

ECO

FOR SUSTAINABLE DESIGN

CLEAN INDUSTRY

GOOD SOUND ENVIRONMENT IN CLEAN INDUSTRY

GOVERNMENT MILLIONS FOR
UPDATED ROOM ACOUSTICS
IN LABORATORIES

NOISE CHALLENGE

FROM LOGISTICS GIANT

VIETNAM BREWERIES

WITH FOCUS ON SOUND



CONTENTS

- 2** Better acoustic environment in industry and catering with strict hygiene requirements
- 4** Government millions for updated room acoustics in laboratories
- 8** "Thanks to the sound absorbers, we are now under 80 decibels," says Barbara Oko.
- 10** Successful, fast-growing bakery doubled quantity of sound absorbers
- 12** Vietnam breweries with focus on sound
- 14** Successful acoustic treatment of hospital kitchen despite limited resources acoustics
- 16** Zero laboratory emissions a challenge for acousticians
- 18** Noise challenge from logistics giant
- 19** Fruitful cooperation on noise reduction
- 20** Good sound environment in clean industry



Saint-Gobain Ecophon Group is represented in many countries in Europe. Please find your contact via our website www.ecophon.com

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 an ongoing dialogue with our readers. Don't hesitate to contact any of our companies through the website, www.ecophon.com!

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BETTER ACOUSTIC ENVIRONMENT IN INDUSTRY AND CATERING WITH STRICT HYGIENE REQUIREMENTS



ECO - FOR SUSTAINABLE DESIGN/CLEAN INDUSTRY is an issue focusing on a better acoustic environment in industrial and catering premises with strict hygiene requirements. The articles describe different system solutions using sound absorbers on ceilings and walls. Ecophon Hygiene™ system acoustic ceilings and wall absorbers, combining the properties necessary for cleanability and good acoustics. These make it possible to create a more effective pleasant and healthier indoor environment by reducing the sound levels, shortening the reverberation time and limiting the sound propagation in more or less all types of industries with strict hygiene requirements.

Strict cleanability requirements have meant that, over the years, hard materials have been used on walls and ceilings as a matter of course. But noise can become almost unbearable if no measures are taken. Thanks to technical development, a solution now exists.

Ecophon offers acoustic systems for industrial premises - in sectors with specific hygiene requirements - such as the food and beverage, electronics, pharmaceutical and restaurant and catering industries.

Benefit from our expertise

Visit www.ecophon.co.uk and have a look around. We promise you will find what you

need to know about the acoustic environment for your particular sector - the advice you need as well as the required technical solutions. We arrange seminars and training to help you plan a good acoustic environment. You are welcome to contact Ecophon so you can participate at the first opportunity. Or we can draw up bespoke training suited to your particular business.

A good acoustic environment is not an impossibility - it is a necessity.

GOVERNMENT MILLIONS FOR **UPDATED ROOM ACOUSTICS** IN LABORATORIES

WITH A BUDGET OF SIX billion Danish kroner, the Danish government started an initiative in 2010 for the renovation and refurbishment of laboratories at the country's universities.

Room acoustics was one of the areas on which the responsible government authority, Bygningstyrelsen (BYGST), focused prior to the renovation work. Other areas included air quality, thermals and the visual design as well as lighting, cleaning and the environmental profile of the products (cradle-to-cradle).

For the University of Southern Denmark (Syddansk Universitet) in Odense, this initiative was a welcome chance to renovate the Physics, Chemistry and Pharmacy Department labs. The buildings date from the 1970s and cover a total of 7,000 square metres. The renovation project was divided into five phases. The first was completed in December 2011, the second was carried out in 2012 and the remaining three will be finished in 2013.



Photo: Sudeen/Reddy/Sandberg

Making the most of daylight

BYGST, which comes under the Climate and Energy Department at the Ministry of the Environment, appointed Nøhr & Sigsgaard Arkitektfirma A/S (architects) as a partner in the project.

“The goal was to create more transparency, contact and visibility,” explains Mads Koch of Nøhr & Sigsgaard. “We achieved this by using a lot of glass, to introduce daylight. A better feeling of openness developed, as well as a more homogenous appearance, and there was much flexibility in the design in order to meet future changes.”

Mads Koch says that the old acoustic ceilings had a mixture of different materials. It turned out that a lot of them contained asbestos - a substance that is dangerous to inhale and that has been prohibited in Danish building materials since 1987.

Two appropriate class A acoustic systems

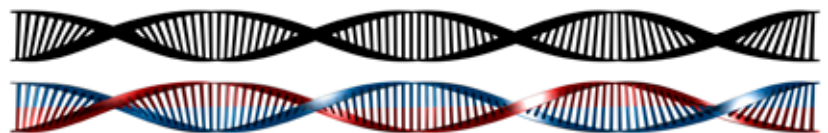
Ecophon Hygiene™ Labotec Ds C1 was chosen as the new acoustic ceiling for the laboratories. This is a wall-to-wall system for environments with requirements for low particle emission and where washing and/or disinfection are sometimes needed. The Ds-system only has vertical joints, minimizing the problem of dirt pockets. Although the grid is concealed, the absorbers can easily be removed in order to access the installation systems above them.



