ECOLOGY IN THE CONSTRUCTION

Sustainable insulation: what owners and architects need to know

- **isofloc cellulose insulating material:** ecological, economical, efficient
- **isofloc production:** sustainable from the first to the last step
- **isofloc values:** practising a basic attitude – not just talking about it

DIRECT CONTACT

+41 (0)71 313 91 00

Our employees will be happy to answer your questions!

isofloc®

WHAT MOTIVATES US

The term sustainable is applied to many products nowadays. But what does sustainability mean in the insulating material market?

Just insulating a building according to the U-value is no guarantee of sustainability for isofloc. For isofloc, insulation must be a purposeful structural measure that optimally fulfils its function unchanged over a long period of time. Sustainability begins for isofloc with the careful selection of the natural raw materials. Sustainable means low-energy production. Sustainable means the joint-free installation of insulation even in crooked old buildings, so that the calculated values are also achieved in reality. Sustainable means insulation that offers a low risk of building damage thanks to its positive properties and is thus effective and requires little maintenance over a period of many years. Sustainable is when the inhabitants can enjoy a breathable and pleasant room climate over a period of decades. Sustainable is when the insulation discretely ensures that old houses retain their charm but can nevertheless offer their inhabitants modern comfort. And, last but not least, sustainable means a practice-proven and environmentally friendly recycling concept. isofloc cellulose insulation fulfils all these sustainability criteria – for 35 years.

The best known brands of the isofloc cellulose insulating materials is isofloc LM, which is manufactured in Switzerland.

isofloc AG, Bütschwil (Switzerland)

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Photos: istockphoto.com (pages 1/4/12/20/22)

SUSTAINABLE FOR 35 YEARS

ISOFLOC CELLULOSE INSU-LATING MATERIALS ARE FSC®- AND NATUREPLUS-CERTIFIED
isofloc cellulose injectable insulating materials from Switzerland (Bütschwil) have been certified according to the criteria of FSC® and natureplus.

FSC www.fsc.org FSC® C128800
The mark of responsible forestry

natureplus.org
natürlich nachhaltig bauen

The founders of isofloc recognised almost 35 years ago that it was time to face the responsibility for society and the environment and to back up words with actions. They developed a resource-preserving insulating material that greatly lowers the energy consumption of buildings and thus makes a contribution to climate protection. In many parts of Europe we are now the market leader in injectable insulating materials made from renewable raw materials. Much has changed since the founding of isofloc, but the subject of climate protection is more topical than ever today.

High energy consumption in buildings
Binding long-term strategies for lowering emissions of greenhouse gases are being decided at political and economic level throughout Europe. Amongst other things, the building industry is called upon to provide suitable means for the substantial reduction of heating energy consumption so that these goals can be achieved. In the German-speaking countries around 40 % of the energy consumption and CO_2 emissions are accounted for by buildings.

Only a small portion is renovated
In Switzerland, for example, around 1.67 million existing buildings were registered in 2012, of which around 90 % are urgently in need of energetic renovation. However, just 1 % of the existing properties are renovated each year. The figures are comparable in Germany. The heat requirement and the CO_2 emissions can be significantly reduced with good and efficient rehabilitation – buildings are often even renovated to the passive house or plus-energy house standard together with other structural measures. Good thermal insulation thus contributes significantly to the reduction of CO_2 emissions; if possible starting with the manufacture of the insulating materials.

Valuable contribution to environmental protection
isofloc's primary concern and daily obligation is therefore the further development and promotion of ecologically and economically convincing building materials and building systems. isofloc produces and supplies effective cellulose insulating materials for energy-saving existing buildings. From the development to the manufacture to the effectiveness of the installed cellulose insulation: isofloc makes a valuable contribution every day to the responsible treatment of our environment.

