

Research hatchery on Circular economy

Dimina Dimitrova

Philipp Noller

Maria Ruiz de Elvira

Charlotte Harman

WAYS TO UTILIZE MINERAL WOOL (BOTH GLASS AND CERAMICS)
ORIGINATING FROM CONSTRUCTION WASTE REPORT

-- For Ekopartnerit and LSJH



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INTRODUCTION

As a group and as part of the project we aim to work along side the companies Ekopartnerit and LSJH.

The primary goal of this report is to explore ways Mineral wool originating from construction waste can be utilised to adhere to a circular economy.

Through benchmarking we will explore what has been done outside of Finland
- what the situation is like currently and how mineral wool has been utilised previously.

We aim to establish the level of expertise needed to utilise the material

By exploring companies that produce mineral wool we will explore the composition of the wool and how the companies feel responsible for the life cycle of the products:

- Rockwool
- Isover
- Knauf
- Technicol

Looking at companies that use mineral wool will allow us to see how the companies can repurpose the wool after consumer use. This will give Ekopartnerit and LSJH the opportunity to receive inspiration and ideas from existing systems and companies:

- Eurobond
- Grodan

Waste management companies provide a competitive benchmark for the waste management companies we are working with. This provides the companies with alternative systems, methods and ways they can utilise and process the wool themselves:

- King
- SUEZ
- Van Vliet Contrans

LSJH AND EKOPARTNERIT CURRENT SITUATION AND OBJECTIVES

QUESTIONS

Who are the stakeholders and what is the government influence? How do they affect the waste disposal and potentially new ideas and plans?

Are companies aware of what to do with construction waste?

What is more common, disposal service or consultancy?

Who are the client Companies?

How they manage the waste?

Where are they based?

What do they specialise in?

What do they say about mineral wool? What experience do they have?

What is the process of managing mineral wool?

LSJH: what kinds of waste are treated by the company? What type of treatment? What is the process?

Exactly how much construction waste is generated in the Turku area?

What are the facts and figures?

Costs? Budget?

How big is the area the companies manage?

What kind of mineral wool waste is received by the companies? Is it construction waste? If it is, how do they receive it? Is it all mixed together with other types of waste?

Do they also receive renovation and demolition waste? Is the sorting done on site or offsite?

Are the companies responsible for the recycling process or are they only responsible for the removal and collection of the material?

Who are the leading competitors?

LSJH

OBJECTIVE

LSJH are working alongside Ekopartnerit in order to find solutions to some of Finland's waste problems, and to create a more sustainable and environmentally responsible country as well as focusing more directly on Turku and the surrounding areas.

By working with LSJH we will get a more general insight into the waste management within the city of Turku. There are 27 municipalities in Finland and LSJH is working in 17 of them, making it a particularly influential company to collaborate with. Their aim is to predominantly emphasise a circular economy within Finland and Scandinavia.

THE COMPANY

LSJH is based in the waste management site of Topinpuisto and therefore has a close connection with Ekopartnerit as well as being part of a hub within Turku alongside other companies. It is important to them that their experiences are shared and they are able to share knowledge they already have as well as new systems and methodology.

LSJH already has a lot of experience with the handling of waste. Despite dealing mainly in municipal waste, the company has experience with over 50 different material flows so it counts on much experience with mineral wool.

Turku is a circular economy pioneer and LSJH are now wanting to create a stronger connection and want to be recognised as a leading innovator within Finland and Scandinavia.



EKOPARTNERIT

OBJECTIVE

The company receives around 700.000 tons of mineral wool per year, both glass wool and ceramic and stone mineral wool. The current situation is that all this material is normally classified into hazardous waste and is therefore burnt or put into landfill. The company wants to reduce all this waste by looking for recycling or reusing possibilities, as burning and landfill have a negative impact both environmentally and economically.

DIFFICULTIES OF RECYCLING MINERAL WOOL

One of the difficulties the company faces is that almost all the mineral wool waste they receive is originated in demolition sites rather than construction sites. This means that the mineral wool received is normally around 20 to 40 years old. There are two main problems with this. Firstly, the time passed may have degraded its insulation properties to some degree. The second problem is that legal regulations for the construction of new buildings tend to be very strict concerning the recycling and reusing of building materials. These have to be guaranteed to be in perfect condition after at least 10 years (?), and many times this task is hard and very costly. Another difficulty is that for the mineral wool to be suitable for recycling and reusing it must be clean and dry. In demolition sites where all the waste is normally mixed this can be hard.