Photo: Sørensen / Fredrik Sørensen



Architect Mads Koch at Nøhr & Sigsgaard Arkitektfirma A/S.



Research in the field of modified DNA is an area where the university in Odense has made a name for itself.

Bild: sxc.hu/flaivoloka



Photo: Sudeen/Reddy/Sunderphen

Building boom at University in Odense

Another building project in addition to the lab renovations is under way on the campus. This is a 40,000 square metre complex for health science that will accommodate the Institute of Molecular Medicine.

The University of Southern Denmark (Syddansk Universitet) is the country's third largest and is relatively young, dating from the mid-1960s. The university has almost 20,000 students and is divided between six different campus areas mainly in the south of Denmark.

The Department of Physics, Chemistry and Pharmacy in Odense has made a name for itself in the area of research into modified DNA. Successful biomembrane research is also conducted, contributing to the development of pharmaceuticals that, behaving like target-seeking robots, attack sick cells in the body.



Photo: Sudeen/Reddy/Sunderphen

“It’s been a success right from the start,” says Stefan Vogel, chemist, PhD and lecturer at the Faculty of Physics, Chemistry and Pharmacology at the University of Southern Denmark. “All aspects of the indoor climate have improved. The ventilation system has been installed above the ceiling and is much quieter now, the premises are a lot lighter and we are not bothered by noise.” He states that a good sound environment is vital since the teachers often work in groups together with the students.



Photo: Shutterstock/Fredrik Stenlund

Easy access to these systems was also a requirement for the acoustic ceilings in the corridors. It is well known that corridors reinforce and scatter noise to other parts of a building and thus also need acoustic treatment. Ecophon Access™ C is now used at the University of Southern Denmark. The system has an inset grid and absorbers that are easily accessible.

Both of these acoustic systems are of the highest absorption class (A). They have an Akutex surface that reflects and diffuses the light evenly without any shine or dazzle – an appropriate quality in the University's

renovated areas, where the aim is to make the most of the natural daylight. These sound absorbers from Ecophon's acoustic system are eco-labelled and completely recyclable, fulfilling the cradle-to-cradle-based environmental requirements of the renovation project.

Making the most of daylight is also about reducing energy consumption. "Saving energy and creating a good indoor climate have been two of the key aims from the start of the project," emphasizes Mie Thomsen, project manager at BYGST.

Enthusiastic reception

She is pleased that the renovation work has not disrupted the daily activities at the university to any great extent. The aim was that people would only have to change workplace once.

"And it's been a pleasure to witness everyone's enthusiasm about moving into new premises," says Mie Thomsen.

Mads Koch has been met by the same positive reactions.

"I feel that we've achieved everything we set out to do."

Acoustic systems from Ecophon:
Ecophon Hygiene™ Labotec Ds C1
Ecophon Access™ C

“THANKS TO THE SOUND ABSORBERS, WE ARE NOW UNDER 80 DECIBELS,” SAYS BARBARA OKO.



“The work environment is an important part of our brand.” Barbara Oko, project engineer at Unilever in Katowice.

IN POLAND, one of Europe’s most expansive countries, a good work environment is seen as being one of the most profitable investments. So says Barbro Oko, project engineer at Unilever in Katowice.

Important part of the brand

“And, as a global company, we have to be at the forefront – work environment issues are an important part of our brand,” declares Barbara. “The questions of sound are high on the agenda when we build or renovate. Polish standards require hearing protection in equivalent (average) sound levels of 85 dB and over, and at levels over 80 dB, the employer is obliged to examine the possibilities for improvement. All in accordance with EU regulations.”

Use acousticians

Unilever always uses an acoustician when sound issues come up. The Laboratorium Acoustic company, at the technical university in Wroclaw, examine the room

acoustic conditions and suggest solutions in connection with construction planning, often in consultation with Ecophon, who develop and market acoustic systems for ceilings and walls.

Under 80 decibels

Barbara Oko takes us on a guided tour of the Katowice plant, which covers a total area of 6.5 hectares and employs about 900 people.

The ECO magazine looks in at the tea factory, built in 2006, and Barbara says proudly that she ran much of the project herself. The facility, with its 8000 square metres of floor space of which production occupies half, still feels like new. Barbara assures us that the working conditions for the 250 employees are excellent.

“See for yourselves! It’s so light and fresh due to the overall acoustic ceiling with its white surface, reflecting the light throughout the entire premises.”

Acoustic calculations during the building process showed that the sound pressure levels ought to reach 85 dB (A) without any room acoustic treatment.

“By choosing an acoustic system in the best sound absorption class, the equivalent level has landed at 78-79 decibels, with the odd peak of 81. So we are on the right side of the authorities’ required limits.”

Sound level almost halved!

Barbara guides us on to Unilever’s margarine factory. About 240 sound absorbing baffles were installed in the ceiling here in 2010. The sound pressure levels suddenly went down by 40-50%!

