



SUSTAINABILITY REPORT 2010

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Front page photo:

Even while relaxing comfortably at home, Kalle Christensen is a 'sustainability activist', protecting energy resources for his 4 year old daughter, Freja, and for future generations. Kalle and his wife are the happy owners of the first PassivePlus house in Denmark, producing more energy than the few kilowatts their energy efficient home consumes. Read more on page 15.

WHAT ARE WE WAITING FOR?

Making our buildings energy efficient holds huge potential - more than a million green jobs, at a time of high unemployment, better homes and workplaces with comfortable indoor climates, lower dependence on vulnerable imports of fossil fuel, less CO₂ and air pollution and billions of dollars or euros in saved energy costs. The technology for all this is available today. So what are we waiting for?

Important political decisions are needed. But just waiting around for others to build a sustainable future for us is not sufficient. Let's take things into our own hands. As numerous homeowners, building professionals and visionary politicians are already doing. This sustainability report gives you some inspiring examples.

Why accept that buildings consume some 40% of the world's energy if – like the Christensen family (page 15) – you can build a new home that is so well insulated and energy efficient that it can easily produce more energy than it consumes?

You don't have to live in an old, poorly insulated home that is cold and draughty in the winter or uncomfortably hot in the summer. You can have an energy efficiency upgrade on your house or flat with a thorough 'deep' renovation, making full use of the best available technology and giving you much lower energy costs over many decades.

Where should the money for making our buildings more sustainable come from, you may well ask?

The money is already there. It just needs to be re-directed. Developing countries are spending billions of dollars subsidising energy prices. Major economies like Japan, India, China, the US and the EU, all consume more energy than they can produce themselves. Within two decades EU energy imports will reach \$ 671 billion per year, or some \$ 2000 per citizen. Surely some of that money could be spent intelligently to reduce energy waste.

Positive net carbon footprint

"The more you consume, the less you pollute" - insulation is one of the few products that offers you this luxury. The new carbon footprint analysis in this Report reveals that, during the lifetime of the Rockwool insulation being sold this year, some 4,000 million tonnes of CO₂ will be saved in buildings and industrial processes worldwide. This equals today's annual emissions from Russia, India and Germany combined. But why not double or triple this energy efficiency and CO₂ reduction?

Energy efficient buildings and industrial processes offer green jobs, better quality of life and a better environment. Let's put this potential into practise.

Eelco van Heel, CEO of the Rockwool Group.

ENERGY EFFICIENT BUILDINGS AND INDUSTRIAL PROCESSES OFFER GREEN JOBS, BETTER QUALITY OF LIFE AND A BETTER ENVIRONMENT.

A STRONG APPEAL

Seconded by the International Energy Agency's building expert, Jens H Laustsen and WWF International's Head of Climate Unit, Kim Carstensen, the Rockwool Group made a strong appeal at the UN Climate Summit (COP15). The simple question from CEO Eelco van Heel, 'What are we waiting for?' is as acute as ever. Billions of tonnes of CO₂ can still be saved cost efficiently, more than a million green jobs can be created and massive savings can be made in energy costs. All we need to do is use the technology readily available today and make our buildings energy efficient.



A GROWING CHALLENGE



Energy efficiency is the most important key to a low carbon future. According to the International Energy Agency it can deliver 56% of the CO₂ reductions needed – that's more than the combined effect of a drastic increase in renewable energy, nuclear power and carbon capture and storage.

Better still, sustainable buildings hold some of the most profitable means of abating climate change. According to McKinsey, insulation retrofit of commercial buildings will give an economic gain of some € 70 per tonne saved CO₂. Ecofys reports that 460 million tonnes of CO₂ – and € 270 billion in annual energy costs – can be saved in Europe alone, if buildings undergoing modernisation anyway were retrofitted to contemporary (low) energy standards.

Insulation is one of the most attractive low hanging fruits. Installing it saves so much expensive energy that we can no longer afford to neglect investing in such straightforward CO₂ reductions.

“In the absence of new initiatives to tackle climate change, rising global fossil fuel use continues to drive up energy related CO₂ emissions, from 29 Gt in 2007 to 40 Gt in 2030, an increase by 40%.

Although the financial crisis has slowed the growth in emissions, current trends put us on a path to a global average temperature increase of up to 6°C.

The projected rise in energy demand also has implications for ambient air quality, with serious public health and environmental effects, particularly in developing countries.”

The International Energy Agency (IEA)

FOR URBAN DESIGN



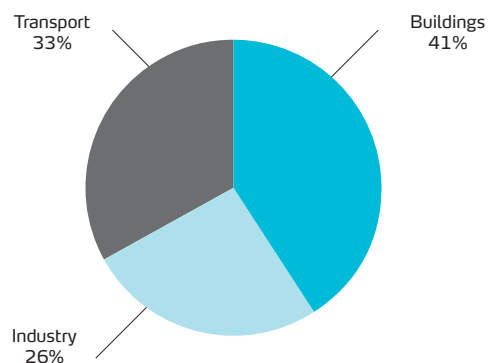
For many people – especially those living in a house built before the first oil crisis – insulating their home is the single most climate-friendly measure they can undertake.

A family who choose to modernise their 40+ year old, poorly insulated house to high energy efficiency standards can, for instance under German conditions, save some 11 tonnes of CO₂ per year. In order to save the equivalent amount of CO₂, this family would need to give up their two modern medium-sized cars, skip two annual flights from Munich to Mallorca, stop eating beef and start taking cold showers! With so much to sacrifice, hiring a team of building professionals to make your home energy efficient, once and for all, is quite appealing - at least to some people.

Global warming is a growing challenge for building design. Our buildings and infrastructure must become both more resistant to extreme weather conditions and also more CO₂ efficient.

WHAT USES MOST ENERGY?

EU figures

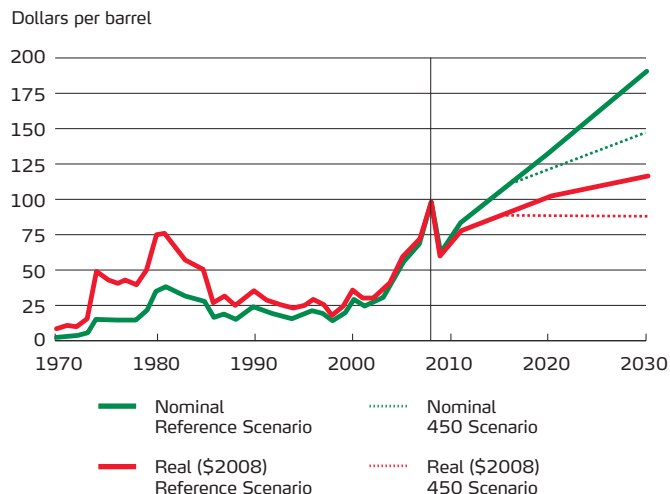


Source: Eurostat

LOWER ENERGY PRICES WITH CO₂ REDUCTIONS

Using more insulation and other climate friendly technologies will have the additional benefit of reducing the growing demand and price of fossil fuel. With a CO₂ concentration of 450 ppm (parts per million) in the atmosphere, there may still be a chance to limit the growth in average temperature to 2°C.

Average IEA crude oil import price



Source: World Energy Outlook 2009, © OECD/IEA, 2009, figure 4, page 65



Security of energy supplies has become a key issue, notably in Russia. In order to protect vitally important revenues, Russia will improve its energy efficiency by 40% before 2020.

ENERGY SECURITY UNDER PRESSURE

The speed with which we consume scarce resources, especially fossil fuel, is not sustainable. How can we lift millions of people out of poverty while, at the same time, improving the quality of life for the more privileged? With a global population that is heading from 6 to 9 billion, with mouths and needs to be catered for, the only way is for us all to become more efficient and much less wasteful. Better buildings are one of the most important keys to a sustainable future.

Most activities in modern society depend on fossil fuel. Non-renewable energy sources account for 86% of our consumption. The economic crisis is not over, but oil prices are already quite high. The International Energy Agency expects them to rise even further in the years to come. Many buildings will last for 50 years or more. But is your building constructed for the energy prices and environmental taxes of tomorrow when fossil fuel becomes even scarcer?

Security

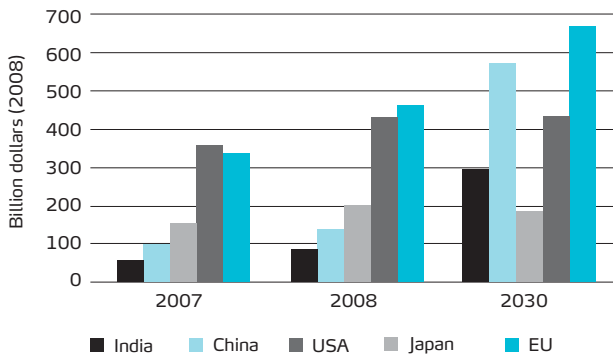
Many of the major world economies are challenged by a high dependence on natural gas imports. Most of the world's natural gas reserves are being controlled by just three countries: Russia, Qatar and Iran.

This makes many societies vulnerable to disruptions in energy supplies. As recently as January 2009, during a period of very high gas demand in Western and Eastern Europe, with the coldest weather in two decades, supplies of natural gas via Ukraine were shut off. In some countries, important societal and business activities came to a standstill.

Stop subsidising energy waste

The best way to reduce our non-sustainable dependence on fossil fuel is to combat the waste of energy. This also requires re-allocating funds to energy efficiency projects among less affluent citizens. The huge sum of \$310 billion (or more than the entire GDP of South Africa, the World's 32nd largest economy) was spent in 2007 on fossil fuel price subsidies in 20 non-OECD countries, putting a strain on public budgets. If energy subsidies were gradually dismantled, global energy demand would decrease by 5% and GDP per capita would actually increase in most countries in question, according to the International Energy Agency. Promoting energy efficiency instead of energy wastefulness is a more sustainable solution to the world's growth challenges.

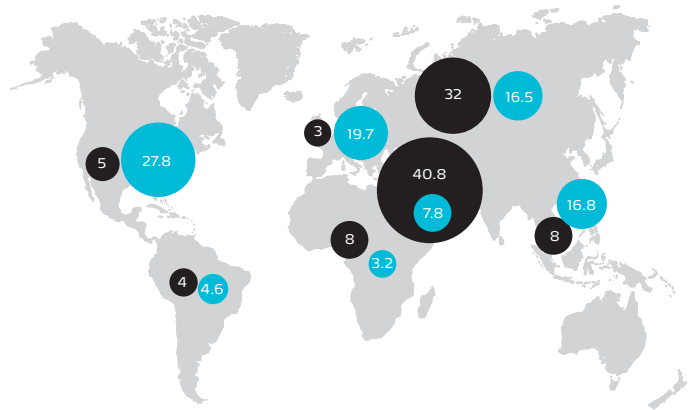
HIGHER SPENDING ON OIL AND GAS IMPORTS



The spending on oil and gas imports in the EU is expected to reach \$671 billion in 2030 (in year-2008 dollars). This is more than today's GDP of Poland, the World's 18th largest economy, and represents some \$ 2000 per EU citizen. India's & China's expenditure on oil and gas imports are expected to skyrocket.

Source: World Energy Outlook 2009, OECD/IEA page 124

WHO HAS THE GAS RESOURCES



● % of worldwide gas consumption by region

● % of worldwide gas reserves by region

Sources: EIA 2009; BP 2009.

ENERGY NEUTRAL IN 2040

How can our country become energy neutral in 2040? BuildDesk – a Rockwool Group consultancy – has elaborated such a plan for the Netherlands for which it received the InnoSencia Energy Award 2010. BuildDesk also advises municipalities and developers on energy, climate and sustainability issues.



FACTS ABOUT ENERGY SECURITY

The dire facts

- 86% of our energy comes from non-renewable resources
- More than 80% of the oil producing nations are facing, or already experiencing, declining production
- Dependence on energy imports will grow in most of the major economies

Buildings

- Some 40% of the world's energy consumption is consumed by buildings
- Most of this energy is used for heating, cooling or ventilation
- More than 50% extra CO₂ emissions from buildings are expected before 2030

The promising opportunity

- 75% of the energy consumption in buildings can be saved. This represents a 20% reduction in the world's total energy need
- More than a million jobs can be created by making buildings more energy efficient and sustainable
- Energy efficiency can reduce the pressure on energy prices worth billions of dollars.
- Eradication of energy poverty can also be facilitated.