The company has already started to implement some solutions by first making the sorting easier. They deliver special bags or containers to the client companies so that the mineral wool can be separated in the demolition site, making it easier and faster for the company. But the number of companies that use this service is not very high. Around 100 and 200 tons per year of mineral wool are lost being processed with other demolition waste without being separated. Another future implementation will be some more sophisticated optical waste separating machines, in addition to the crushers and separators they already have, which classify the waste through particle size or weight. These will be used mostly in plastic classification. When it comes to separating glass wool and mineral wool no solutions have been analysed yet. It is a hard process and the most cost effective solution would be automated processing and separation process (?). Even then, the ideal situation would be that the separation process lied on the client companies rather than Ekopartnerit.



PRESENT SITUATION

In the present time the company receives mineral wool waste from Turku and a 20km radius around it. The plans for the future are to expand this area, to collect mineral wool also in other parts of Finland. The company works with around 4500 client companies, 300 of which provide mineral wool waste. The organization has a few competitors in the area. Some are smaller companies that deliver from the clients to the Ekopartnerit sites. Other companies who receive mineral wool deliver it to other places such as Estonia, where it is processed in the same ways as in Finland: burning and landfill. This company is the only one that receives this kind of waste in the area

Both LSJH and EKPARTNERIT are part of the waste management hub - Topinpuisto. This hub is rare as it is part of a local and national circular economy network. It has a positive impact on various aspects of waste management as well as offering services to companies to decrease their environmental impact. The aim is to utilise material flows through the system as there are multiple waste management and sorting stations at the Topinpuisto site that can benefit aspects of the company not just from one stance but from multiple.

MINERAL WOOL GENERAL KNOWLEDGE

MINERAL WOOL

COMPOSITION

Mineral wool is made with two different components:

- Insulating fibers: depending on the type of wool these can be made out of rock or ceramic (typically basalt, dolomite or blast furnace slag) or glass.
- Binder: normally this consists of polymeric resins such as Phenol– formaldehyde, sodium silicates, polyesters etc. The amount of binders can account for up to 10 % of the final product mass.

PROPERTIES

A few properties concerning mineral wool are:

- High thermal conductivity and fire resistance
- Average useful life of 30 years
- If dry and without impurities, after 40-50 years of service the thermal conductivity is the same. More research, however, is needed to ensure the suitability for various reuse solutions
- In some situations, it can release respirable fibres into the air. A lot of research has been done on this matter but most of it inconclusive. The most dangerous time for breathing issues is during the early technological processes of manufacture.

MINERAL WOOL WASTE

Mineral wool waste can be generated from

Production

In this case the composition and cleanliness of the wool are known, so it is easier to recycle.

Construction

The composition and condition can be known most of the times. This waste is often easy to reuse or recycle, so some producers offer a leftover material takeback scheme for their products.

Cutting scrap during installation accounts for 5 % of the original product used.

Demolition

The composition and condition are often not known.

MINERAL WOOL

MINERAL WOOL RECYCLING

To recycle the mineral wool it is simply added to the furnace to melt again. To do this the exact composition of the material has to be known. This is why normally this recycling process is only used for waste coming directly from the manufacturing line.

Advantages of recycling:

It is possible to replace about 10 % of virgin material with fine production waste.

This reduces the melting energy consumption noticeably. By replacing 5 % of the pure raw material with production waste, coke consumption is reduced by more than 10 %.

POSSIBILITIES FOR RECYCLING

Recycled mineral wool can be used to create new virgin material, but it can also be used as a raw material in other products such as:

Composite ceramics

Mineral wool waste is combined with low-melting illite clays

Indoor ceiling tiles

Recycled mineral wool waste can be used to substitute other mineral fibre materials. The mineral fibres are dispersed in a solution of cold water and blended with the other fillers and binder ingredients cement-based composites: that rock wool waste can be used as coarse aggregate, finemaggregate, cementitious material or ultrafine filler in concrete

Artificial growing substrate

To grow various plants in soilless cultures

Wood–mineral wool hybrid particleboard

MAIN CHALLENGES OF MINERAL WOOL RECYCLING

1. Ensuring the purity and steady availability of recycled mineral wool

Recycled mineral wool can contain various contaminants which must be considered when evaluating reuse potential (binders, lubricants or aluminum layers), as they may have degraded the properties of the wool. These come from:

- Contamination from foreign construction components (such as fasteners, reinforcement fabrics foils, plaster materials or sealing tapes etc)
- Fungal and bacterial growth (in mineral wool recovered from moisture-damaged buildings).

MINERAL WOOL

2. Managing transportation costs effectively.
3. Sorting and separating the mineral wool properly from other construction waste.