“But I believe the situation can improve even more,” says Barbara. “With the help of free hanging, sound absorbing units above certain noisy machines, we should get the sound level down even more ... here and there ...”



Photo: Kozłowski Sp. z o.o.

An acoustic system in the best sound absorption class (Class A) in Unilever’s tea factory meant an equivalent sound pressure level of 78-79 dB(A) – below the limit of what the authorities deem to be hazardous sound levels. Light and fresh, isn’t it?

A pleasanter, safer workplace

Our tour continues to Unilever’s logistics centre. This is where orders and deliveries are handled, not only for Poland, but also for other customers in Europe. Each year, 180 tonnes of margarine leave the factory in Katowice.

“Here too, we have paid a lot of attention to the sound environment – in the two open offices with 120 employees. Spontaneous comments indicate that people are pleased!”

According to Barbara Oko, a good indoor environment is vital. If people are tired and irritated at work – usually unnecessarily – production falls and waste and complaints increase.

“A better sound environment makes the workplace pleasanter as well as safer,” she declares.



The acoustic system on the bottom floor, in Unilever’s logistics centre, is equipped with impact sound insulation, which limits disturbing noise from the floor above.

Sound absorbing baffles with a dirt resistant, cleanable surface was the hygienic, room acoustic solution that reduced the sound pressure levels by 40-50% in the margarine factory.

Facts Unilever in Poland

Unilever is a British/Dutch company and is one of the world’s largest manufacturers of everyday commodities, especially food, drink, laundry detergents and hygiene products. Unilever have four factories in Poland. Tea (Lipton and Saga) and margarine are manufactured in Katowice. The factory in Gdansk produces ice cream under the Algida brand. In Poznan, soups, mustard, ketchup and noodles. Chemical products such as shampoo and body lotion are manufactured in Bydgoszcz.



**Acoustic systems from Ecophon:
Ecophon Hygiene Protec™ A C3
Ecophon Hygiene Foodtec™ Baffle C3
Ecophon Combison™ Duo A**

SUCCESSFUL, FAST-GROWING BAKERY DOUBLED QUANTITY OF SOUND ABSORBERS

THE DANISH COMPANY Easyfood A/S has rapidly baked its way to the top of its sector and is now leader in the area of convenience products in its home country.

With more and more staff and an increasing production, this expansion has naturally resulted in a higher level of noise in the factory.

When the Danish Labour Inspection Authority carried out a sound control audit, high levels of mainly background noise were measured at one of the production lines and in the factory's packing area. Along certain parts of the production line, the work environment consultants AM-Gruppen, who conducted the measurements, found noise levels of between 80 and 88 dB.

To reduce noise to a level that would mean that hearing protection would rarely

be needed, room acoustic calculations showed that double the existing quantity of sound absorbers would be needed.

Without too much exaggeration, it could be said that Easyfood's success is measurable by the number of sound absorbers in the factory.

Deep-frozen success

Easyfood, enjoying great success, manufactures deep-frozen varieties of bread in the form of bake-off and "thaw and serve" products as well as pre-cooked pasta. Everything to simplify baking, cooking and serving for the customers who buy the company's products.

And the customers are many. Since its start in 2000, Easyfood has grown to be the major Danish producer in this sector. The market is in Scandinavia and northern

Europe and the customers include chains such as Coop, Danish Supermarket and McDonalds.

Easyfood now has about one hundred employees and it manufactures the popular products at two production lines.

As this is a question of food handling - in addition to bread and pasta, meat and vegetables are also handled - there are strict requirements in the area of hygiene and quality control.

Cleaning requirements were decisive

Careful consideration had to be given to the choice of absorber type. The company's cleaning procedures mean that materials have to be able to withstand aggressive chemicals. Apart from the cleaning of machinery at the start of each new baking session and the weekly cleaning of the factory, all surfaces including the sound absorbers in the ceiling are cleaned once every three months.

After having evaluated different acoustic systems, the conclusion was that vertically hanging Ecophon Foodtech™ Baffle C3 was the correct ceiling solution. The choice made for the walls, which are cleaned more frequently, was Ecophon Advance™ Wall C4, which has a fixing that is adapted for highly corrosive environments.

All in all, a floor area of 450 square metres at the production line and 100 square metres in the packing area were given acoustic treatment. The total area of





In the ceiling, sound-absorbing baffles in combination with an anti-corrosion system of wall absorbers. The total area of sound absorbers is almost twice what it was before. It is now easier for the staff to communicate with each other in a normal tone.



Operational manager Peer Jespersen and technical manager Svend Östergaard say that the sound environment is now much better in successful, fast-growing Easyfood's factory.

the factory is 2,500 square metres and the whole of Easyfood's plant in the Danish town of Kolding covers double that area.

With the new sound-absorbing wall panels and ceiling baffles in place, the company's technical manager Svend Östergaard says there is now a great difference in the sound environment. Comments from other staff are also positive and they appreciate the fact that it is now easier to talk to each other in a more normal tone.

