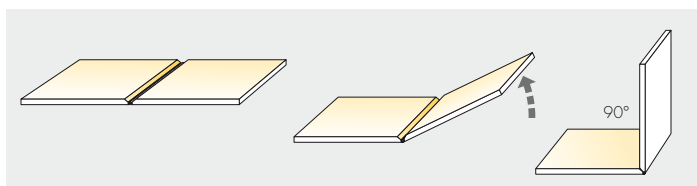
Ecophon Fixiform™ is designed to be integrated with existing Ecophon acoustic ceiling systems.

Thanks to standardised components, it allows uniform joins to be created between the different levels. These acoustic panels have the same surface as the rest of the acoustic ceiling, guaranteeing a homogeneous appearance with neat angles and profiles.

Ecophon Fixiform™ also makes the ceiling contractor's work safe and simple. The ready-to-use verticals come in flat packages and are easily folded to a 90 degree angle, which is fixed into place and mounted. The whole ceiling area is sound-absorbing – a great advantage in open-plan spaces with a variety of ceiling heights, but where a good acoustic environment is required.



"For someone like me who spends most of their time here in reception it's great to work in such an attractive and quiet environment. And best of all – that ugly piping is now hidden above the ceiling," says Ann-Charlotte Snygg, an assistant broker.



Ecophon Fixiform™ easily folds to fit the angle between the acoustic ceiling at different levels.

The Sound Guide – an aid to creating good acoustic environments

Various research and studies have shown that the acoustic environment plays a vital role in the way that patients and staff feel in hospitals and other care premises. Effective sound absorption and sound insulation contribute greatly to the well-being of staff. Patients sleep better and feel less stress, which reduces treatment times and care costs. A good acoustic environment also contributes to privacy and safety.

Easier to create a good acoustic environment

So what do we actually mean by a “good” acoustic environment and how do we achieve it? Property managers and clients can now consult the Sound Guide, which explains what you should aim for and what requirements you should make when building or renovating care premises. The aim is to make it easier to create a good acoustic environment for everyone who will use care premises.

Some time ago, Lars Johansson, a functional planner with property management company Locum, requested a checklist to help him specify the right acoustic requirements for a project. Together with

Locum, Ecophon has now produced the Sound Guide.

“I’m convinced that everyone who plans care buildings will find this tool makes it clearer and easier to deal with sound issues related to activities in hospitals, says Katrin Bergmark, a concept developer at Ecophon. Common acoustic terms such as reverberation time, equivalent sound level and sound absorption coefficient can otherwise cause confusion.”

The purpose of the Sound Guide is to provide support for the client right from the early planning stage when acoustic issues have to be discussed by the project team. This will make it easier for the client to explain his requirements to architects, acoustic consultants and building contractors. The Sound Guide contains advice on room acoustics as well as airborne sound insulation.

Answers to questions

The Sound Guide contains a number of questions that relate to different aspects of the acoustic environment. Do patients need peace and quiet? Will people spend a large amount of time in the premises? How much

disturbing noise is expected? The answers to these and other questions form the basis for establishing priorities.

Based on the answers given, the Sound Guide gives advice on which acoustic aspects are most important to consider in different applications. Do you require low noise level, short sound propagation or good speech clarity? The Sound Guide also gives advice on the acoustic design of rooms.

Guidance for your application

The Sound Guide is just one of many examples of a partnership that can help you specify requirements for a good acoustic environment. To find out which tools are best for you and your application, you should contact Ecophon.

We promise it will be worth it.



“Most of all we will be using the Sound Guide in discussions with tenants, doctors and nurses when we make plans for building and renovating nursing premises,” says Lars Johansson, a functional planner with Locum.

“Amateur acousticians like us find it a little difficult to interpret the meaning of all the guidelines and regulations relating to indoor acoustic requirements and the Sound Guide now helps us with this.”

Locum AB is a leading property management company in Sweden, with a property portfolio of around 2.1 million square metres in the county of Stockholm. The majority of tenants are nursing establishments in the county. Locum AB is owned by Stockholm County Council.

Photo: Peter Lindström



What should we expect of the acoustic environment, what should we aim for and what requirements are reasonable to impose in an environment such as this? The Sound Guide helps you answer these questions.

Photo: Nicklas Rudolf



“We should not forget the people who will be using the rooms,” says Katrin Bergmark, concept developer for Healthcare environments at Ecophon. “Who are they and what will they be doing in the rooms?”

By answering the questions in the Sound Guide, property managers or clients build up a picture of what is required from the acoustic environment.

FINALLY A SPACE WHERE PEOPLE CAN RELAX

Before:

“When there are a lot of people there’s an incredible din that makes it impossible to talk, even to the person next to you.”

“I spend as little time there as possible.”

After:

“There’s no echo at all now. Lots of people can talk at the same time in different parts of the room without it becoming hard work.”



The staff in the emergency department were asked to answer a series of questions before and after the sound absorbers were installed. The results were striking.

There had been numerous complaints about the awful acoustic environment in the newly built room at Landskrona General Hospital in southern Sweden, which was used for lunch, coffee and meetings. Something had to be done. By taking some relatively simple steps, the room was transformed from a

noisy chaos into a space where people could talk and relax between tough shifts.