FURTHER LINKS TO ENVIRONMENTAL PROTECTION BODIES AND BUILDING INDUSTRY (MOSTLY IN GERMAN):

Bundesamt für Umwelt:
www.bafu.admin.ch

Energie Schweiz:
www.energieschweiz.ch

Minergie Schweiz:
www.minergie.ch

Gebäudeprogramm Schweiz:
www.dasgebaeudeprogramm.ch

eco-bau – Nachhaltigkeit im öffentlichen Bau:
www.eco-bau.ch

IG Passivhaus:
www.ig-passivhaus.ch

Bundesamt für Bauten und Logistik BBL:
www.kbob.admin.ch

Bundesministerium für Verkehr und digitale Infrastruktur:
www.bmvi.de
(Infos EnEV)

Umweltbundesamt:
www.umweltbundesamt.de

Deutsche Energie-Agentur:
www.dena.de

Institut Wohnen und Umwelt:
www.iwu.de

Passivhaus-Institut:
www.passiv.de
www.passivhausplaner.eu

Fraunhofer-Allianz Bau:
www.bau.fraunhofer.de

natureplus e.V. – Internationaler Verein für zukunftsfähiges Bauen und Wohnen:
www.natureplus.org

FSC®:
www.fsc.org

Extracts from the websites listed above were used for the production of this brochure.

Plus-energy industrial building belonging to AS Solar, Hanover, with exemplary character.

„The owner insisted on an ecological and economical insulating material. So that only left isofloc cellulose – with an area of about 5,000 m² and an insulation thickness of 30 cm, isofloc is simply unbeatable! Thanks to the simple material transport via the blowing hose, the blow-up method is the most economical and efficient insulation solution for inaccessible top floors of buildings.“

Toni Geddert, managing director, K3 insulating service, Hanover

Rehabilitation of the flat inclined cold roofs of blocks of flats belonging to a large Berlin housing association.

ISOFLOC CELLU-LOSE INSULATION MATERIAL

The loose, injectable isofloc cellulose insulation material is made of newsprint paper turned into fibres with additives for fire prevention. The high-tech secondary use of the paper from daily newspapers is a form of material upcycling found only rarely in the building industry. Care is taken in the isofloc works that all raw materials and goods are procured from regional sources as far as possible.

Extended life cycle of the paper thanks to the isofloc insulating material

Germany, Switzerland and Austria are among the world's front-runners in terms of the per-capita consumption of paper. The production of paper requires a great deal of energy and water, because the individual fibres have to be extracted from the wood. Thanks to recycling the fibres can be re-used up to six times for the manufacture of paper. The collection rate is pleasingly high in Germany and Switzerland at 76 % and 97 % respectively.

Nevertheless, a large portion of the paper has a short life time – a newspaper has already become waste paper within 24 hours. With the recycling of the paper as a cellulose insulating material, isofloc substantially extends the life cycle of the raw material – that is genuine upcycling! In terms of quantity, newsprint is the dominating raw material in the cellulose insulation and is directly procured from print shops, waste paper collections or raw material dealers. After that it is processed in low-energy production steps into a high-performance product.

DID YOU KNOW THAT CELLULOSE FIBRES HAVE THE SHORTEST AMORTISATION TIME?