**Acoustic systems from Ecophon:
Ecophon Foodtech™ Baffle C3
Ecophon Advance™ Wall C4**

VIETNAM BREWERIES WITH FOCUS ON SOUND



LARGE PREMISES WITH LARGE AREAS of hard surfaces result in large sound problems. But problems are for solving. The Asia Pacific Limited (APB) brewery giant decided to reduce the noise levels in their production premises in Vietnam.

The Vietnam breweries put much effort into fulfilling strict demands in the field of work environment. For this reason they have now invested in effective sound absorption in the plants in Ho Chi Minh and Danang. All in order to give the staff an acceptable working environment.

Same international sound requirements

Also in Vietnam there is a legal requirement stipulating a maximum equivalent sound level of 85 dB if hearing protection is not going to be used. When noise levels exceed 80 dB, companies must conduct a review and draw up proposals for improvement.

Bottles and cans moving at high speed on production lines result in considerable noise levels, so acoustical measures are a necessity.

Resistant to damp and rust

Acoustic consultants were called in to estimate the sound absorption needs and where the absorbers should be located. After looking at several different solutions, Clifford Jones, Supply Chain Director, decided to have about 900 sound absorbing baffles of sound absorption class A installed in the ceiling, above each of the two production lines.

The demand made on the sound absorption system was that it had to be able to withstand the high humidity that can cause corrosion and mould growth. The system consists of sound absorbers that are encapsulated in a high-tech resistant film and a humidity-resistant grid.

In the sister brewery in Danang 600 sound absorbing baffles were installed in a limited area of the plant where the noise problem was most acute, absorbers made a considerable difference. It was then decided to install another 1,000 baffles in a new canning line in order to reduce the reverberation time.



APB and the local partner Vietnam Brewery(VBL) runs the four Vietnamese breweries in Danang, Ho Chi Minh, Quangnam and Tiengiang. APB is in the process of being taken over by Heineken to 100%.



Mr. Dietmar Laske of Heineken's head office and who is responsible for health and safety, says that the company strives to fulfil the same working environment requirements irrespective of where in the world their breweries are located.



Almost 2,000 sound absorbing baffles provide an acoustic environment that is acceptable for the employees and that meets the legal requirements at the Danang brewery.



Two lines at APB's brewery in Ho Chi Minh City, one opened in 2009 and the other in 2011. The brewery is the fastest and most advanced canning lines in Vietnam. Tiger and Heineken, beer are produced here.

Acoustic systems from Ecophon:
Ecophon Hygiene Advance™ Baffle C3

SUCCESSFUL ACOUSTIC TREATMENT OF HOSPITAL KITCHEN DESPITE LIMITED RESOURCES

Everyone who has been in an commercial kitchen knows about the high noise levels. The bigger the kitchen, the greater the risk of noise problems developing.

Tampere University Hospital is one of the largest hospitals in Finland. More than 7,000 people work there, and half a million live in its catchment area.

The noise levels in the hospital kitchen, particularly in the dishwashing area, were so high that maintenance engineer Illka Late finally turned to Ecophon for a solution. It was not only the noise itself that was irritat-

ing but it also meant that it was difficult for the staff to communicate with each other.

The solution that was chosen was simple and quick to implement, without upsetting the work in the kitchen.

Minor resources, major results

Fifteen square metres of sound absorbers were mounted on the walls along the dishwashing conveyor belt. They were installed at a distance of 40 mm from the wall so that they could be removed easily when the walls needed cleaning.

The total floor area in the section that was given the acoustic treatment amounts to 98 square metres – more than six times the total area that was covered with sound absorbing panels.

This shows that good room acoustic results can be achieved even with limited means.

The acoustic consulting firm Helimäki could confirm the improvement in the room acoustics after having measured important parameters both before and after installation of the sound absorbers.

Results by octave band before and after installation of acoustical tiles.

	Parameter	63 Hz	125	250	500	1k	2k	4k	8k	16k
Before	EDT(s)	0.9	0.7	0.7	0.9	0.9	0.7	0.6	0.3	0.2
After		0.9	0.6	0.5	0.7	0.6	0.4	0.3	0.2	0.1
Before	RT(s)	1.1	1.0	0.8	0.9	0.9	0.9	0.8	0.6	0.4
After		1.1	0.7	0.7	0.7	0.7	0.7	0.6	0.5	0.3
Before	C ₈₀ (dB) ¹⁾	5.8	1.8	3.6	2.7	2.8	6.3	6.8	11.0	16.8
After		5.8	8.4	8.8	6.3	8.7	12.0	12.5	15.4	22.5
Before	D ₅₀ (%) ²⁾	42.7	34.0	51.3	48.7	48.3	70.3	68.7	81.7	93.3
After		71.0	50.3	74.7	70.3	79.0	88.0	89.0	93.3	98.0

Note: 1) and 2) are related; if the one measurement is known, the other can be calculated. The difference is that C is expressed in dB while D is expressed in per cent, which is often preferred. It is easier to relate to a percentage, which stands for something relative, than to a dB-value.