BUILDINGS MUST AND CAN DELIVER

Here's the recipe as to how the world can lower its consumption of scarce energy resources by some 40% ! A happy Energy & Climate Minister, Ms. Lykke Friis, inaugurates Denmark's first PassivePlus house. With a photovoltaic panel recently installed on the roof of this comfortable and affordable home, it will use less energy than it produces. The visionary mayor of Egedal, who initiated Northern Europe's largest low energy settlement, Willy Eliassen (right hand side), is seconded by Eelco van Heel (left), CEO of the Rockwool Group that helped enable this high degree of energy efficiency.



BUILDINGS MUST AND CAN DELIVER SUSTAINABILITY

Today buildings account for some 40% of the world's energy consumption. Most of this energy is used for heating, cooling or ventilation. And most of it – in some cases up to 90% - is needlessly wasted. Every week more than a million people relocate to urban areas in search of a better life in the city. Yet the new buildings constructed for the growing urban population often have little – if any - insulation. This lack of thermal protection, together with the slow renovation of old leaky buildings in the developed economies, makes a daunting cocktail: CO₂ emissions from buildings are projected to increase by more than 50% before 2030, according to the UN climate panel, the IPCC. Unless, that is, we improve things.

Save 75% and improve our quality of life

Making a change for the better is indeed possible. New figures from

the International Energy Agency reveal that before 2050, we can actually save some 75% of the energy currently used in buildings, primarily by using technologies available today. This could reduce the total demand for energy by 20%, just by having better buildings.

In order to achieve this:

- New buildings must be constructed as very low energy buildings. It is easier to turn an energy efficient home, with proper levels of insulation installed, into a Plusenergy building, adding a few solar panels, geo-thermal energy, wind energy or other means of sustainable energy (see page 14).
- Existing buildings must be modernised to high energy efficiency standards. This can be done cost effectively when the building needs modernisation anyway (see page 16). The rate of the building stock being modernised must be increased manifold.

75% OF THE ENERGY USED IN BUILDINGS CAN BE SAVED, PRIMARILY BY USING TECHNOLOGIES AVAILABLE TODAY



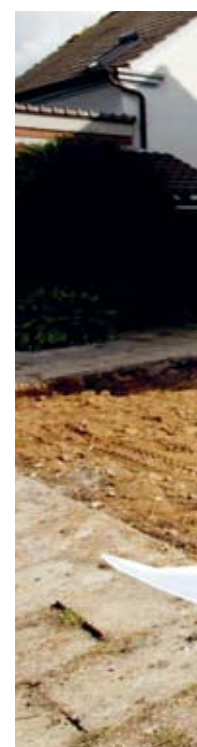
SAVING ENERGY IS NOW PART OF

Few people in modern society want to live in a draughty home, with an expensive energy bill, with mould in damp corners and a carbon footprint that is embarrassingly high. Germany is actively tackling this problem and has started a strong energy efficiency trend. The more energy efficient you make your building, the larger a subsidy and/or low-interest loan you will receive. Massive energy and CO₂ savings have been achieved and thousands of green jobs are being created. This makes Germany's efficiency in buildings programme one of the world's most efficient climate policies.



"Saving energy is becoming a people's sport here in this country – driving the right car, improving your own house. People proudly tell their family and friends how much energy they saved by modernising and insulating their home... and these home owners recommend those planners who – like we do – helped them and made an integrated concept improving the energy efficiency of their building."

Oliver Kroll, from falkenstein + kroll ingenieure in Dortmund, Germany





"ENERGY EFFICIENCY OFFERS THE BIGGEST SCOPE FOR CUTTING EMISSIONS"

The International Energy Agency (IEA)

MODERN LIFESTYLE



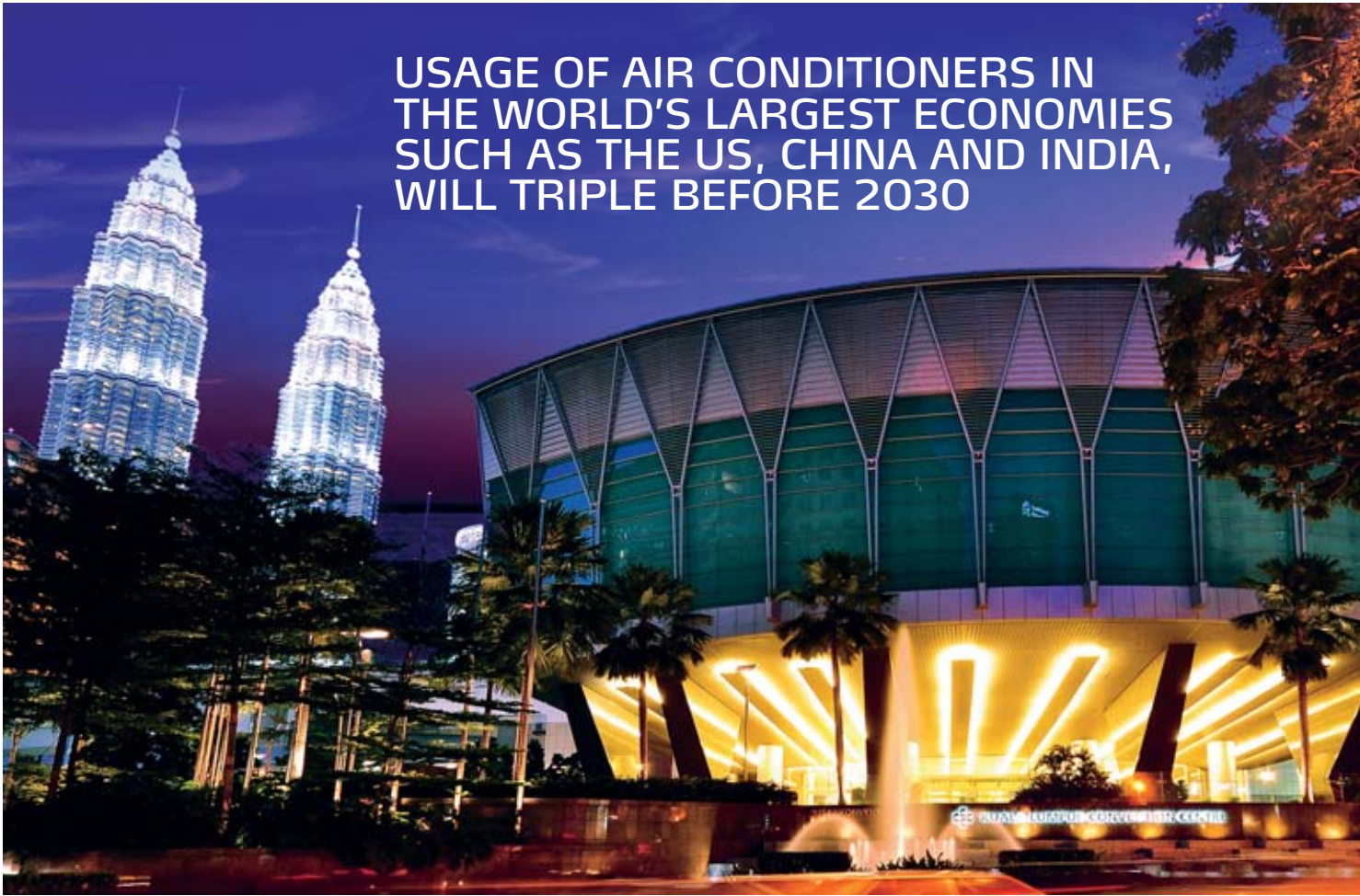
Oliver Kroll (left hand side) and Christian Falkenstein.



IMPROVING OUR BUILDINGS COULD CREATE MANY NEW JOBS

Green jobs. Less CO₂. Energy savings worth billions. Energy efficiency in buildings is a win-win-win opportunity that cannot be wasted.

USAGE OF AIR CONDITIONERS IN THE WORLD'S LARGEST ECONOMIES SUCH AS THE US, CHINA AND INDIA, WILL TRIPLE BEFORE 2030



SOLUTIONS FOR HOT CLIMATES

PREVENTING SWEAT BOXES AND EXCESSIVE COOLING BILLS

Today the most intense building activity is seen in growth economies, very often in hot climates and in countries that don't have a tradition for insulating buildings sufficiently. But insulation doesn't just keep the heat out, it is also an important solution for reducing the energy needed to cool homes, offices and commercial buildings.

Sweat boxes

On a sunny day in a hot climate, a roof temperature of 70°C is not unusual. Without insulation, the extreme heat can penetrate the building and transform it into a sweat box making it extremely uncomfortable and difficult for people to work or live in. Air conditioners are being used more extensively to cool the indoor temperature of buildings – and the associated energy costs grow. In countries with poor insulation standards, investment in large cooling devices becomes an expensive





In hot climates, Rockwool insulation helps keep indoor temperatures and 'cooling bills' comfortably low. Kuala Lumpur Convention Centre, Malaysia.



ARCHITECTS CAN CHANGE THE WORLD

Maison Respekt is the name given to a new sustainability trend among French architects and building designers. Adapted to the varying climatic conditions in Western Europe's largest country – hot in the South, cool and often rainy in the North – the comfortable and energy efficient homes are attracting strong recognition.

Architect Jacques Patingre's 'Villa Concept' in sunny Provence is a modern energy efficient Plusenergy home, integrated with the landscape and providing a high quality of life for the residents.



'solution' that puts a strain on personal finances and the regional power supply.

Untapped potential

People's changing urban lifestyle and expectation of higher comfort also contribute to higher energy demand. According to McKinsey/Vattenfall, usage of air conditioners in the world's largest economies such as the US, China and India, will triple before 2030. In order to curb an excessive use of air conditioning in these countries, it is crucial to insulate better. This is especially important in fast developing countries such as India and China, and other Asian regions where more than half of the world's new construction is taking place, yet where the potential for energy improvement remains largely untapped. In order to contribute to this process, in 2010 the Rockwool Group built its first factory in India and three additional factories in Asia are under acquisition.

NEW BUILDINGS

GOOD-BYE TO ENERGY BILLS

From Romania to Ireland, from Finland to Sicily – by the end of 2020 all new buildings in the European Union must be ‘nearly zero energy buildings’.

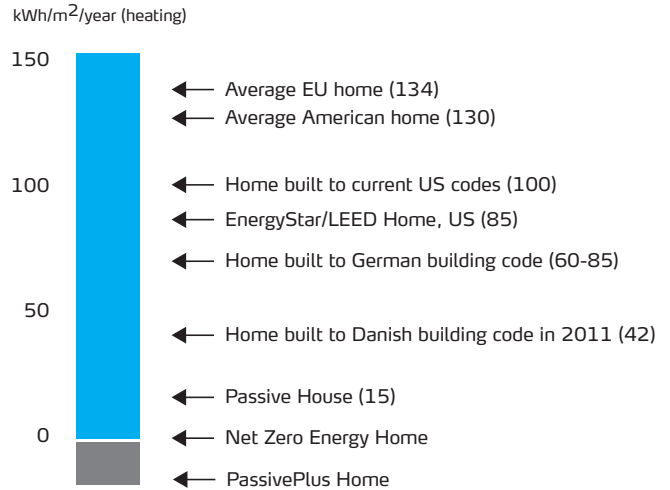
Yet already today, we can build an efficient, comfortable and affordable property that enables you to wave goodbye to energy bills. As the Christensen family (depicted on these pages) is happily doing in their novel PassivePlus home.

What’s a Nearly Zero Energy Building?

A nearly zero energy building, or as one of the most popular versions is called - the Passive House – is so well insulated and energy efficient that the free ‘passive’ energy from solar gain, body heat and excess heat from appliances, constitute the main ‘radiators’. More than 10,000 Passive Houses have been built. In the Austrian region of Vorarlberg, for instance, buildings must be Passive Houses to be entitled to public funding. Excessive energy bills are unacceptable, not least in social housing with low income residents.

Once the energy demand has been reduced in the house, it becomes possible and affordable for the building to produce more energy on an annual basis than it requires. Solar cells and other renewable energy technologies can do the trick.

HOW ENERGY LOW CAN WE GO?



BY THE END OF 2020 ALL NEW BUILDINGS IN THE EUROPEAN UNION MUST BE ‘NEARLY ZERO ENERGY BUILDINGS’



“First ensure that the building is well insulated and energy efficient. Then it becomes easier - and affordable – to turn it into a Plusenergy home.”