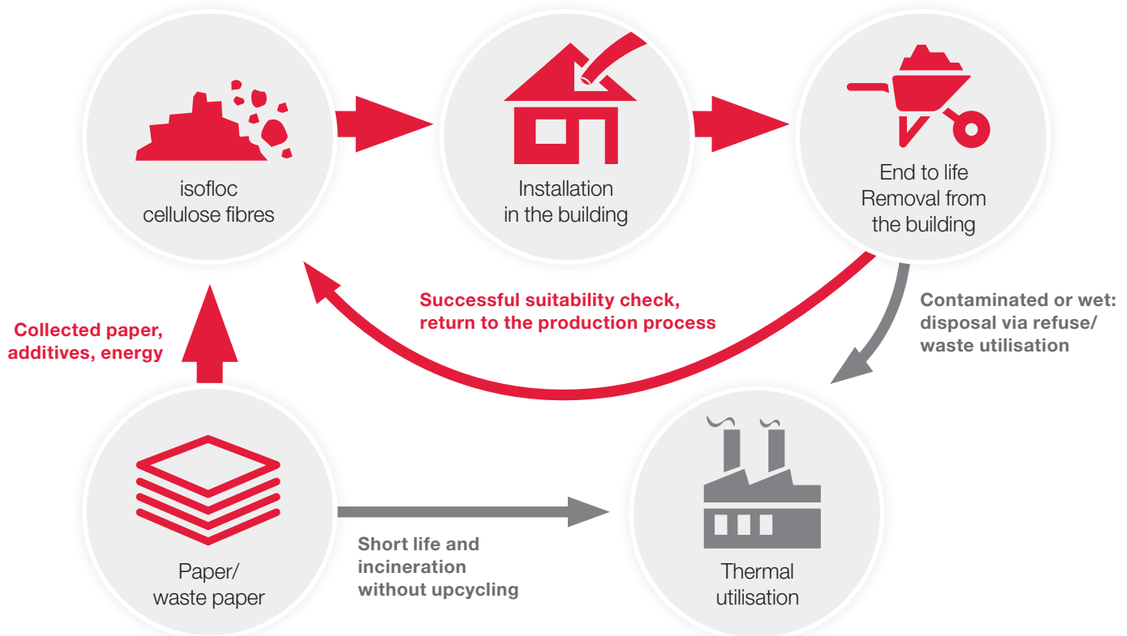
Assuming a U-value of the existing building component of 1.4 W/(m²·K) and a target U-value of 0.24 W/(m²·K), the amortisation period of cellulose fibres is shortest at just 1.2 months. That was proven by a metastudy 'Thermal insulating materials – products – applications – innovations' carried out by the Forschungsinstituts für Wärmeschutz e.V. FIW Munich.

„Cellulose fibres are quick and easy to install. Even the smallest hollow spaces are perfectly filled and the construction only needs to be opened in a few places. An economically and ecologically perfect solution."

Oliver Friedrich, managing director, mitgeDACHt Dämmtechnik GmbH, Zühlsdorf

Extended life cycle of the paper thanks to isofloc

Waste paper is turned into a valuable insulating material (upcycling) with a long-lasting effect. The isofloc cellulose fibres work in the thermal insulation for 30 to 50 years after their production.



Source: isofloc

Optimum protection for the insulating material

Mineral fire protection agents are incorporated during the production of isofloc cellulose insulating materials. These partly consist of raw materials whose natural deposits lie outside Europe and must therefore be imported. isofloc is constantly developing the recipe in order to save resources. In recent years this has already enabled the saving of large amounts of additives while at the same time improving the product quality. Today they constitute between just 5 and maximally 11 per cent by weight of the total product, depending on the product.

„I prefer the use of isofloc cellulose insulation material, because I can implement every insulation thickness with it, easily and quickly. That proved itself in the prefabrication and the rapid construction progress of the Neugrüen settlement.“

Dietrich Schwarz, Prof. Dipl. Architekt ETH/SIA, CEO of Dietrich Schwarz Architekten AG, Professor of Sustainable Design at the University of Liechtenstein, member of the executive board of Minergie

Sustainable housing development in Mellingen according to the highest Minergie standards (A-Eco and P-Eco).

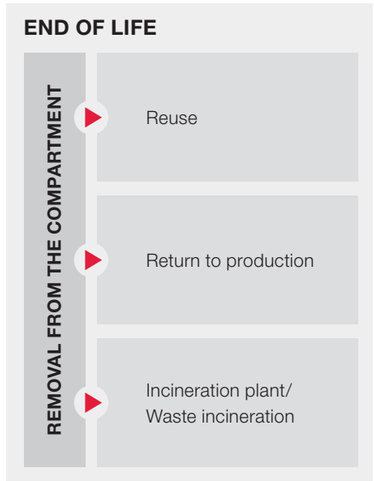
CO_2 STORES AND RECYCLING

Forests are CO_2 stores and important for the greenhouse gas balance. isofloc cellulose insulating materials extend the CO_2 storage of the originally felled timber by a further 30–50 years. Around 45 % of the CO_2 stored in the wood remain in the waste paper raw material, which constitutes about 90 % by weight of the isofloc cellulose insulation material. Thus 1 kg of isofloc fibres binds around 1.4 kg CO_2. In the active recycling this storage is retained. The recycling concept of using cellulose insulating materials several times, which is already practised throughout Europe, conforms to the political demands for a green economy. The future thus belongs to the cellulose insulation materials.

isofloc is ready for the circular-flow economy
Like all insulating materials, isofloc cellulose insulation also has a service life of at least 30 years. Unlike adhered, hardened insulating materials, however, the isofloc cellulose insulation can simply be extracted during demolition. It is therefore ideally suited to material recycling that requires very little energy. isofloc thus gives the paper and the insulating material a further life. Because the cellulose insulation material is still a new building material in Europe (35 years), only the future will show whether the isofloc cellulose fibres will see a third life.