A continuous acoustic ceiling was installed and wall absorbers were fitted on one wall. This was all that was needed to provide a much-needed place to relax for all the nurses, nursing assistants and doctors! With 20 to 25 people in the room at one time, the acoustic environment was clearly very important.

To provide objective evidence of the acoustic improvements, the acoustic properties of the room were

measured, and it was found that the sound level had fallen by 7 dB, a considerable improvement. Another measure of acoustic performance is speech clarity, which compares the levels of early and late reflected sounds in the room. Early reflections help listeners perceive speech clearly, while late reflections impair speech clarity. Speech clarity was also found to have increased markedly, and this was also shown by the replies of the staff to the questionnaire.

Delighted staff comments on their impressions before and after



Comments on impressions before...

- "It echoes so much. If you sit in the middle of the room you can't hold any conversation at all, as the sound just bounces around the room."
- "I took shorter breaks and avoided having lunch at the same time as others."
- "I sometimes have to ask afterwards what was said."
- "When there are a lot of people there's an incredible din that makes it impossible to talk, even to the person next to you."
- "I spend as little time there as possible."

...and after the sound absorbers were installed:

- "The environment is much more muted; it feels as if I can relax more in the room."
- "We can talk to each other without struggling."
- "There's less background noise when a lot of people are in the same room."
- "There's no echo at all now. Lots of people can talk at the same time in different parts of the room without it becoming hard work."

Continued on next page

Room Acoustic Comfort™ – crucial parameters needed to achieve the demands on the sound environment

Room Acoustic Comfort™ is an acoustic concept that is based on the interaction between people, the room and the activities that take place, and aims to optimise the acoustic environment to suit the needs of the end user. It looks at who is in the room, how the room is shaped and the activities in which the occupants are involved and provides solutions to create the desired acoustic comfort.

Four descriptors are used to define the subjective acoustic experience of the occupants:

- Spatial Decay
- Clarity
- Auditory Strength
- Reverberation

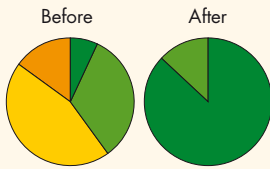
Depending on the room, certain descriptors are crucial to support the objectives for the room.

In this case of a staff room, auditory strength and clarity appear to be the most important based upon the staff's feedback after the acoustic interventions had been made.

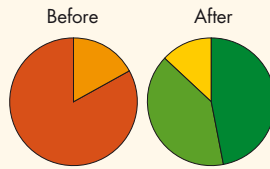
The choice of acoustic material and the placement of the absorbers are crucial to reach the optimal values. The used acoustic parameters, respectively G (auditory strength) and C_{50} (clarity) and the values reached make a good reference for other projects.



“Perceived sound environment depended on number of people in room”



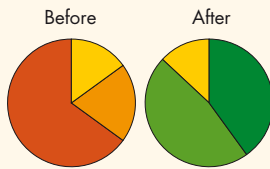
The acoustic environment appears good when there are a few people in the room.



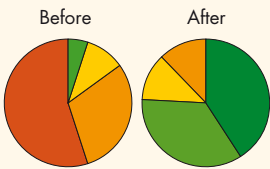
The sound level seems good, even when there are a lot of people in the room at the same time.

Before the change, the staff felt that the acoustic environment was relatively good when just a few people were in the room, but when there were more people in the room the acoustic environment was no longer good. After the change, many people are significantly happier with the acoustic environment, even when there are a lot of people in the room at the same time. Since the change, the acoustic environment is also perceived as being more muted.

“Impact of the acoustic environment on speech clarity”



It feels easy to talk to a colleague, even if there are other conversations going on in the room at the same time.



It's easy to understand what's said when there are several of us involved in a conversation.

Before the change, most people felt it was difficult to talk to a colleague when there were other conversations going on in the room. It was also difficult to perceive what was said when there were several people taking part in the same conversation. After the change, it feels considerably easier to hold a conversation with a colleague, even when other conversations are taking place in the room. It is also considerably easier to take part in a conversation that involves several people.

To what extent do you agree with the above statements?



Acoustic measures that transformed the room



The photo on the left shows the acoustic ceiling in the room, and the photo on the right shows the wall absorbers on one of the walls – all of the highest absorption class, class A, which contributed to the fantastic results.

Acoustic systems from Ecophon
 Ecophon Master™ B
 Ecophon Wall Panel™ C

Acoustic Bulletin

– your portal to room acoustic design!

The Acoustic Bulletin is a free online news service that covers all aspects of room acoustics. You can search among 500 articles. This is a valued tool for quickly finding specialist knowledge, advice, ideas and solutions for designing a better acoustic environment.

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- **Visualization**
- **Room Acoustic Comfort™**

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We want to give you the knowledge and advice you need to make or influence the right decisions during the planning of offices, schools, care premises and other environments where people work, spend time and communicate. Room acoustics – one of the most important factors that affect the way people work together or individually – will be given special attention in the magazine.

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