Finn Christensen, PassivhusDesign, developer, designer and contractor for the PassivePlus house



GENERATE SURPLUS ENERGY

No more energy bills - or even a plus on your energy accounts. Does this sound too good to be true? Not for Kalle, Anne and their 4 year old daughter Freja Christensen in Stenløse. They are the proud owners of Denmark's first PassivePlus house. A house so well insulated and energy efficient that - with moderate-sized solar cells - it can supply more energy annually than the house requires for heating, hot water and appliances. On sunny days the Christensen family sell their surplus energy to the grid. Their comfortable home saves so much expensive energy that the extra investment in building a better house will even give the family an economic gain.

See the PassivePlus home and learn more:

➔ www.rockwool.com

FACTS ABOUT THE PASSIVEPLUS HOUSE IN STENLØSE

- ✓ Size: 172 m²
- ✓ Energy consumption for heating: max 15 kWh/m²/year
- ✓ 500 mm of Rockwool insulation in roof and walls
- ✓ Efficient triple glazed windows
- ✓ Efficient ventilation system with heat recovery
- ✓ Geothermal energy pre-heats the indoor air in winter and cools it in summer
- ✓ Efficient appliances and intelligent electrical installations
- ✓ Draughtproof, airtight construction, preventing thermal bridges
- ✓ Building oriented for optimal solar gain
- ✓ Solar panels 46 m²



ENERGY EFFICIENT MODERNISATION

FACELIFT OR 'DEEP' RENOVATION?

We can meet our climate goal, while at the same time increasing employment significantly, and saving billions of euros annually on the costs to our citizens of energy. We can also reduce import dependency and eliminate fuel poverty. But to do this, however, we will need to at least triple our current rate of building renovation, which – in Europe – lies at only 1.2% - 1.4% per year.

Most of the buildings we will be using in 2050 have already been built. Even today the majority of our buildings were constructed before the oil crises. Insulation standards are often inadequate. Energy efficient modernisations are crucial and need to be drastically increased both in numbers and in levels of competency. We must prepare ourselves for a low carbon future where fossil fuel is even scarcer than today and the demand for energy even greater, not least in emerging economies.

Modernise thoroughly

The most efficient thing to do is treat your building to a thorough, energy efficient upgrade – a deep energy renovation – whenever it needs to be renovated anyway. It requires relatively little extra effort to add sufficient insulation when the roof or façade is being modernised anyway and the scaffolding is already in place. Similarly it makes sense to install energy efficient windows rather than a cheap option. This sound principle will become mandatory in the European Union.

Lifetime costs

Too many people go in for superficial building modernisations. From a short-sighted perspective this may appear cheaper but, in fact, it proves to be uneconomical in the longer term. It is far better to invest

in a deep energy renovation with quality energy efficient measures right from the start. A deep renovation means an improvement in energy efficiency of at least 50%. Consider carefully:

- what's the lifetime of a well insulated roof? (It may well be 30 – 50 years.)
- What are the expected future energy prices and costs in that period? (Presumably prices will be higher, or even much higher, than today.)

It may seem alluring to add just a little extra insulation with low costs upfront and an apparently fast payback. However, this may well turn out to be a less economical choice that becomes needlessly costly and regrettable after a few years. It may also prevent you from enjoying some of the additional benefits of a proper energy efficient modernisation: a better indoor climate without draughts, condensation and moulds. Energy efficient modernisations must be done thoroughly and with future standards in mind.

Save 84% on average

When applying efficient techniques in old buildings, efficiency improvements of 70% or even up to 90% have been achieved, reducing the annual energy need for heating and cooling to 15 kWh per square meter.

It is paramount to increase the energy performance improvement rate for building renovations, from today's shallow 15% - 20% per building (in the EU) to around 50% -90%, depending on the age and condition of the building being renovated. On average, the energy performance of these buildings should, with today's energy prices, be improved cost-optimally by around 84%, or by a factor of 6.

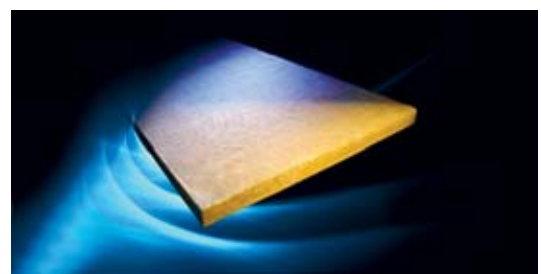
Upfront financing

Being poor can be expensive. In order to kick-start economical energy efficiency improvements, upfront financing must be made available. In 2009 the German KfW building modernisation programme was lauded by WWF as the most efficient climate policy. It included low interest loans of up to € 50,000 and subsidies to the most ambitious energy efficiency projects. This helped to create thousands of jobs, produced better homes, and saved vast amounts of fossil fuel energy and CO₂.

WE WILL NEED TO AT LEAST TRIPLE OUR CURRENT RATE OF BUILDING RENOVATION

NEW SUSTAINABLE WAY TO INSULATE OLD BUILDINGS

Apart from expanding the Rockwool Group's sales of insulation material, the best thing we can do to raise our positive net carbon footprint is to improve the thermal performance of our products and systems for buildings and industrial processes. In 2010 the Group introduced Aerorock, an innovative product that incorporates aerogel technology. The thermal resistance is almost 50% better than in many traditional products. The product is ideal for old buildings where the space for retrofit insulation is limited internally, for instance behind radiators, or where the architectural features of the façade do not allow for external insulation. Germany is the first market to test this innovative and exclusive product.





The 1903 multi-storey housing in Sleephellingstraat in the Netherlands has been beautifully and thoroughly renovated. The energy consumption for heating has been reduced by more than 86%.



“WE NEED TO OVERCOME THIS BACKWARDNESS AND CHANGE THE THERMAL EFFICIENCY OF BUILDINGS”

President Dmitry Medvedev, Russia

Millions of people around the world live in dilapidated buildings that are difficult and expensive to keep warm in winter and comfortably cool in the summer. In Russia, energy used to be heavily subsidised, leaving little incentive to insulate properly. Yet the price citizens now have to pay for energy is increasing considerably and better reflecting world market prices. Yana and Roman Bykov in Moscow are among the lucky ones. During winter their poorly insulated flat from 1967 used to be frosty inside in the corners - even when they used both central heating and two additional electric heaters, trying to keep their home warm. Their block of flats has now been energy modernised and insulated, finally preventing freezing indoor temperatures. Russia's ambition is to improve its energy efficiency by 40% before 2020. The Moscow region and the federal budget have for the next few years allocated in total € 19 billion to help thousands of buildings to be insulated and made energy efficient. The energy that used to be wasted can soon help generate economic growth and prosperity instead.

The acute fiscal situation is now forcing the German government to downscale this commendable scheme somewhat— although hopefully only temporarily. But the idea of stimulating green jobs, CO₂ reduction and energy efficiency in buildings has proliferated in a number of countries. Norway, for instance, is now granting € 75/m² for deep energy renovations of dwellings to Passive House standards or better. France is undertaking an energy efficient modernisation of all its 800,000 public buildings – including its social housing – and is also supporting energy efficiency in private property. Meanwhile in Russia, where the goal is a 40% improvement in national energy efficiency, cities like Moscow are actively insulating and modernising numerous dilapidated “Kruschev” concrete blocks of flats, most of which were erected in the 1950s and 60s.

Social housing

Social and co-operatives housing offers an important potential for improved energy efficiency. This sector represents 12% of the building stock in the EU. Many of these buildings, however, are poorly insulated, causing high energy bills and unhealthy indoor environments to some of society's most vulnerable households. The European social housing organisation (CECODHAS) has ascertained that, in Europe alone, 340,000 jobs could be created if every year 4% of these buildings (two to threefold more than today) were refurbished to achieve optimal energy performance.



PAY AS YOU SAVE

Lack of financing can be an obstacle, even for cost effective improvements. At the moment various models are being tested. In order to provide householders with access to financing for the energy efficient upgrade of their homes, a new model is currently being tested in the UK: the Pay As You Save scheme (PAYS). Similar schemes, called PACE, have been applied successfully in the US.



Mrs. Jones has an old, uninsulated home. Her energy bill is too high, but she doesn't have enough money in the bank to pay for a thorough energy renovation.

Money is provided by a third party finance company – at virtually no credit risk. The loan is linked to the property – and not to the owner of the building. So if Mrs. Jones sells/moves away, the charge – and benefit of the energy efficient home – will be transferred to the new householder.

The professionals make the building energy efficient.

The loan repayments, including interests, are collected on behalf of the financing company using an existing payment mechanism such as the energy bill, local authority council taxes, or water rates. The financing is repaid from the savings made on the occupant's energy bill, thus 'Pay As You Save'.

CHECKLIST FOR THE ENERGY EFFICIENT BUILDING

To ensure a high energy performance of a building it is important to ensure that the following criteria are achieved:

- ✓ **My building has a good energy certificate/energy label**
In the EU, an energy rating of A+ or A is preferable.
- ✓ **A high level of insulation**
In cold climates all parts of a building must be highly insulated – in warm climates in particular roof, east and west facades must be insulated. It is very important to insulate hot water pipes and boilers.
- ✓ **Draughtproof and airtight building**
A 'blower door test' can be used to determine the actual airtightness of a building. Thermographic imaging can disclose unwanted gaps and insufficient insulation.
- ✓ **Efficient windows**
In cold climates it is important to keep heat in. Here, triple glazed low energy windows with super-insulated frames, orientated for optimal solar gain, are important. In hot climates heat must be kept out and large window areas to the East and West should be prevented.
- ✓ **Efficient heating, cooling and ventilation system**
- ✓ **Efficient appliances (for instance A+ rated) and efficient lights**
Also minimise stand-by losses
- ✓ **Solar shading to prevent overheating and excessive cooling bills on hot days**
- ✓ **Eliminate thermal bridges**
Thermographic imaging can reveal this. Mould on cold parts of a wall - often in the corner - is an unhealthy sign of poor insulation with thermal bridging.
- ✓ **Moisture must be ventilated out of the building**
Proper insulation and airtight constructions are crucial to prevent condensation. Outer surfaces must be weatherproof.
- ✓ **Renewable energy**
Solar panels, photovoltaic panels, geothermal energy. Most cost efficient when constructing a house or renovating it.

THE FORGOTTEN POTENTIAL



Insulation of technical installations – such as hot pipes, boilers and tanks – represents a vast potential for energy and CO₂ savings.

If our climate had to cope with extra CO₂ pollution nearly as high as the emissions from India, Russia and Germany today, the consequences could be dramatic. However it's a fact that this huge amount of carbon dioxide – nearly 4,000 million tonnes of CO₂ – is just what Rockwool insulation for technical installations in industries and buildings, installed in this one year alone, will save in its lifetime around the world. More importantly, imagine

how much extra CO₂ – and energy costs – we could save, if we insulate hot processes with the same drive as we will soon be insulating new buildings – at least in the EU. The benefits would be phenomenal.

Inadequate insulation

Today insulation requirements for buildings are often prescribed by law – at least in most developed countries. It will soon be quite common to see more than 300 mm of insulation in the roof of a new building. In the process industry, however, where the difference between the internal and external tem-

perature of a very hot pipe could exceed 600°C (and not 'just' 20°C - 40°C as in a building), the energy loss without sufficient insulation is huge and horrendous. Amazingly, up until today, hardly any specific energy efficiency requirements for industry have been prescribed. In practice, if insulation is specified, it is more as a practical necessity for burn protection than for energy conservation.

This means that the only demand has been to insulate technical elements to the limited extent that workers would not suffer skin burns if they happened to touch say a hot pipe or a

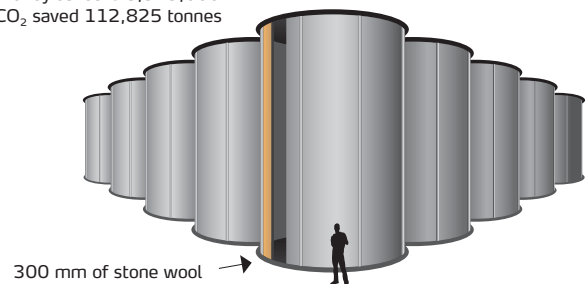
INSULATE WARM PROCESSES

Too often, warm processes are not insulated. These warm surfaces may seldom pose a risk of skin-burns, but they do cause an energy loss that is unsustainably high.

A plant having 14 storage tanks for warm fluids - operating at average temperatures between 30°C and 50°C - can actually save more than € 8.5 million if it insulated those tanks with 300 mm of stone wool. In addition 110,000 tonnes of CO₂ can be saved in the lifetime of that insulation. If the price of energy or CO₂ allowances increases over the next 25 years, the economic savings will become even higher.