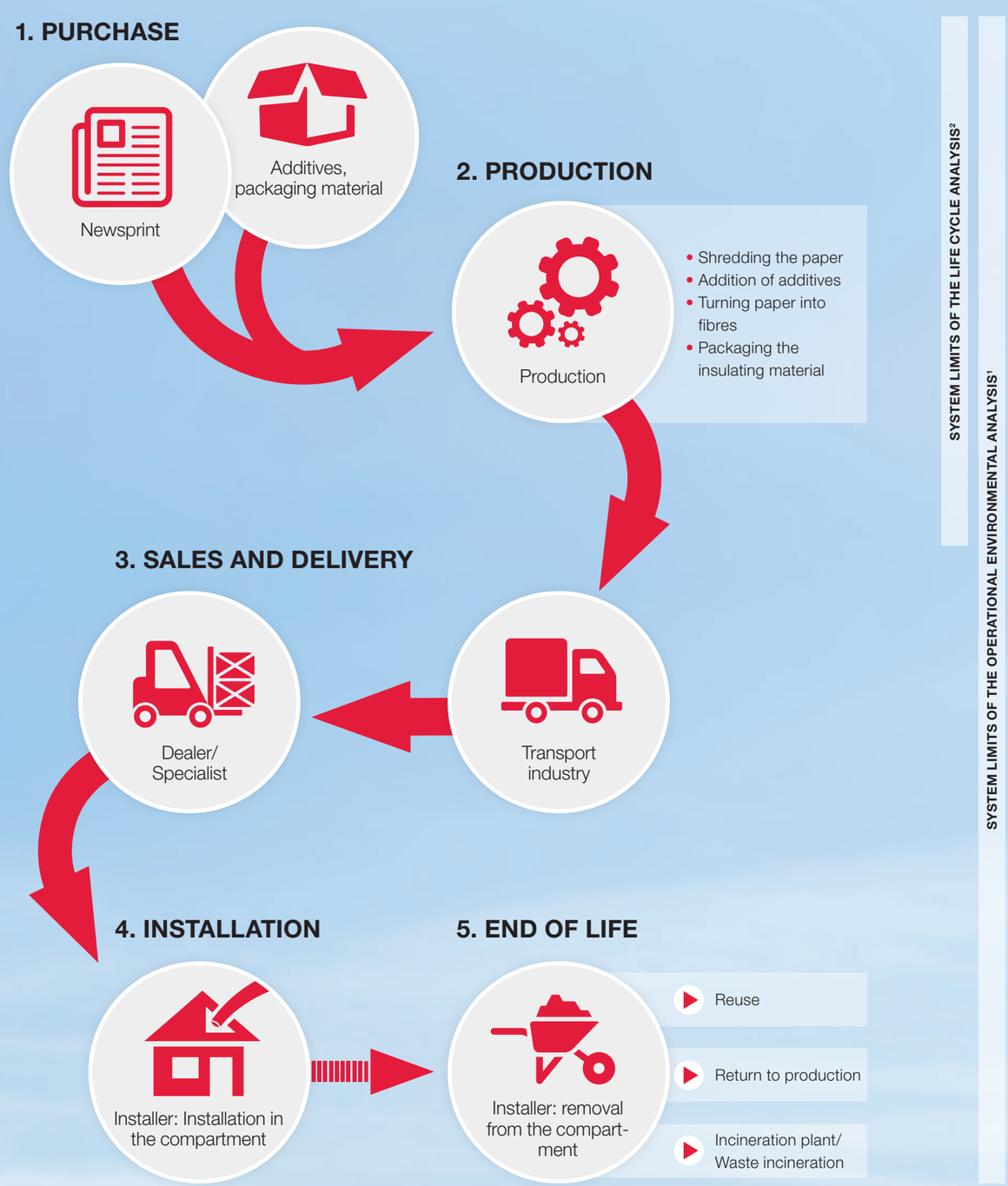
isofloc recycling concept
isofloc specialists all over Europe are making use of the possibility to use cellulose insulation materials several times over. Using this technology the specialist extracts the cellulose insulation material with a special extraction device. After successful checking of the extracted material it can immediately be reinstalled somewhere else or returned to the production process. Further utilisation in top quality is thus guaranteed. Contaminated and wet material must be disposed of. The empty packaging of the cellulose fibres is often used on the building site for the collection of waste or reused by recycling companies.