- Reverberation time (RT). Decreased (see table).
- Early decay time (EDT). Decreased (see table).
- Clarity (C₈₀) Increased (see table).
- Definition (D₅₀) Increased (see table).
- Speech Transmission Index (STI) Improved.
- Background noise level (L_{Aeq}). Decreased a little.
- Spatial decay (DL₂) – measurement of how much the noise level decreases with distance. Increased from 3dB to 6 dB.

C₈₀, D₅₀ and STI are three different measures of speech intelligibility.



Before and after installation of wall absorbers. Hard, tiled areas resulted in a noisy work environment near the conveyor belt for dishes. Wall absorbers that are easy to remove for wall cleaning improved the room acoustics and the staff can now communicate with each other without being bothered by noise.

The staff can now communicate

The most important improvement was that speech clarity increased at midrange (500 Hz) from 48.7 to 70.3 per cent and at 1,000 Hz from 48.3 to 79 per cent. The staff finally could enjoy a work environment where it was easier to communicate, and they have also said they think the sound environment has improved.

The positive results of the acoustic treatment have led to the University Hospital in Tampere planning for further improvements. Next in line is the staff canteen which is adjacent to the kitchen.



Photo: Kent Pekala

**Acoustic systems from Ecophon:
Ecophon Hygiene™ Foodtech Wall C3**

ZERO LABORATORY EMISSIONS **A CHALLENGE FOR ACOUSTICIANS**

WELCOME TO A CHALLENGE for acousticians: heavily contaminated laboratory environments.

This is a question of facilities dealing with substances that must not leak out. The stringent safety demands placed on premises like these can involve areas of special glass, magnetically locking steel and glass doors, and hard, easy-to-clean areas that have to withstand aggressive substances and steam-cleaning. In other words, these are not dream conditions when you want to achieve acceptable reverberation times.

In cleanrooms where sensitive electronic equipment is manufactured, it is crucial that no contamination can enter the premises and damage materials and components. One method of combating the problem is to use HEPA filters, also known as absolute filters, to exclude airborne particles.

In reverse, the same type of filter is used in contaminated laboratories to prevent harmful substances from escaping to the surrounding areas. There also has to be negative air pressure in order to bind the particles. The same technique can be used in cleanrooms where a positive air pressure regime can be applied to prevent the ingress of airborne substances.



With clean room environments designed primarily to inhibit the ingress of foreign particles, high-containment environments, whilst sharing broadly similar engineering principles, aim to do the opposite. That is; to prevent harmful substances from escaping a sealed space.

Avoid a noisy box

To get the air pressure and filtering to function properly, everything is hermetically sealed in a large, dense shell of hard walls, glazed areas, glass and steel doors etc, in order to prevent any kind of leakage.

EU member states have strict criteria for the classification and management of harmful substances but also for how the premises must be designed in order to fulfil environmental and safety requirements.

Bearing in mind the unique prerequisites for laboratories of this kind, the question of room acoustics should be addressed early in the building process, with acoustic measures being included naturally in the design work. A room that is a big sealed box will be extremely noisy if it is not given the appropriate acoustic treatment.

As there may be restrictions about the use of mechanical fixings, the sound absorbers must sometimes be bonded to the ceiling surfaces that surround surface-mounted power cables, light fittings, ventilation grilles and the like. The acoustic ceiling is supplemented with highly effective wall absorbers to minimize the effect of flutter echoes, which can be considerable in this type of premises.

Examination of the architect's design of the ceiling with its different installations is a

guide as to the suitable quantity of acoustic absorber that will be necessary to reduce the reverberation time to an appropriate level.

It is important during installation to seal the perimeters between the acoustic panels and to do this with a material that is resistant to water, steam and the chemicals handled in the laboratory.

Don't trust the Sabine values

When planning the room acoustic treatment, another important detail must be observed: the actual reverberation times in an environment like this can bear very little relation to those calculated in advance using Sabine's formula.

This has been shown by tests carried out to check the room acoustics in a small laboratory environment (58 m³). Walls, floor and ceiling were all concrete and no absorbers had been installed. The laboratory was narrow, with a width of 3.2 metres.

The reverberation times measured were in fact almost double the length of the Sabine values.