SAVINGS BY INSULATING 14 WARM STORAGE TANKS

Money saved € 8,525,000
CO₂ saved 112,825 tonnes





Better insulation of industrial processes offers huge potential for energy and CO₂ savings. This is particularly so in the emerging economies where every week new power plants and factories see the light of day. The Rockwool Group's first factory in India will help boost energy efficiency.



Increase the insulation thickness

Extra savings	Energy	Heating costs	CO ₂
	65,797,600 kWh	€ 1,973,930	22,300 tonnes

50 mm of insulation is common, but inadequate, for a 250°C hot pipe. Even a moderate increase to 100 mm can deliver important extra savings in terms of energy, heating costs and CO₂. For a 10 km long pipe with a 150 mm diameter, nearly € 2 million extra can be saved in energy costs. If the price of energy and CO₂ allowances increases, the economic savings will become even greater. This conservative example presupposes a complete turnaround of the entire pipe installation after 10 years, but actually the potential lifetime of the technical insulation can be more than 25 years.

boiler. This is also known as "safety engineering". Consequently the insulation is of minimal thickness, sometimes as thin as only 30 mm. With the industrial sector consuming approximately a quarter of all our energy input, this is a massive missed opportunity. Huge sums are being lost, year after year, simply because we do not insulate hot process elements in our buildings, and especially in our industries, well enough.

Better than money in the bank

Investing in the insulation of hot pipes and processes can be extremely profitable. Annual

returns on your investment by the hundreds of per cent are indeed common, if you insulate a very hot process pipe properly. So why isn't it done every time?

Redesign needed

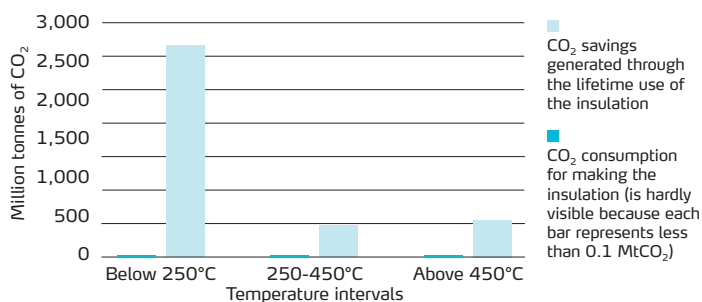
Inertia and lack of focus mean that large economic and environmental gains are not being harvested. But, just as the building sector has had to change its habits and redesign the way we construct buildings - for instance the introduction of nearly zero-energy buildings such as Passive Houses - so does industry need to move out of its comfort zone. This

means redesigning pipes, ducts, boilers and hot process equipment for a low energy, low carbon future. Today the standard designs don't leave enough space for insulating pipes properly. They are often put too close to other pipes or construction components to allow for sufficient insulation. What is required is sustainable design. For very hot processes that often means incorporating insulation thicknesses of 300 mm or more. This will ensure that a processing plant is not wasting energy and money, but is reducing its impact on the environment.

POSITIVE CARBON FOOTPRINT

Technical insulation has an extremely positive net carbon footprint. Insulation for a very hot pipe in the process industry can save 30,000 times more energy and CO₂ in its lifetime than was used in its manufacture. Even insulation for a hot water pipe in a building can recoup the investment by a hundredfold. On average it takes less than a day to earn back the emissions caused by the production of technical insulation for high temperature process industries and for lower temperature Heat, Ventilation and Air Conditioning (HVAC) purposes.

CARBON FOOTPRINT OF ROCKWOOL TECHNICAL INSULATION





KEY SUSTAINABILITY ASPECTS WHEN SELECTING INSULATION

Sustained performance

Insulation is one of those rare industrial products that saves more energy and air pollutants than is invested in its lifetime. A typical Rockwool insulation product will save more than a hundred times the energy and CO₂ needed for its manufacture, transport, use and disposal. The long time phase of use, and therein the sustained efficiency of the material, represents the most important sustainability aspect of insulation products. All insulation is good for the environment. Yet often, investing just a little more in high quality durable insulation, gives you the most sustainable solution.

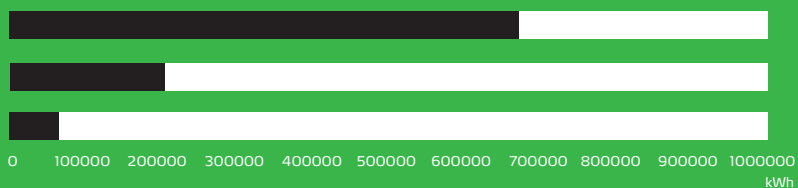


ENERGY, CONSUMED FOR HEATING OVER 50 YEARS, IN DIFFERENTLY INSULATED BUILDINGS OF 100 M²

Average house (EU)

New house (strictest building code, DK from 2011)

Passive House/Very low energy



■ Energy used for heating

Sources: LCA data from Sverre Fossdahl, NBI, Energi og miljøregnskap for bygg Prosjektrapport 173 - 1995; EU, COM(2001) 226 final 2001/0098 (COD), Brussels, 11 May 2001; Danish Energy Authority, Danmarks Energifremtider, 1995; Danish Building Code (Bygningsreglement 2010); Passivhausinstitut, Darmstadt, Germany; and Cepheus work group.

Energy efficiency – the most sustainable solution!

In the long life cycle of a building, the crucial factor is the energy consumed during its use. The energy needed for insulation materials represents less than 9%, even in a well insulated Passive House.

AIRTIGHT INSTALLATIONS

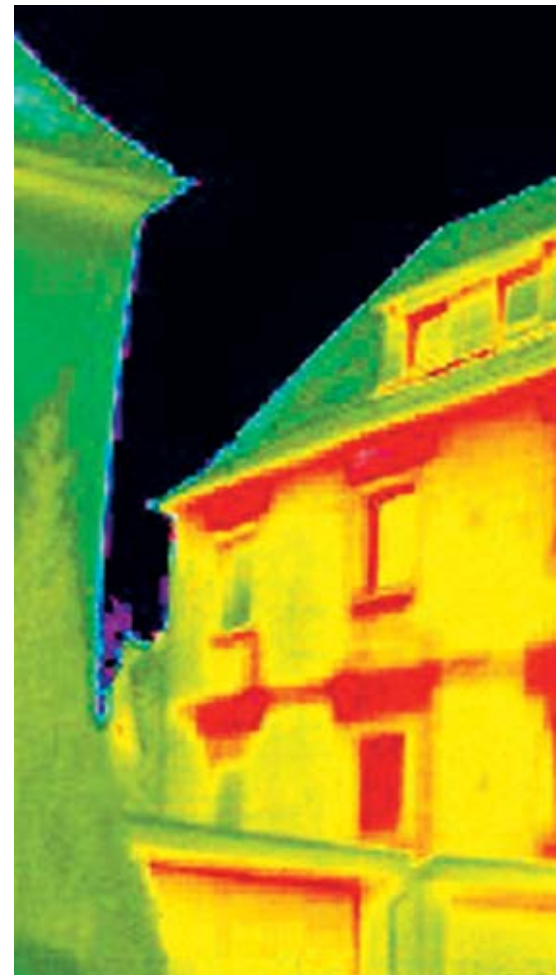
PREVENTING GAPS, DRAFT

A sustainable building must have insulation that delivers good thermal performance (a low U value) and avoids thermal bridges. It must be easy to install the insulation to achieve an exact fit in the construction without any gaps. It is paramount that the building envelope is airtight, which also requires the correct installation of the vapour membrane. Even small gaps in the vapour membrane may allow critical leaks that can dramatically increase energy loss and cause drafts. This means much higher energy bills, plus extra air pollution from burning additional fossil fuel. In cold climates, if the vapour membrane is breached, condensation may occur on which fungi and moulds can thrive.

Airtight fitting is crucial. Rockwool insulation is not a rigid material - it is sufficiently flexible to ensure excellent fitting, even where adjoining surfaces are slightly uneven. This flexible property reduces the risk of gaps in the final construction, for instance between wooden members or between uneven wall or roof surfaces and the insulation. Rockwool insulation is capable of adjusting a few centimetres to accommodate the oddities of many constructions. Of course, good workmanship is always important and installing a strong, yet slightly flexible material, minimises the risk of leaving gaps in your construction.

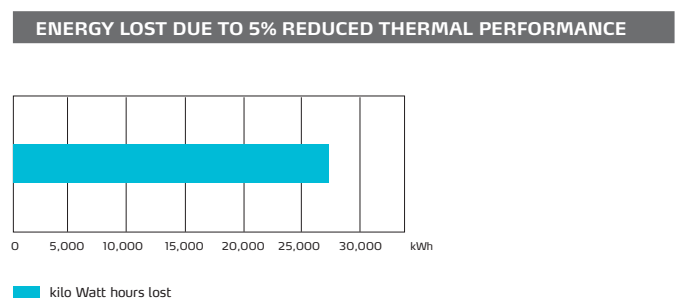
“The Rockwool insulation has excellent workability. I squeeze it in between the rafters. And it stays there, on its own accord, completely filling the construction. Even when positioned horizontally under the loft, those solid Super-A-Batts didn’t fall out.”

Rolf Christensen, building professional who insulated the PassivePlus home in Stenløse.



EVEN SMALL DEFECTS CAN BE EXPENSIVE

Why is it paramount to ensure that high quality, robust yet flexible, insulation is properly installed within the construction, plus a vapour membrane without any gaps? Because, for example, just a 5% reduction in the thermal performance of an insulated 100 m² attic can have a substantial impact. Over 50 years it can add more than 25,000 kWh to a family’s energy expenditure - that’s more than five years of electricity costs for the appliances in an average Danish house.



AND LEAKS



Leaks, poorly installed materials and thermal bridges create drafts and a needless waste of energy. It is important for a sustainable energy efficient result to use robust flexible insulation, installed correctly, to ensure an airtight building envelope.



DURABILITY

WILL THE THERMAL PERFORMANCE REMAIN HIGH?

A building can last for 50 or even more than 100 years. It is crucial that the insulation inside the wall and in the roof performs well; not only when the insulation is new, but over the entire lifetime of that construction. An insulation material that performs badly will not as easily reveal its malfunctioning. Even if you did reveal the poor performance, it would often be both troublesome and expensive to tear out the degraded insulation and install a better product instead.

Rockwool insulation has an open, porous structure. The configuration of air trapped between the stone fibres delivers outstanding insulation properties. Using only natural air, Rockwool insulation does not rely on gases such as blowing agents, that might leak out of the product and thus weaken its thermal performance. Not using any blowing agents, Rockwool insulation naturally does not contain ozone layer depleting substances.

ROCK SOLID

Rockwool insulation products last and are unaffected by changes in temperature or humidity. They are highly durable, maintaining their mechanical strength, their dimensions and stiffness. Millions of square meters of concrete floors have been laid on top of Rockwool insulation with no evidence of long term shrinkage or deformation.

A PLEASANT AND STABLE INDOOR TEMPERATURE

Proper insulation helps provide a pleasant and stable indoor temperature between 20-26°C, whether during freezing winters or scolding hot summers. Most of our life we spend indoors so it's crucial to provide pleasant comfortable shelter. Draughty, damp living conditions not only reduce the quality of life for far too many people but also, for vulnerable citizens, such conditions can even pose the extra risk of catching a life-threatening disease such as pneumonia.

Lack of proper insulation, airtight construction and controlled ventilation allow warm humid air to condense on cold, poorly insulated surfaces. This enables fungi to grow and thus increases the risk of allergic reactions. In schools, for instance, pupils may suffer from headaches due to poor indoor air quality and their ability to learn can be reduced.

Draught – a pain in the neck

Even a building without any significant gaps can be uncomfortably draughty. However if room surfaces are well insulated, keeping the temperature difference between the indoor air and the wall, loft and floor below 3°C, then this problem can be prevented.