There is usable energy at the end of life
If insulating materials cannot be recycled, they must be burnt in an incineration plant (combustible insulating materials) or dumped (inert mineral insulating materials). As opposed to mineral insulating materials, isofloc cellulose fibres contain stored usable energy, which can be used for generating heat or electricity. In mathematical terms, however, cellulose insulation materials fare worse than the mineral insulating materials with the current disposal scenarios, because the usable energy is not credited.



The life of isofloc

The life of isofloc cellulose insulating materials and the system limits of the two environmental analyses carried out.



[1] By sinum AG in the context of the operational environmental analysis/ecobalance
[2] By IBO GmbH in the context of the life cycle analysis

WE MEASURE EVERYTHING

In order to be able to make fact-based decisions, an operational environmental analysis was carried out in parallel in all isofloc production plants. This analysis encompasses the entire life of the cellulose insulation materials from the procurement of the raw materials, production, transport and installation through to the disposal at the end of life.

Comparable results
The findings presented in this brochure are based on the updated data from the business year 2012 for the production locations of Bütschwil. The analyses led at all isofloc works to absolutely comparable results, which are pre-sented in this brochure as average values.

Bases for the ecobalance
The operational ecobalance forms the basis for the calculation of the product ecobalance. It consists of the systematic analysis of the environmental effects of the cellulose insulating material during each phase of the product life (see diagram on the left).

COMPARABILITY OF DIFFERENT CHARACTERISTIC VALUES

In order to interpret an ecological balance and to enable comparisons, the results are converted into different characteristic values. Two of the most important characteristic values are:

- The CO_2-equivalent (CO_2-eq): the dimension figure for the greenhouse potential (greenhouse gas emissions in accordance with the factors for the Global Warming Potentials according to IPCC 2007).
- The environmental impact point: this method is also called the 'method of the ecological scarcity'. This material-flow-oriented evaluation instrument summarises the various environmental impacts into a single characteristic variable – the environmental impact point.