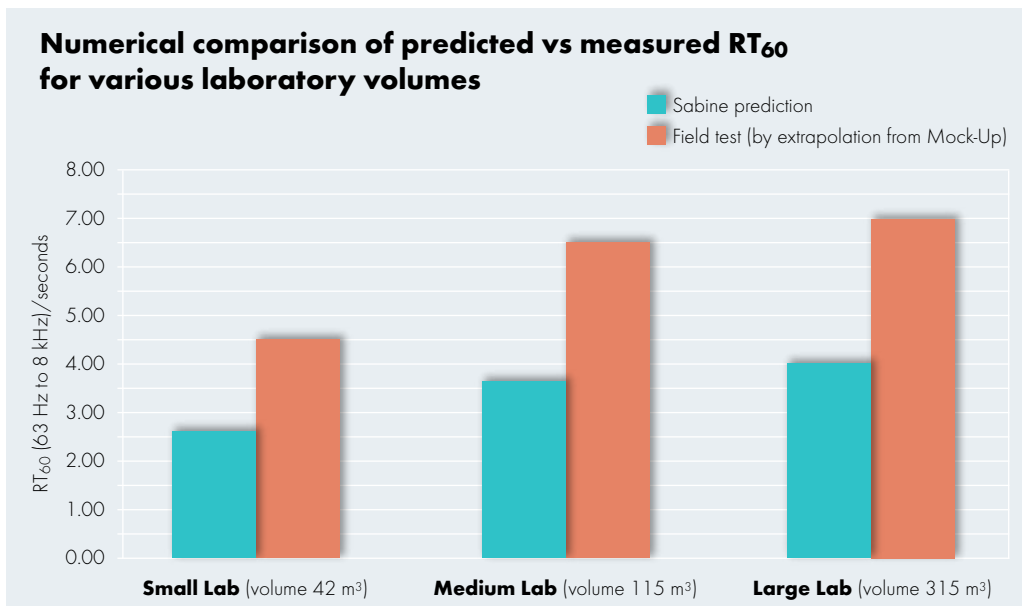
There are several explanations for the discrepancy: the sound field in the laboratory environment is not perfectly diffused, which it is presumed to be in Sabine's formula, in which the calculations are

based on asymmetrical areas that diffuse the sound waves. In a high-containment laboratory that is comparatively symmetrical, "room modes" develop easily, creating long reverberation times. "Flutter echoes" could also be observed, these being the effect of sound waves rebounding between opposite walls.

The test results comprised the basis for extrapolating approximate values in three different-sized laboratories (see diagram). In the largest, 315 m³, the reverberation time increased to a total of seven seconds.

The use of sound absorbers such as acoustic ceilings and wall absorbers is necessary in order to achieve a work environment with an acceptable sound level and good speech intelligibility. In critical environments such as these, ease of communication is of extreme importance.

Ecophon Labotec™ Ds C1 is an acoustic system developed for all-over ceilings in environments that demand low particle emission and where wet cleaning and/or disinfection are necessary. The system only has vertical joints, minimizing dirt traps.



This text is based on the article "The flip side of the clean room coin: acoustic design of high-containment laboratories", by Alex Krasnic, senior acoustician.

The moral: in cases like this, reverberation times calculated using Sabine's formula should not be trusted.

NOISE CHALLENGE FROM LOGISTICS GIANT

NETHERLANDS-BASED HSF Logistics Group are specialists in refrigerated transport and related logistics services including distribution, packaging and cold storage. HSF is one of the largest transport companies in Europe with 600 lorries and 1,300 employees.

Much of the goods are transported in plastic crates and large boxes that place strict demands on cleaning after use, such as here at the plant in Dutch Nijmegen.

Better acoustic environment needed

The staff had complained about the noise levels and something had to be done. The ceiling, which is of corrugated iron, and the hard floors both contributed significantly to the poor acoustic environment. Hard surfaces reflect and scatter the noise from conveyor belts, boxes and cleaning equipment. The staff had to wear earplugs to prevent damage to their hearing.

When the 600 square metre building was originally built, no acoustic treatment was carried out.

A programme of measures was implemented to reduce noise levels and thus achieve a better work environment.

Ceiling and walls must withstand moisture and water

In contact with Ecophon it was decided to install an acoustic ceiling and wall absorb-





To make the most of the daylight from the roof, there are wide gaps between the rows of acoustic panels. Wall absorbers have been mounted beside the noise sources.



“Packaging is cleaned bacteriologically in our modern cleaning facility and is then stored completely separately, and trained staff do this,” explains Hans Remie, Manager Technical Service.

**Acoustic systems from Ecophon:
Ecophon Hygiene Foodtec™ A C3
Ecophon Hygiene Foodtec™ Wall C3**

ers of the best absorption class A as a first step towards noise reduction.

It was of great importance that the surfaces should be able to withstand moisture and water for cleaning, so Ecophon Hygiene Foodtec™ was chosen.

Approved!

Employees can now understand and talk to each other more easily, there is less

risk of accidents and it is easier to hear signals and alarms so communication has improved.

All this has been achieved with quite a limited amount of sound absorption. In the next stage, with a doubling of the amount of absorbers, conditions would be improved significantly.

FRUITFUL COOPERATION ON NOISE REDUCTION

NOISE ISSUES can cover everything from levels of individual sound sources to a room’s ability to reduce the general sound level and propagation. Ecophon, together with INVC, Industrial Noise & Vibrations Consultants, the UK’s leading consultants in these areas, is developing solutions to reduce high noise levels generated by machinery.

The acoustic systems used in many industries often involve strict hygiene requirements. This means that the sound absorbers’ different properties, not only relating to their ability to absorb sound, must be taken into consideration.

Reduce noise at source!

Sound absorbers can either be installed at the actual noise source or can even be used inside the equipment itself.

Acoustic treatment at source can often eliminate the need for mandatory protective equipment.

No longer impossible

Peter Wilson, INVC’s technical director: “Technically, the Ecophon range has been a godsend for us as far as noise control in high hygiene industries is concerned. The products provide high performance whilst solving the hygiene issue.