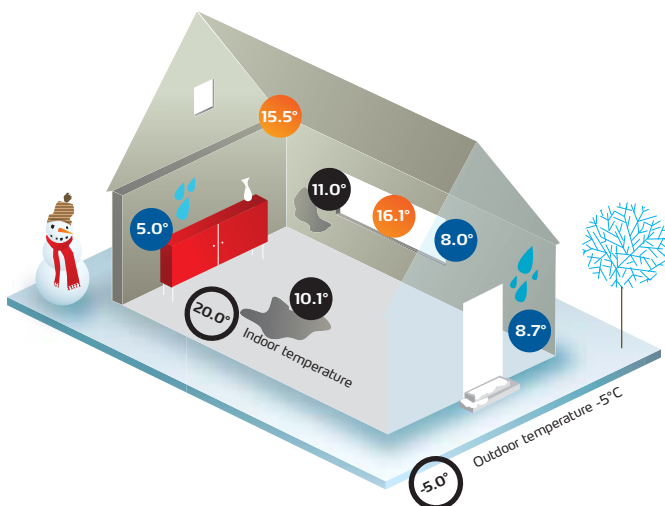
Ventilate

Unless you live in a modern building – such as a Passive House – with an automatic ventilation system, you'll need to open your windows briefly several times a day in order to refresh the air. During the cold winter months, 5 minutes (with radiators off) may be enough for a complete air exchange without a dramatic cooling of the warm surfaces in the building. On windless summer days, 30 minutes may be necessary.

HOW INSULATION PREVENTS CONDENSATION AND MOULD

Old building lacking insulation

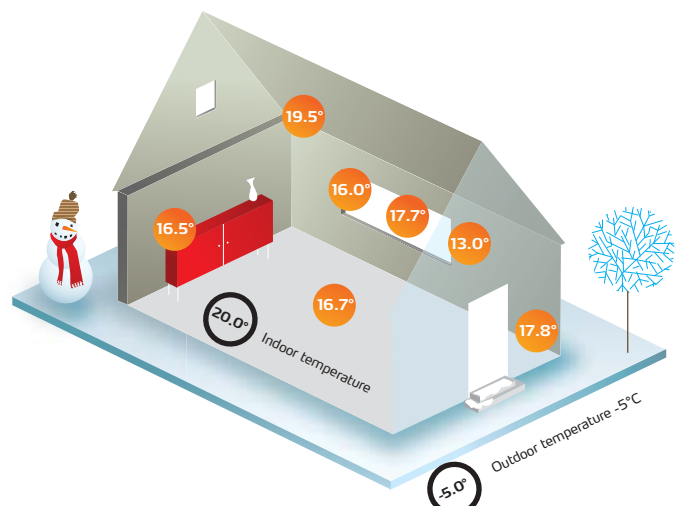
Despite new windows, condensation and mould problems can occur around window frames, the foundations, in joints and behind cupboards.



Surface temperature: around 9° C

Renovated building

200 mm insulation (Passive House technique) and new Passive House window



Surface temperature: above 16° C

The relevant surface temperatures are now above 16° C with no condensation or mould problems occurring. Humidity of 62% is no longer a problem.

- Safe surface temperature – well insulated
- Critical surface temperature
- Very cold and critical surface temperature

Source: Passive House Institute

HEALTH

RESISTANCE TO MOULD AND FUNGI

A comfortable, but also a healthy indoor climate, is an essential social dimension of sustainable building. Far too many people suffer due to the allergens that are emitted in moist and mouldy buildings. The only safe way to avoid mould in buildings is to keep the building materials dry and - in a temperate climate - to keep the indoor surface temperature above 16°C and the relative humidity of the indoor air below 70%. This can easily be achieved with a weatherproof outer surface, an airtight building envelope, sufficient insulation and proper ventilation – preferably a mechanical system with efficient heat recovery.

At relative humidity levels of 70%, moulds can start to grow on the most prone materials such as cellulose and other organics (for instance on wallpaper, paints, plasterboard with paper, wood and wooden panels). If there is excessive moisture in a building construction, then inorganic stone wool is among the very last materials to host the growth of moulds. Rockwool insulation is water repellent and almost entirely inorganic, having negligible nutrients for moulds.

If a moist building material cannot be dried out almost immediately, then it must be replaced or moulds will grow.

AT RELATIVE HUMIDITY LEVELS OF 70%, MOULDS CAN START TO GROW ON THE MOST PRONE MATERIALS

Workability – why does it itch?

A minor part of the stone wool fibres are coarse. For building users these fibres do not represent an issue because, once built in, the insulation rarely releases any significant debris. But during installation, the coarse fibres can cause transient itching of the skin. Washing the affected skin in cool water removes the nuisance. In order to minimise fibre debris, impregnating oil is added to stone wool. The Rockwool Group has developed a set of recommended work practices that help installers minimise adverse effects: use gloves, a sharp knife for cutting, good ventilation and cleaning practices, and – when necessary – a disposable suit, goggles and a dust mask.

Indoor emissions – is it safe?

Rockwool stone wool passes the strict Finnish indoor climate test M1 for low emissions. This signifies low emissions of Volatile Organic Components (VOCs), smell and formaldehyde.

In full scale building emissions tests, mineral wool is found to add only very low emissions to the indoor climate - even when compared to buildings equipped with other certified low emission building materials and furniture.

Declassification of stone wool

The World Health Organisation concluded in 2001 that rock (stone) wool should be removed from classification as a “possible human carcinogen”. This positive re-classification is because epidemiological studies and long term inhalation studies have provided no evidence of increased risk of lung cancer from occupational exposure to stone wool fibres.



Proper ventilation and insulation are crucial.

NOISE

USING INSULATION AS A PEACE KEEPER



Noise pollution reduces the quality of life for millions of people around the world. It reduces our ability to learn, relax and be productive. It hampers good communication. Noise even causes stress and may contribute to thousands of premature deaths.

Stone wool absorbs noise and regulates sound. Soundproofing not only makes it more peaceful for those living next to noisy neighbours, it also enables people to have freer expression - for instance through their music or other sociable, yet noisy, activities.

A good night's sleep

Rockwool insulation in walls, roofs and under floors prevents noise from the outside – or from adjacent rooms – penetrating the building. A good wall construction with Rockwool insulation can help reduce noise transmission by more than 50dB (R_w - value) which is about 20dB more than a poor construction without insulation. A 10dB difference is perceived by the human ear as a doubling (or halving) of the audible sound.

Machines that create ear-deafening noise can also be encapsulated with Rockwool insulation. Along busy roads, stone wool in noise screens, or as RockDelta vibration control under rail tracks, helps minimise unhealthy noise and vibrations. Traffic noise affects 40% of EU citizens and can reduce the value of property along major roads by 1.6% for every decibel above 55dB.

With Rockfon acoustic ceilings inside a room, 'noise infernos' with disturbing echoes can be prevented. A poor acoustic environment is not just a problem in offices, concert halls or cinema theatres. Millions of school years are lost due to the disruptive effect that noise can have on concentration and learning. At reverberation times of 0.7 seconds, only 67% of the spoken word remains comprehensible, falling to just 40% at 1.7 seconds.

A GOOD WALL CONSTRUCTION WITH ROCKWOOL INSULATION CAN HELP REDUCE NOISE TRANSMISSION BY MORE THAN 50dB

Living next door to a noisy neighbour, such as the Düsseldorf Airport in Germany, can be painfully stressful – or even hazardous to your health. Rockwool insulation in this roof has helped reduce the noise nuisance by up to 53 dB.



Learn more about noise at
www.rockwool.com/acoustics



In many countries, combustible insulation is widely used. In case of fire, this can cause the loss of sustainability of the building. The CCTV Tower in Beijing has still not recovered after the dramatic fire. Before the fire, the building was valued at more than five billion RMB (some \$750 million).

FIRE SAFETY

PROTECTING PEOPLE AND PROPERTY

In case of fire it is also vital that the building is sustainable. If the building materials are hazardous in fire, even a small fire in a room can quickly spread and engulf the entire building. Such fires release vast amounts of eco-toxins such as dioxins, furanes and other hazardous substances. Decontaminating the site and resurrecting the building requires massive resources. According to the insurer FM Global, fire risk can add up to 14% to carbon emissions over the lifetime of a building exposed to extensive fire hazards. Focusing on energy efficiency alone, and ignoring fire risk, can increase the carbon footprint of a building by a factor of three, FM Global concludes. Even in a low risk, standard office building, fire risk increases the lifecycle carbon emissions by an estimated 1-2%.

The economic loss due to fires is tremendous. Even the best fire insurance cannot re-establish the loss of cultural heritage, personal belong-

ings, or customers. A business may risk bankruptcy after a major devastating fire as customers opt for competitors who can immediately cater to their needs.

When combustible insulation fuels the quick spread of fire and toxic smoke, the outcome can even be deadly.

Rockwool insulation is firesafe - it is quite literally made out of rock that cannot burn. It tolerates temperatures up to 1000°C. Correctly installed Rockwool stone wool insulation works as a fire barrier, providing those vital extra minutes needed for people to escape and for the fire brigade to arrive and extinguish the flames, before the building structure starts to collapse.

A GUIDE THROUGH THE JUNGLE?

Making the right choices in the multifaceted discipline of sustainability isn't always easy. In order to simplify decisions, many people let eco-labels guide them. More than 340 environment tools have been identified globally, herof 55 within buildings alone. And there are dozens of international and national eco-labels referring to the sustainability of buildings. But they are not always complementary. They have different focuses – on some aspects they can be outright contradictory. Examples of major systems can be found on page 31. Defining your priorities and picking the eco-labels that best fit your needs is crucial. Using an eco-label without knowing what it signifies, is like jumping on a train without knowing where you want to go.

ROCKWOOL SUSTAINABILITY QUALITIES

- ✓ Energy efficient
- ✓ Positive net carbon footprint
- ✓ Fire safe
- ✓ Noise control
- ✓ Fitting
- ✓ Durable
- ✓ Recycling
- ✓ Made of renewable resources
- ✓ Strength
- ✓ High resistance to mould and fungi
- ✓ No hazardous flame retarders
- ✓ No hazardous blowing agents
- ÷ Not skin-friendly

MORE THAN 340 ENVIRONMENT TOOLS HAVE BEEN IDENTIFIED GLOBALLY

A new generation

Due to the long-lived nature of buildings, the consumption of energy and other resources – every day, year after year – often constitutes the key environmental impact of a building. Whereas first generation sustainability systems for buildings such as LEED or BREAM have tended to underrate the importance of energy efficiency, giving this aspect less than 20% of the achievable points, second generation schemes such as DGNB (Deutsche Gesellschaft für nachhaltiges Bauen) place greater emphasis on energy efficiency. DGNB also takes economic sustainability into account. Rockwool insulation solutions can be used in buildings that qualify for optimal LEED, BREAM, HQE or DGNB performance.

The best way

The best way of assessing the environmental impact of a building is to calculate its impact over the whole lifecycle, following the ISO or CEN standards. The energy consumed in buildings represents the major environmental cost. First and foremost the energy for heating, but also for cooling, hot water and electrical appliances. When comparing - and rating - buildings, a number of other impacts of social or economic nature also need to be taken into account. Sustainability rating systems for buildings often reflect local and political preferences and weight them against another. This is illustrated in the adjacent table comparing major building rating systems.



Kroon Hall at Yale School of Forestry & Environmental Studies in US New Haven has obtained LEED® Platinum Certification. It uses 58% less energy than a comparable baseline structure and was voted the 4th "greenest" project in the USA by Environmental Building News.

MAJOR CERTIFICATION SYSTEMS FOR BUILDINGS



	LEED	BREEAM	DGNB	HQE	SBTool
Origin	USA	UK	Germany	France	Canada
Name	Leadership in Energy and Environmental Design	Building Research Establishment Environmental Assessment Method	German Sustainable Building Certificate	Haute Qualité Environnementale	Sustainable Building Tool
Established	1998	1990	2009	1996	2002
Responsible	U.S. Green Building Council	BRE	DGNB	Association pour la HQE	iISBE

CRITERIA

Energy					
Low emissions		+	+		+
Renewable energy	+		+	+	+
Efficiency	+	+	+	+	
Electrical demand	+	+	+	+	+
Low carbon		+	+		+
Refrigerant management	+	+	+	+	
Water					
Re-use/Recycling		+	+	+	+
Water consumption	+	+	+	+	
Site/Location					
Public transportation	+	+	(+)	+	+
Site selection	+	+	(+)	+	+
Grace/Elegance				+	
Cyclist facilities	+	+	+		
Indoor environment					
Air quality	+	+	+	+	+
Daylighting	+	+	+	+	+
Acoustics		+	+	+	+
Thermal	+	+	+	+	+
Smell				+	
Hygiene			+	+	
Materials					
Materials reuse	+	+	+	+	+
Waste management	+	+	+	+	
Robustness		+	+		
Process and management					
Planning			+		+
Construction phase		+	+		
Commissioning	+	+	+	+	+
Economical issues					
Costs			+		+
Life cycle consideration			+		
Value stability			+		
Functionality/Comfort					
Flexibility/Adaptability			+	+	+
Access disabled persons			+		
Safety and security		+	+		+
Innovation					
Innovation issues considered	+	+			
Minimum requirements					
Yes	+	+	+		
Grades					
	LEED Certified LEED Silver LEED Gold LEED Platinum	Pass Good Very Good Excellent Outstanding	Bronze Silver Gold	Basic Level High Level Very High Level	Minimum Good Practice Best Practice

Based on information from the websites of the respective certification systems (September 2009)

Source: Deutsche Bank research



OUR OWN SUSTAINABILITY PERFORMANCE

Rockwool insulation is one of the most sustainable industrial products. It saves far more resources critical for future generations than are used for its production. And it reduces greenhouse gas emissions, acid rain and smog by more than the pollution caused during Rockwool production. Doing good for millions of people should never be an excuse for being complacent about any adverse environmental or social impacts locally. Rockwool production must also be sustainable and safe for the neighbours living close to the 22 Rockwool factories. The Rockwool Group continually strives to make improvements at our production sites.