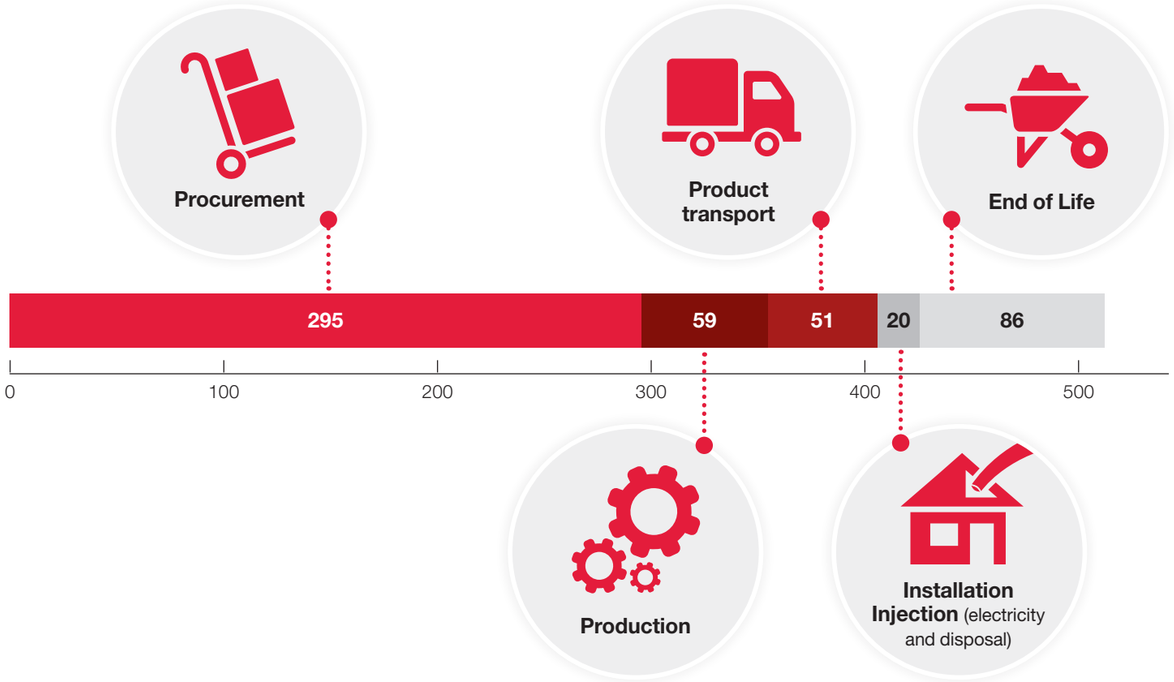
The expert system REGIS Environmental Performance Systems from sinum AG was used for the modelling, the calculations and the documentation of the data. The ecological inventory data originates from the ecoinvent data-base v2.2 (ecoinvent Centre 2010). Compared to the results of the KBOB list (see pages 20/21), additional operational aspects were considered in the ecological balance by sinum AG (administration, business and commuter traffic). As is usual in operational ecobalances, the creation of the infrastructure was not included. This check resulted in a low relevance in the total result.

450-year-old residential building in Thurgau, insulated with isofloc cellulose insulating material.

Photo: Michael Rast

Ecobalance from the procurement to the disposal

Product ecobalance of the average isofloc cellulose insulation material from the procurement to the disposal (EIP/kg isofloc cellulose insulation material)



Source: isofloc

Good ecobalance thanks to low energy expenditure

The analyses carried out led to comparable results at all isofloc works. From the individual values for all three works, values were calculated that correspond to the average isofloc cellulose insulation material.

The diagram above shows the environmental effect of each life phase for 1 kg of the average isofloc cellulose insulation material, expressed in environmental impact points. The ecobalance clearly shows how little energy the production of isofloc cellulose insulation materials requires (59 EIP/kg). This is due among other things to the fact that the manufacturing process requires neither heat nor water and because no material is wasted.

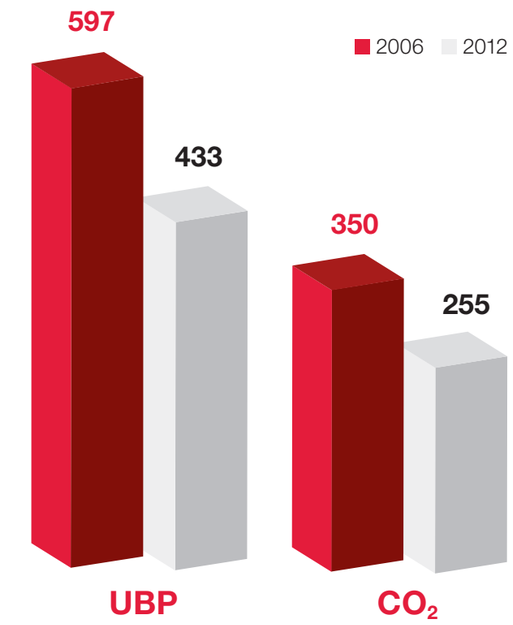
The transport of the products to the building site, their installation in the structural element and their disposal also exhibit a small environmental impact in the ecobalance (in total 71 EIP/kg). Amongst other things, that is because the material is compressible: the material in the sacks is compressed. For transport the product requires only approximately 1/3 to 1/5 of the volume that it has after installation. In addition, the loose injectable insulating material offers the great benefit that no material is wasted in any application or insulation thickness. From the ecobalance it follows that, in the life cycle, the procurement (including transport and packaging) of the raw materials constitutes over half of the environmental impact. The End of Life phase is still relatively high at 86 EIP/kg, because the analysis exclusively foresaw disposal by incineration. The product can be reused after removal or returned to the production process. This circumstance was not taken into account.