“This allows us to focus on technical source control - which can also include the use of Ecophon absorbers inside machine guards. Combining the technologies allows us to achieve noise reductions that were previously considered impossible.”



Fan noise reduced by 20 dB!

The noise levels in one manufacturing area of a pharmaceuticals company were 95-100 dB(A). INVC’s award winning fan noise control technology reduced the direct noise from the fan by 20 dB, eliminating the need for protective equipment.

Peter Wilson,
technical director at INVC.



High quality acoustic systems now exist for most acoustically 'impossible' environments.

GOOD SOUND ENVIRONMENT IN CLEAN INDUSTRY

IN 1984 THE SWEDISH NATIONAL FOOD ADMINISTRATION launched a project together with Ecophon, among others, to find out whether new acoustic ceiling surface materials could fulfil the food industry's strict hygiene standards.

It was necessary for the food industry to reduce sound levels in order to improve the work environment. Up until then, for hygiene reasons, use only of hard materials such as tiles and metal had been permitted.

Approved!

With Ecophon's help, absorbers and ceiling systems with the Akutex™ surface were tested. The Food Administration approved the systems, which improved the sound environment and also satisfied the hygiene requirements. Since then, Ecophon has continued to develop new products as well as their acoustic expertise and know-how.

Ecophon can offer a wide range of different acoustic solutions for a variety of industries, all with varying hygiene and cleanability requirements in damp and sensitive environments.

A profitable investment

Hard surfaces on floors, walls and ceilings reflect sound, increase the noise level and spread disturbing noise in the area. Many industrial premises, laboratories, professional kitchens and other large premises have sound levels that are unhealthy or even harmful. An improved acoustic envi-

ronment increases wellbeing and productivity and also reduces the risk of workplace accidents.

In other words – an extremely profitable investment.

Sound absorbers do the job

The reverberation time can be disturbingly long in large industrial premises. The sound bounces around the room and the echo effect increases the general noise level. Sound absorbers of the highest absorption class, Class A, are always recommended in order to reduce that sound level.

Noise level halved

An acoustic ceiling, perhaps supplemented with wall absorbers, can reduce the sound level by as much as 10 dB(A), which is the equivalent of halving the perceived sound level! If, for some reason, an overall acoustic ceiling cannot be installed, there are other solutions in the form of wall absorbers or baffles. But also remember 3dB corresponds to 50% reduction of the sound energy.

Hearing protection is then not usually needed, improving wellbeing, communication and, as a result, safety.

What does C4 mean?

Corrosion class C4 normally means acid resistant steel but completely painted profiles can also be produced in accordance with C4. If painted profiles are trimmed

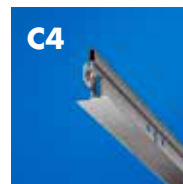
or cut, the anti-corrosive protection is no longer effective and this is a considerable limitation.

Mixing different components of different corrosion classes involves galvanic elements. It is therefore essential that each system component is of the same corrosion class, meaning that the whole system must be complete at the point of installation. This is particularly important in C4 environments, which are extremely corrosive.

Ecophon Hygiene Advance™ A C4

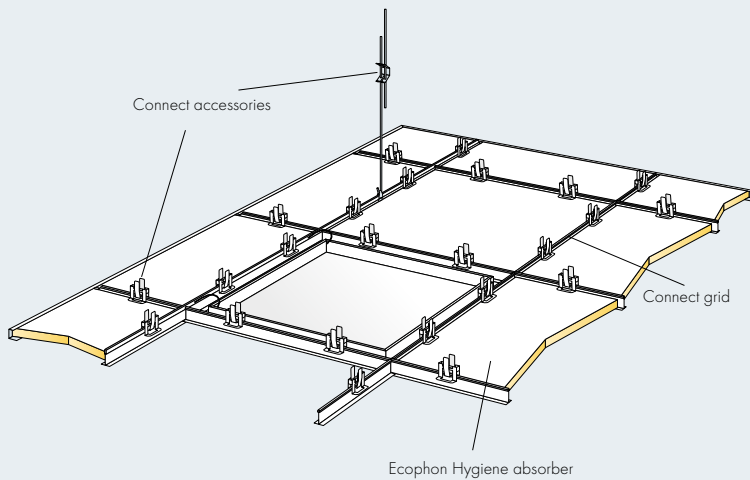
After many years of experience, Ecophon has discovered the long-term solution for an acoustic ceiling system that meets the demands of the food industry's aggressive environments. In the Ecophon Hygiene Advance™ A C4 system, every little screw, clip and other detail for the grid profiles are made of a homogeneous, stainless, acid resistant steel that fulfils corrosion class C4. Together with sound absorbers that are adapted for different environments, most situations can be dealt with.

Ecophon Hygiene Advance™ A C4 is an acoustic ceiling that lasts for many years, requires minimum maintenance and produces no unpleasant, costly surprises.



ECOPHON HYGIENE™

Ecophon Hygiene systems are based on sound absorbers with a core of glass wool, one of the most sound-absorbent materials. The sound absorbers' surface properties are combined with different types of grids to create systems that are specially developed in order to meet a variety of hygiene requirements.