POSITIVE NET CARBON FOOTPRINT

There are five key areas for determining the Rockwool Group's environmental performance:

- Scarce resources: energy and potable water
- Climate change: CO₂ and other greenhouse gases
- Air emissions: nitrogen oxides (causing global warming, acid rain, smog and eutrophication), carbon monoxide (causing smog), ammonia (causing smog, acid rain, eutrophication and smell), phenol (smog indicator) and formaldehyde (smog factor and a hazardous substance), and dust
- Waste/recycling
- Work place safety/accidents.

In 2009 all five of these sustainability areas showed an overall improvement compared to 2005, despite a set-back in a few individual indicators. A detailed description of each element is presented on pages 34-43. Other aspects of sustainability such as neighbour relations are also dealt with on these pages.

Better net performance

The net performance is an improved environmental footprint over all of the above five areas and within 7 of 11 indicators.

The total size of the environmental footprint is smaller than in 2005, with CO emission reduction showing a 50% improvement while, at the other end of the scale, SO₂ and ammonia increases were in the range of 10%. Of course not all indicators are equally important. And some indicators – such as potable water – may be critical in some locations, but less critical in other places. The polygon graphic (page 35) gives an illustrative overview.

According to a new externally verified assessment, 4000 million tonnes of CO₂ – equal to today's emissions from India, Russia and Germany combined – is the positive net carbon footprint of the Rockwool Group's production of insulation in 2009. Rockwool insulation will, in its lifetime, save so much energy in buildings and industrial processes worldwide, that the energy and emissions invested in its manufactured are recouped many times over.

A 250 mm Rockwool loft insulation product in Denmark can save more than 100 times the primary energy and CO₂ needed for its manufacture, transport and disposal. The energy and CO₂ balances become positive only five months and four months respectively, after installa-

4000 MILLION TONNES OF CO₂ IS THE POSITIVE NET CARBON FOOTPRINT OF THE ROCKWOOL GROUP'S PRODUCTION IN 2009

tion in the building. However technical insulation for very hot pipes (often exceeding temperatures of 200°C) can have a positive net energy and CO₂ balance of more than 30,000 times.

Less CO₂

In 2009 the Rockwool Group's factories recorded Scope 1 CO₂ emissions (generated from production) of 1.03 million tonnes. The data accuracy was improved in 2009, adding new sources of CO₂ to the inventory. Extrapolating for this difference in calculation methods, Scope 1 CO₂ emissions decreased by nearly 6% over 2005.

The Group's Scope 2 CO₂ emissions (generated from our consumption of electricity produced off site) reached 250,178 tonnes. Ironically, the lower level of CO₂ emissions over last year (110,406 tonnes for Scopes 1 + 2) is bad for the climate, because it reflects the dramatic decrease in insulation sales caused by the largest financial crisis since the Great Depression of the 1930s.

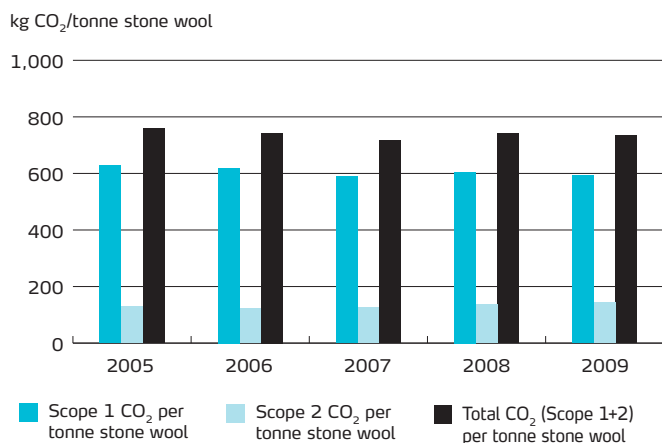
Monitoring

Eleven Rockwool factories are part of the EU Emission Trading Scheme, but all Rockwool factories make detailed monitoring and documentation of their CO₂ emissions. Currently, the Rockwool Group does not have a need to buy additional CO₂ allowances. The remaining factories in the EU will become part of the ETS in 2013.

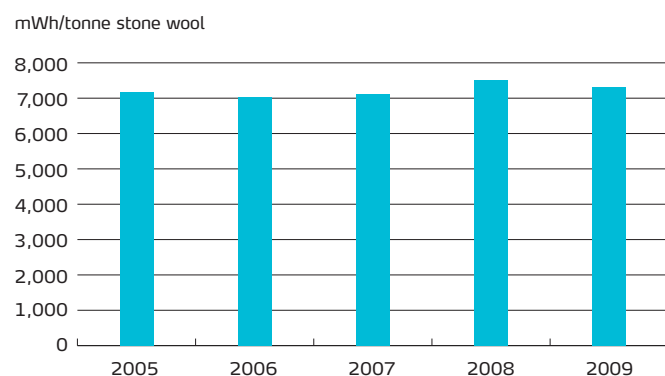
Exceptionally high transparency

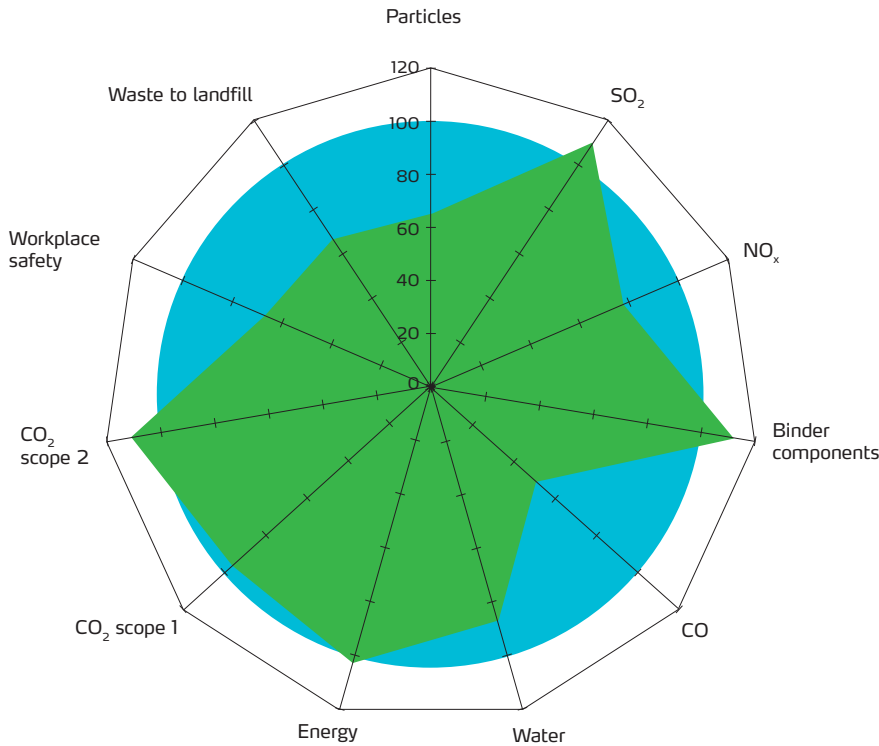
In 2009 the Rockwool Group scored 68 points in the Carbon Disclosure Project, which is a recognised standard for CO₂ reporting. This was

CO₂ EMISSIONS



TOTAL ENERGY CONSUMPTION





7 of 11 environmental performance indicators where improved from 2005 (index 100) to 2009 (green colour).

Blue areas connote an improvement.

Green areas exceeding the blue index 100 limit indicate a set-back.

The indicators are calculated per tonne stone wool.

Workplace safety, however, is calculated as accidents per million work hours.

Indicator	Improvement 2005-2009
CO	48% ↑
Particles	35% ↑
Waste	35% ↑
Workplace safety	33% ↑
NO _x	26% ↑
Water	10% ↑
CO ₂ Scope 1	6% ↑
Energy	-2% ↓
SO ₂	-8% ↓
Binder	-10% ↓
CO ₂ Scope 2	-11% ↓

deemed "exceptionally high for a first time reporter". The reporting is in accordance with the Greenhouse Gas Protocol of the World Business Council on Sustainable Development (WBCSD). Details about the Rockwool Group's carbon emissions, carbon management and strategies are published at

➔ www.cdproject.net

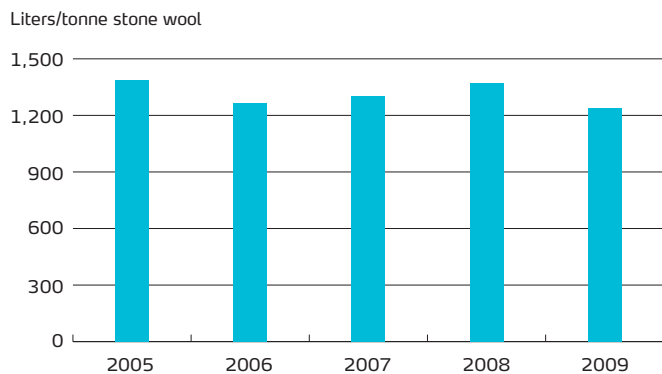
Getting efficiency back on track

Since 2005, the Group's energy efficiency has decreased by 2%, but with an improvement of nearly 3% in 2009 over the previous year.

Pulling in the right direction is the fact that most of the improvements identified in our energy audits have now been – or are in the process of being – implemented. As an extra bonus € 3.4 million per year is being saved in energy costs. Another positive factor for energy efficient performance is that we now have four large modern production lines in place of five small and typically less efficient lines which have ceased operation either permanently or temporarily. High capacity lines use fuel resources more efficiently, and this also has a positive effect on CO₂ emissions.

The CO₂ efficiency of the Group improved by 3% from 2005 to 2009.

WATER CONSUMPTION



"EXCEPTIONALLY HIGH SCORE FOR A FIRST TIME REPORTER."

*The Carbon Disclosure Project.
The Rockwool Group's entry in 2009.*

THE TAMED VOLCANO

The forces of a volcano are enormous. They can wipe out settlements or paralyse air traffic for several days. But the volcano is also a source of fertility.

Everyday Rockwool specialists 'tame the volcano', a process by which diabase rock or recycled stone material and limestone become molten at 1500°C in a cupola or electrical furnace. The liquid rock mass (the lava) is spun into fibres as it cools. Binder and water-repellent oil are added before the material is cured in an oven, stabilising the thermo-setting resin.

The inspiration for developing the Rockwool process was found by scientists who visited the Hawaiian Kanua volcano in the late 19th cen-

tury. The stone fibres they found in the landscape, the locals said, was hair that the goddess of the volcano, Queen Pele, had torn out in anger.

The Rockwool 'volcano' is a less ill-tempered lady! Filters help retain the dust and ashes. Pre-heaters, after-burners and other cleaning and collection systems help make her an environmentally sustainable process.

Improving the tamed volcano

Applying novel technology, the Rockwool Group expects to save a further 10% of the CO₂ and energy used in our wool production by optimising the energy efficiency.



1.7 million m³ of natural gas, and 3800 tonnes of CO₂ will be saved every year in Doense, Denmark. Excess heat from the local Rockwool process will now supply valuable energy to help heat the radiators and boilers in thousands of homes in the local community. This initiative was granted an Environmental Award by the Municipality of Mariagerfjord.