„isofloc is a high-quality ecological insulating material with very good material properties, and is versatile and economical in use even for the most demanding building tasks. In old houses isofloc blends seamlessly into the classic material canon and the often crooked structural elements.“

Philipp Hostettler, architect, Sensible Architektur, St. Gallen

IMPROVEMENT IN ENVIRONMENTAL PERFORMANCE BETWEEN 2006 AND 2012

Example: Bütschwil works in EIP or g CO_2/kg isofloc cellulose insulation material



ECOLOGICAL CHARACTERISTIC VALUES OF ISOFLOC CELLULOSE INSULATION MATERIAL

From the life cycle analyses carried out by IBO GmbH (17/12/2013 – Bütschwil work)

Characteristic value	Per kg	Per functional unit FU R=1.0 $(m^2*K)/W$
Non-renewable primary energy PEI [MJ]	**4,3**	**10,1**
Global Warming Potential GWP [kg CO_2-eq]	**–1,1**	**–2,4**
Acidification Potential AP [kg SO_2-eq]	**0,002**	**0,005**
Photochemical Oxidation Potential POCP [kg Ethylen-eq]	**$2,2*10^{-4}$**	**$5,1*10^{-4}$**
Ozone Depletion Potential ODP [kg R11-eq]	**$2,8*10^{-8}$**	**$6,5*10^{-8}$**

Source: isofloc

28 % improvement in environmental performance since 2006
isofloc constantly strives to optimise both the production and the product, including their effects on the environment. The improvement has become precisely measurable through the eco-balances carried out in 2006 and 2012 in the Bütschwil works. During this period the environmental impact of 1 kg of cellulose insulation material from this factory was reduced by 28 % (see diagram)! This success is attributable to a large number of measures, for example a substantial reduction in the quantity of additives, the lighter packaging films and the conversion to 100 % hydroelectric power for the electricity supply.

Life cycle analysis of isofloc cellulose insulation material (Cradle to Gate)
The table above describes the ecological characteristic values of the isofloc injectable cellulose insulation material (average values from all locations from the life cycle analyses carried out by IBO GmbH). These ‘Cradle to Gate’ analyses extend from the production of the raw materials through the production to provision at the factory gate.

„The special construction system for this building was developed with the help of various industrial partners and the German Environment Foundation. The building shell dimensions of the timber construction (including the foundation slab) were reduced by two thirds compared to structural concrete. At the same time the primary energy consumption for the production of the building materials as well as the heating energy consumption were drastically lowered.“