The systems are developed to deal with tough factors in environments which are known to have an impact on a ceiling's performance and lifespan.

Cleanability

Ecophon Hygiene™ acoustic systems can be cleaned using the most widely used cleaning methods. In addition, systems that have been developed for specific areas of use can withstand applied cleaning methods. Certain systems can be cleaned on both sides and on the edges.

Most of the industrial detergents on the market can be used, alkaline as well as acidic, and also detergents in combination with disinfectants. Ethanol, isopropanol, sodium hypochlorite and hydrogen peroxide can all be used for disinfection.



Dry cleaning, vacuum cleaning



Wet wiping



Washing (low or high pressure)



Disinfection



Steam cleaning

Possible methods of cleaning depending on which Ecophon Hygiene™ system is chosen.

Physical properties

All materials, including the ceiling, are affected by the ambient climate. Ecophon Hygiene™ has been developed to withstand tough indoor climate factors such as high humidity, heat, microbiological activity and corrosive environments.

Ecophon's products do not absorb water by capillary action and do not absorb water from the air. The surface of Ecophon Hygiene Advance™ is completely waterproof and can be subjected to constant humidity.



Deflection of ceiling tiles deformed after absorbing moisture.



Glass wool is one of the materials most resistant to moisture. Thus, glass wool ceiling tiles are dimensionally stable and stay flat even in environments with high or varying air humidity.

The absorbers are dimensionally stable and remain flat even in environments with high or varying humidity. In combination with the robust surface material, this means that the systems can be installed even before the building's heating and ventilations systems are in operation. This has been proven by humidity tests in accordance with methods and instructions in EN ISO 4611.

Not a microbiological breeding ground

Ecophon's products themselves do not serve as a breeding ground for microorganisms. They have been tested in different contexts for microbiological growth and remained unaffected.

Clean room classification

The EN ISO 14644-1 international standard is used for the classification of airborne particles.

In certain environments it is necessary to limit the quantity of airborne particles, such as in the pharmaceuticals, electronics and food industries. Ecophon offers systems that fulfil the conditions up to and including ISO class 3.

The pharmaceuticals industry is regulated by Good Manufacturing Practice (GMP) standards. Ecophon's acoustic systems are tested and assessed in accordance with these standards.

Corrosive environments

EN ISO 12944-2 is a standard that classifies corrosive environments in five classes (C1-C5) depending on their corrosive effects.

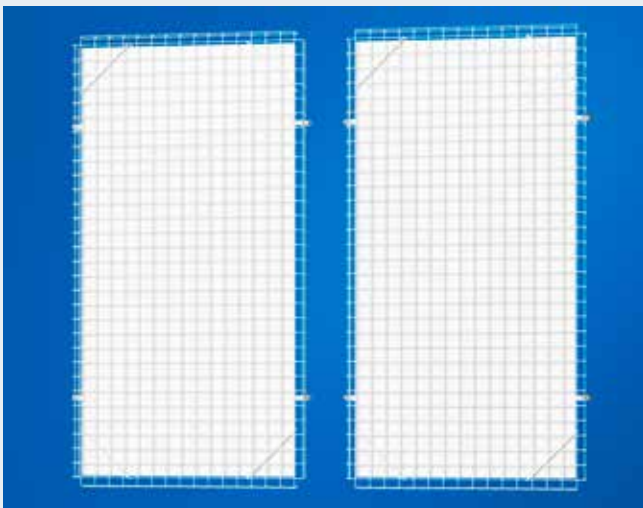
According to this standard, Ecophon Hygiene is suitable for use up to class C4, such as in the food and fish preparation industries and parts of the pharmaceuticals industry. C4 grids are also sometimes specified in swimming baths.



An acoustic ceiling (on the left) where the grid has corroded due to choice of an incorrect choice. A Connect C4 grid of homogeneous, acid resistant steel would not have been affected, as seen in the picture to the right.



Ecophon Hygiene Advance™ A absorber.



Hygiene Foodtec Protection C3 Wall panels.



Fastener that has been affected by red rust.



Grid component that has been affected by white rust.

WELCOME TO A HEALTHIER, **MORE EFFICIENT AND PLEASANT** INDOOR ENVIRONMENT

Ecophon works consistently with environmental questions in order to reduce the impact of our manufacturing, our products and our transport. Our sound absorbers, which consist mainly of glass wool, are made of 70% recycled household glass.

Not least, the different aspects of the indoor environment are important to us. Ecophon's acoustic system is therefore the perfect choice for building when attention is on the environment and a sound indoor climate. Our aim is to focus on the indoor environment both from a practical and an aesthetic perspective, and to make people, efficiency and wellbeing our first priorities.

You can download our brochures for industrial premises – in sectors with specific hygiene requirements – such as the food, beverage, electronics, pharmaceutical and restaurant and catering industries.

Our acoustic systems for clean industry are presented in the Ecophon Hygiene™ system catalogue.

Visit our website, which refers you on to different countries/languages, and where you can find all you need about solutions, function requirements, acoustic systems, contacts etc.



www.ecophon.com