10%

of the CO₂ and energy used in our wool production will be saved by applying a novel technology

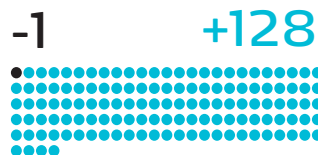
ROCKWOOL SUSTAINABILITY BALANCE

LIFE CYCLE ASSESSMENT (LCA)

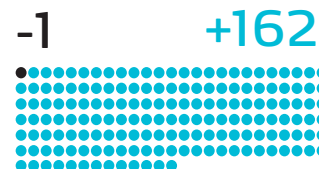
Rockwool insulation is a major energy and CO₂ saver. A typical 250 mm Rockwool loft insulation product – manufactured and installed in Denmark and used over 50 years - will save 128 times more primary energy and 162 times more CO₂ and acid rain components than was used for its production, transport and disposal; reduced airborne nutrients come at a factor of 61 times. The energy balance becomes positive only 5 months after installation. CO₂ and acid rain payback is just 4 months, and 10 months for eutrophication compounds. For a product that insulates very hot pipes, the energy and CO₂ payback is even quicker. It can be less than 24 hours - and the return on invested energy more than 30,000 fold.

Source: FORCE TECHNOLOGY/dk-TEKNIK. ISO 14025 compliant, peer reviewed LCA in: International Journal of Life Cycle Assessment, no 9 2004, p.53-56 & 122-129

ENERGY



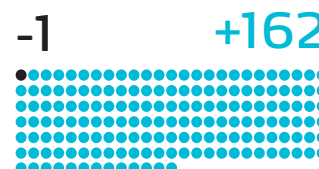
CO₂



EUTROPHICATION (PO₄³⁻ – EQUIVALENTS)



ACID RAIN (SO₂ EQUIVALENTS)



● USED IN LIFE CYCLE ● SAVED IN LIFE CYCLE



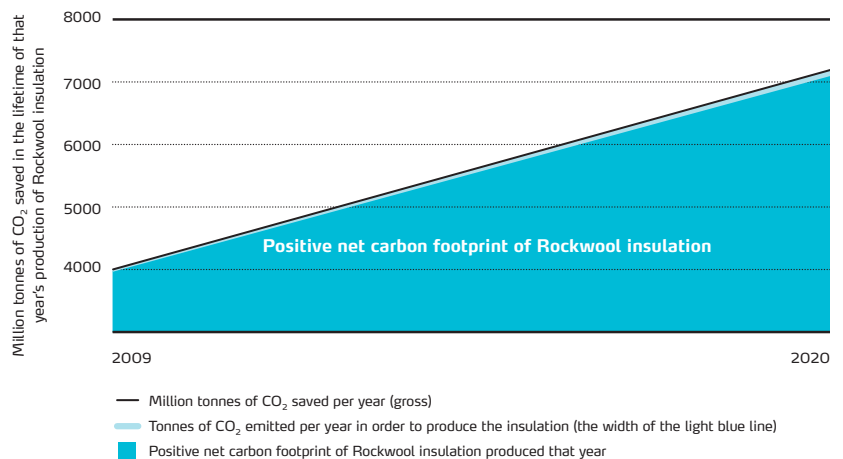
IMPROVING OUR OWN BUILDINGS

- All new office buildings in the Rockwool Group must be constructed according to low energy building standards or better.
- During major renovations, the energy performance will be upgraded to meet or exceed requirements for new buildings so far as this is functional, and technically and economically feasible.
- When upgrading individual components only (for instance windows or the roof) or systems (such as heating), the minimum requirements for new buildings or better will be met.
- All cost effective investments (less than 7 year payback) that are recommended in the energy performance certificate will be implemented no later than 2011.

WHICH IS BETTER?

There is a wide variety of sustainability definitions. Some are based on the concept that organic biological materials are always better and that the use of fossil fuels, metals and minerals (like rock) should be avoided. However bio-materials and fertile land are not an unlimited resource. If, for instance, the production of stone wool were to be substituted by sheep's wool, this would require the wool production from more than 1000 sheep just to insulate a single building of 140 m² to Passive House level. These sheep would need to eat more than 1000 tonnes of grass, requiring 1 sq km of grassland. In a country like Denmark, the annual insulation of 25,000 buildings would require that all the agricultural land be allocated to the sheep. Nothing left for vegetables, fruit and grain or animal feed for pigs, cattle or chicken - or for any other activity. Quite apart from all this, as an insulation material, sheep's wool has to be protected and impregnated with biocides. So, no - bio isn't always better!

POSITIVE NET CARBON FOOTPRINT OF ROCKWOOL INSULATION



The Rockwool Group's net carbon footprint will correspond to saving more than 7,000 million tonnes of CO₂ in 2020 if the development in sales volume increases by an average of 5% per year.

RECYCLING – MAKING OUR RESOURCES LAST LONGER

Increasing recycling and minimising waste are important. The resources on this planet are limited and space shouldn't be taken up by unsightly landfill sites if at all avoidable.

Today the Rockwool Group recycles six times more residue materials from other industries than we deposit ourselves. This is both economical and environmentally responsible. The Rockwool process is ideal for recycling and the amount of 'up-cycled' residue material from other industries has increased to nearly 500,000 tonnes per annum. At temperatures above 1500°C, organic residue is burnt off, providing valuable energy which can be substituted for virgin fossil fuel such as coke. Inorganic remnants, for instance olivine sand that has been used to sand blow vessels or concrete, and some residues from the metal industry, can also be substituted for virgin diabase rock. However rock remains an abundant resource, as nature's volcanic activity creates around 38,000 times more new reserves every year than the Rockwool Group extracts.

Avoiding landfill

Investing in recycling facilities, the Rockwool Group is reducing the amount of stone wool production waste going to landfill. More than € 30 million has been invested in recycling plants just within the last 2 years. From 2005 to 2009, our stone wool waste to landfill decreased by 35% to 64,000 tonnes. Today 95% of our stone wool production is either sold or recycled. Stone wool residue is also used in other industries, for instance as raw material in bricks.

Green and profitable

The Rockwool Group's 'return schemes' are now available in 60% of our operating companies, including Denmark, Germany, the Netherlands, UK, Poland, Hungary. In North America, Grodan horticultural substrates are returned from greenhouses, as is the case in many European countries. Return schemes also exist for Rockfon acoustic ceilings and Rockwool insulation cores for sandwich panels.

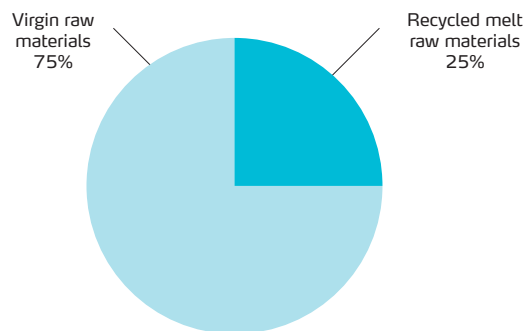
The Rockwool recycling scheme enables our customers to return their Rockwool offcuts. Some factories also take back Rockwool demolition waste from building sites which is subsequently melted and turned into new insulation products.

The EU Waste Framework Directive foresees at least 70% of construction and demolition waste recycled by 2020. But even today, the landfill tariffs for dumping insulation waste are increasing. Near our factory in Wales or in the Danish town of Vamdrup, for instance, it can cost around € 100 to deposit just 1 tonne of insulation waste. In other countries, low landfill tariffs mean customers may be slower to embrace our ability to take back their stone wool remnants. In 2009 customers returned nearly 10,000 tonnes of Rockwool residue for recycling at our plants. This amount can, and should, be increased considerably in future. The Rockwool Group will continue to expand its recycling schemes to more countries where transportation and waste collection systems can be made eco-efficient.

Return schemes for wooden pallets are also gaining momentum, now covering four countries and, in the Netherlands, packaging waste is being recycled too.

INCREASED RECYCLED CONTENT

On average, 25% of the melt raw materials are recycled matters. Our factory in Doense in Denmark, however, has completely skipped the use of virgin rock. Instead, only recycling briquettes are used.



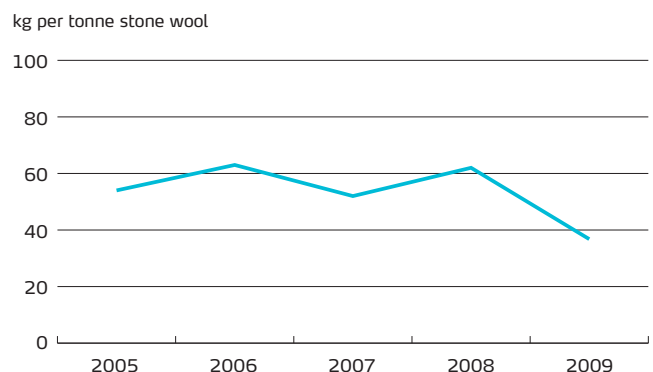
See the film "From waste to resource"

➔ www.rockwool.com/environment/production/recycling

35%

decrease in waste to landfill

WASTE TO LANDFILL





Gerhard Vieregge, Vieregge Bedachungen GmbH, in Allersberg, Germany

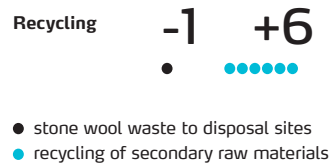
RETURN TO SENDER

“It requires quite a lot of skill to renovate a flat roof. And, regrettably, very often also a lot of time. Transporting and getting rid of the old insulation, for instance, is extremely time consuming. Quite often the nearest waste depot doesn't even handle insulation material or, if it does, only at horrendous cost. That's why I opt for the Deutsche Rockwool return system for stone wool residue. They offer competitive fixed prices and easy handling - the same truck that brings your new insulation also takes back the remnants. That really makes life and my calculations easy for me.”



The EU Environment LIFE programme supports Rockwool recycling initiatives

ROCKWOOL SUSTAINABILITY BALANCE



We recycle six times more residue materials from other industries than we deposit ourselves

Source: Group environment department

WATER FOR LIFE

Water is the prerequisite for life. In some areas potable water can be a scarce resource and thus a key sustainability factor. Climate change will exacerbate drought, not least in the Mediterranean region, where the Group has two factories. In our first Indian factory, a closed water cooling system will be used to save 1 m³ of water per hour.

The Group's water efficiency has been improved by 10% from 2005 to 2009. Consumption is currently 1.24 m³ per tonne stone wool or less than 20 m³ for the insulation needed for a 100 m² Passive House.

The Rockwool Group uses water mainly for cooling purposes, for the binder and for cleaning and maintenance. In order to reduce water consumption and to minimise environmental risks, much of the process water is re-used in a closed system. In rare cases it is conveyed to waste water treatment systems. Many plants collect and use rain water in order to minimise the usage of potable water.



Since 2005, the Dutch factory in Roermond significantly improved its efficiency in water usage, recording an improvement of about 30%.

ENVIRONMENTAL INCIDENTS

In 2009, there were 23 environmental incidents reported to the authorities. Of these, 12 incidents were neighbour complaints which in a few countries must be reported to the authorities. The Rockwool Group makes every effort to avoid any uncontrolled discharge; in the few cases where spills nonetheless did occur, they were of small amounts and were promptly remedied. Our environmental auditing focuses strongly on preventing ground contamination. In 2008, in Hungary, two cases were detected and mitigation was immediately initiated. In addition, many of our factories now use safety drilling to monitor and prevent contamination of ground water resources.

Our environmental management specialists are making strong efforts in order to increase the speed with which we remedy potential non-compliance issues. Our environmental audits pay extra heed to improving neighbour relations and thus reducing the number of complaints.