Dipl. Ing. Andreas Naumann, LOKAL.PLAN GmbH & Co KG, Leipzig

**Plus-energy building:
St. Franziskus School in Halle
with solar facade.**

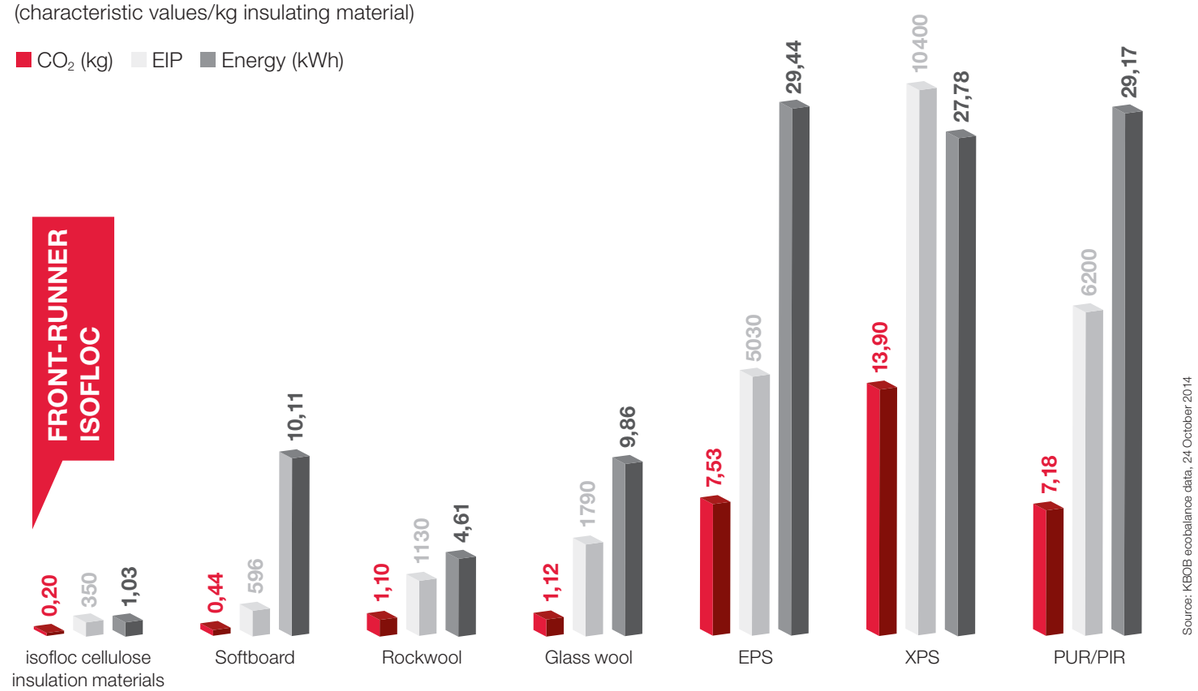
INSULATION WITH THE BEST ECOBALANCE

In comparison with other insulating materials, the isofloc cellulose fibres emerge as the winner and leave their competitors far behind. That was published in summer 2014 by the Swiss Coordination Conference of Building and Property Institutions of the Public Owners, KBOB, in their new recommendations.

The comparison of environmental indicators from product ecobalances of different insulating materials makes sense if these analyses are based on the same system limits. In its recommendations, KBOB publishes the ecological balance data of numerous building products from the operational environmental analyses of many building product manufacturers.
The KBOB values (diagram page 21) confirm once again that insulation with isofloc cellulose fibres offers by far the best environmental performance

ENVIRONMENTAL AND ENERGY CHARACTERISTIC VALUES OF VARIOUS INSULATING MATERIALS PER KG OF INSULATING MATERIAL

Environmental performance of various raw materials in comparison (characteristic values/kg insulating material)



Source: KBOB ecobalance data, 24 October 2014

WE FACE THE CHALLENGES

From the creation of our product to our daily management to the effectiveness of the installed cellulose insulation: our daily dealings revolve around the environment. Ecology and economy will continue in future to go hand in hand at isofloc.

For isofloc, sustainability is a central value that is reflected in the entire corporate culture and is actively practised by the employees. In general that starts with the constant improvement of our products and goes into the smallest detail: for example, the work clothes of the isofloc employees in Switzerland are made wherever possible of organic cotton. All processes and properties in Bütschwil are optimised according to EnAW specifications under the aspect of sustainability: Rooms are gradually being equipped with occupancy control, LED lights are being successively installed and exhaust air filters continuously improved. In Switzerland it has proven to be worthwhile to use exclusively solvent-free printing inks for the packaging of the isofloc insulating material and to use films containing the largest possible proportion of regranulates. Each of these measures may appear unimportant when taken individually, but the complete plan of action is having a sustainable effect and is an expression of isofloc's credible corporate policy.

1. **EnAW CO_2 saving:**
   isofloc AG is committed to the active reduction of CO_2 emissions and the optimisation of energy efficiency

2. **interseroh 2012 climatic protection certificate:**
   5744 kg greenhouse gases are saved annually by the recycling of plastics in Berlin

3. **LichtBlick Berlin:**
   198,020 kg CO_2 are saved annually by the procurement of LichtBlick electricity

4. **SAK Naturstrom Bütschwil:**
   1,200,000 KWh from renewable hydro-electric power avoid 196,473,000 environmental impact points

1

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www.isofloc.swiss