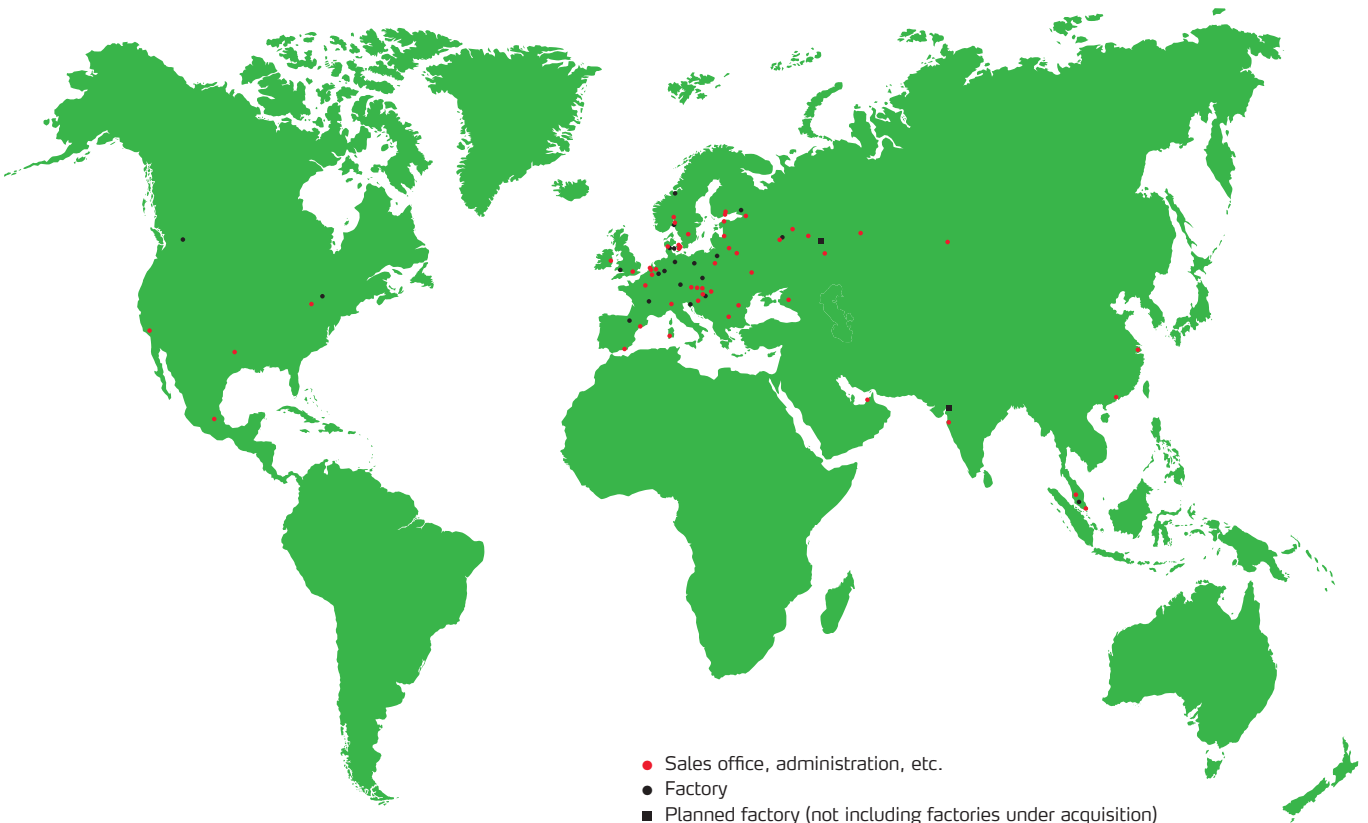
Fines and litigation

The Rockwool Group is not involved in environmental litigation. Yet in 2009, the three factories in Poland and the Czech Republic received fines or penalties from environment, health and safety related authorities, costing the Group € 1,573. We are clear that any non-compliance with environmental laws is unacceptable.

35%

dust reduction over the last five years

ROCKWOOL LOCATIONS



CLEANER AIR – COMBATING EMISSIONS

It is a fundamental requirement that the air we breathe doesn't make us ill and doesn't have a significant negative impact on our environment. According to the World Health Organisation hundreds of thousands of people suffer premature death due to air pollution, while many more live with a poor quality of life – especially the vulnerable elderly, asthmatics and children.

By reducing the need to burn fossil fuel, Rockwool insulation also reduces overall air pollution - smog, acid rain and eutrophication (an excess of nutrients that may disturb the bio-diversity in soil and water). A typical Rockwool loft insulation product saves 61-162 times more of these air pollutants than were emitted during its production.

Improving our sustainability balance

The Rockwool factories use after-burners and other environmental equipment to minimise emissions such as carbon monoxide (CO) from the melting process, and phenol and formaldehyde from the small amounts of binder used to stabilise stone wool fibres. The combustion of carbon monoxide also improves energy utilisation. At temperatures exceeding 700°C, most of the airborne organic remnants from the production process are burnt off.

Less smog

The Group's emissions of smog components have diminished. Formaldehyde and phenol emissions are around 10% lower than in 2005. The factories have used a higher ammonia content to compensate for the lower phenol and formaldehyde in their binder. The 2009 ammonia emissions are thus more than 10% higher than in 2005. Carbon monoxide emissions have been halved since 2005 with the vast majority of active production lines now having environmental equipment burning off CO and other organic remnants from the melting process. Nitrogen oxides have been reduced by 30% per tonne stone wool.

30%

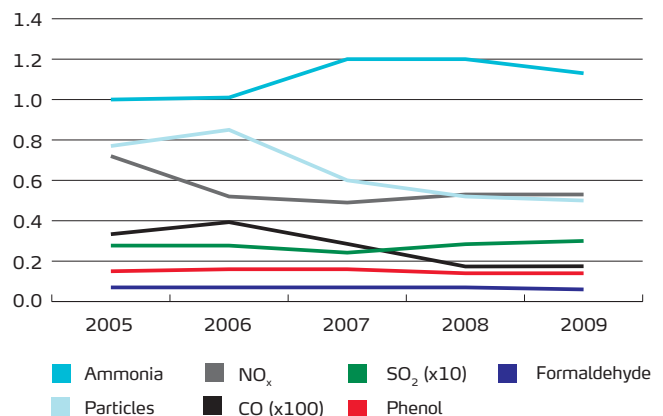
Nitrogen oxides have been reduced by 30% per tonne stone wool

LESS DUST

One of the most frequent causes of disturbance to the neighbours is escaping tufts of stone wool debris. Our factories use filters that, under normal conditions, capture particulate matter and this dust can then be reprocessed. By improving filters and minimising the periods when the filters do not retain the dust as intended, the Group has managed to reduce dust particle emissions by 35% over the last five years.

AIR EMISSIONS

kg per tonne stone wool



Bio-diversity

This concerns the emissions of nutrients that can boost the growth of algae and also disturb the bio-diversity in soil. The Group recorded a drop in nitrogen oxides, but this improvement was outweighed by the increase in ammonia due to the latter's stronger nutrient potency.

Recycling adds acid rain components

Recycling has many advantages, but it also increases the emissions of sulphur compounds from the cement used to keep the recycled briquettes together. This environmental dilemma is the reason why SO₂ emissions are considerably worse in 2009 than in 2005: an 8% increase was recorded. Ammonia emissions also increased, while nitrogen oxide concentration decreased.

NEIGHBOURS

It's our ambition to be a good neighbour and to engage in constructive dialogue. We respect the concerns and requests of our neighbours and always try to keep them informed about the improvements we undertake in our environmental management.

In 2009, 17 factories reported a total of 253 complaints. More than half of the complaints were related to just two factories - one in Croatia and the other in Wales. From a technical point of view, these factories have some of the most modern environmental equipment for stone wool production in the world. But in Croatia the community wasn't used to having a stone wool factory in their backyard. So building trust in the relationship is a long process.

The main grounds for complaints are odour (43%), air and water emissions (39%), noise (16%) and traffic (2%). Air emission complaints deal typically with outbursts of stone wool debris, fly ash or binder droplets.



SOCIAL SUSTAINABILITY

For the Rockwool Group being a sustainable company also includes a strong focus on social responsibility. A good reputation as a responsible and caring company among employees, customers, neighbours and society in general, is an essential prerequisite for the company's success and growth.

For many years, the Rockwool Group has been known for its dedicated social commitment. The company's social vision and values are stated in its Social Charter. The philanthropic involvement of the Rockwool Foundation within scientific analysis related to the current challenges faced by modern society, emphasises that social responsibility is a central part of the Rockwool culture. The Rockwool Foundation is the leading shareholder in Rockwool International A/S.

The Rockwool Group has always been managed on the basis of strong values underpinning the trustworthy and decent behaviour of the company and its employees.

Satisfied employees – also in rough times

The Rockwool Group focuses on the central areas of Corporate Social Responsibility (CSR): human rights, labour standards, the environment, anti-corruption and development of the company's "human capital" – our employees.

The Group supports a number of internationally acknowledged charters and declarations – among them the United Nations Universal Declaration of Human Rights and the International Chamber of Commerce's Business Charter for Sustainable Development. The Group has also developed its own policies and procedures, in order to ensure the implementation and practice of good corporate social responsibility throughout the organisation.

We see the professional and personal development of our employees as crucial, not only for managing a crisis – but also to propel future development and success.

Our bi-annual employee perception survey in 2009, showed very high commitment and a positive perception of how the Rockwool Group is managed, which we celebrate.

Good performance

Especially within the field of environment management, the Group has vast experience. Over the years, an extensive system for running production processes to high environmental standards has been refined. For the first time in 2009, the Rockwool Group made a coherent evaluation of its CSR performance which was found to be positive within all the above mentioned focus areas. A key area for future improvement is the way we ensure the CSR performance of our many suppliers.

The Group intends to maintain its positive CSR performance while constantly monitoring to ensure that the initiatives taken are sufficient to meet the requirements for contemporary corporate social responsibility.

Social responsibility policy:

➔ www.rockwool.com/about+the+group/social+responsibility

Social Charter:

➔ www.rockwool.com/about+the+group/social+responsibility/social+charter

CSR report 2009:

➔ www.rockwool.com/files/rockwool.com/Publications/CSR_Reports/CSR_2010-03-10.pdf



WORKPLACE SAFETY

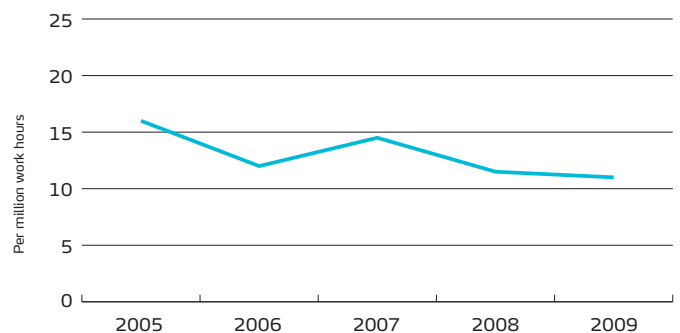
Lowest accident frequency ever

In 2009 our factories recorded the lowest level of accidents in the history of the Rockwool Group: 10.8 per million work hours. This is 33% better than in 2005. The frequency of lost work hours due to accidents was more than halved, reaching 1.2 per thousand work hours. This indicates less severe accidents.

The Rockwool Group must be a safe place to work. Every accident is one too many. On our route to achieving the ultimate aim of zero accidents, the Group has an intermediary goal of reaching a frequency rate of accidents (F.R.A.) of 5 maximum by 2012. Five factories achieved zero accidents in 2009, and our efforts are intensified in the remaining factories.

The recipe for achieving better safety is strong management commitment (e.g. participation in safety walkabouts and safety meetings); allocation of additional resources for training and safety measures; zero-tolerance for unsafe behaviour – including the use of disciplinary action when needed; strong standards of housekeeping that support the safety culture.

FREQUENCY OF ACCIDENTS



The Group reached the lowest frequency of accidents in its history. Our Russian factory in Zheleznodorozhny has by now worked without accidents for more than 1,000 days. Every effort will be made to improve our workplace safety even further across the Group.

10.8

accidents per million work hours in 2009 in the Rockwool Group.
This is 33% lower than in 2005

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THE ROCKWOOL GROUP IN BRIEF

The Rockwool Group is the world leader in stone wool technology. It is our mission to be a trusted partner in the building industry. Our business behaviour is governed by our core values of honesty, responsibility, efficiency, passion and entrepreneurship. Our global leadership in innovative products, systems, partnerships and services is supported by a unique expertise in the areas of energy efficiency, safety, sustainability and comfort in buildings.

Stone wool improves the environment and the quality of life for millions of people. This versatile material is used to insulate against loss of heat and cold. By decreasing the need to burn fossil fuels, stone wool also reduces air pollution.

Made of rock, stone wool is naturally fire resistant. It tolerates temperatures of up to 1000°C and is used as vital fire protection in buildings, and for marine applications, to protect lives and valuable assets. Stone wool protects against noise pollution and is used in acoustic ceilings, noise screens, around noisy machines, in walls and roofs, under floors and even underneath rail tracks. Stone wool is also used as a growing medium for vegetables and flowers, in façade cladding boards, as reinforcement fibres in cars and for other industrial purposes.

The Rockwool Group has nearly 8,000 employees in more than 30 countries - and customers all over the world. In 2009, sales reached €1.5 billion. The Group has been producing stone wool for more than 70 years and currently has 22 factories around Europe, North America and Asia – plus five under construction or acquisition.

ROCKWOOL®
FIRESAFE INSULATION

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