C&D WASTE SORTING

As has been mentioned before, the construction and demolition waste has to be sorted properly in order to recycle the mineral wool effectively. This can be done in two ways:

On-site

- Top-down method: a building is demolished floor by floor from the roof to the ground level (using light tools instead of explosives or wrecking balls)

- Selective demolition:

Demolition is carried out as the reverse of the construction process, and recyclable materials are separated as it's done

The combination of these methods is the best.

Requirements:

A lot of workers and time

Suitable space on the construction site

Education of workforce

Off-site

C&D mixed waste goes to a separate off-site sorting facility. The delivered waste is pre-sorted, usually by hand, to recover some of the recyclable materials. Then it moves on to machine processing:

- Crushing unit

- Shredding unit.

- Other more specific machines, such as magnetic separator, sieving equipment, a gravity separator, float tanks and air classifiers.

- Manual picking station.

- More sophisticated Sensor-based sorting methods (optical systems, near-infrared (NIR) sensors, electromagnetic sensors, laser-induced breakdown spectroscopy, and different x-ray sensors). These emerging waste separation methods can enable more efficient separation results as well as higher quality and value of recovered materials

ECONOMIC VIABILITY OF C&D RECYCLING

For the mineral wool to be recycled, the process has to be economically viable. This is determined by many factors (unique to each case):

- Landfill cost
- Transport cost
- Recycling costs
- Virgin raw material prices

One of the problems is that there are no markets for secondary raw materials, because companies using mineral wool usually need to have the guarantee that they will receive a certain amount of material in a certain period of time. When it comes to recycled materials this can be hard to predict accurately. Furthermore, these markets can only be created if there is economic viability.

POSSIBLE SOLUTIONS FOR RECYCLING

- Create a market for secondary raw materials.

To do this the purity and steady availability of recycled mineral wool have to be ensured, as well as the effective management of transportation

- Crude separation of C&D waste on-site and further separation to recyclable secondary raw materials by off-site recycling.

BENCHMARKING RESEARCH METHOD

BENCHMARKING AND CIRCULAR ECONOMY

DEFINITION

Benchmarking is a strategy used by businesses to improve internal processes, products and services by observing and making comparisons with companies that are successful in the areas that are being compared. By breaking down the performance of the successful company and the methods they use, the research can be used to improve performance. This method also highlights more specific areas in which the company may need improving. For example, the internal structures of a company, products and services are all parts of a complex network, so identifying a problem may not be as simple as it initially seems. Observing other company strategies, the business can identify and acknowledge areas that may not have been visible or obvious before.

BENCHMARKING AND THE FUTURE

Within any field of business it is important for a company to stay competitive. This gives scope for benchmarking to be utilised not only to identify how to match competitor companies but also to create potentially improved strategies that offer a better alternative to the competitor's strategies and placing the company at the forefront of what they specialise in.

TYPES OF BENCHMARKING

Internal Benchmarking

The process of comparing the internal performance of various departments within the business or company. For example, comparing the waste disposal management of household waste to the waste disposal management of construction waste.

COMPETITIVE BENCHMARKING

The process of comparing with direct competitor. This is the most useful form of benchmarking however it is also difficult to collect data from competitors.

INDUSTRY BENCHMARKING

This is a comparison with the leaders in the industry and this gives the company the opportunity to really engage with the most successful strategies and if implemented properly give the company the opportunity to become a competitor for these companies.

PROCESS

1. Understand the company's current process performance gaps
2. Obtain support and approval from the executive leadership team
3. Document benchmarking objectives and scope
4. Document the current process
5. Primary metrics to be used (how the benchmarking and comparisons will be transferred into measurable data and statistics)
6. What is being benchmarked (impact that this may have on the stakeholders and understanding the gaps and what is being measured)
7. Data collection plan

BENEFITS

- Improves employee understanding of cost structured and internal processes
- Encourages team building and cooperation in the interests of becoming more competitive
- Enhances familiarity with key performance metrics and opportunities for improvement company-wide.
- Improves productivity and lowers costs
- Accelerate and manage change
- Achieve breakthrough and innovation
- Set performance targets
- Create a sense of urgency

LIMITATIONS

- Benchmarking does not always identify how problem areas can be improved and usually only identifies what the problem are instead
- Its is often a simplified method and does not always show the macro or micro factors that affect the success of a company

REGULATIONS AND INCENTIVES

POLICIES AND REGULATIONS

INTEGRATED PRODUCT POLICY

Seeks to reduce environmental degradation from manufacture, use or disposal. This is done through an analysis of the product's full life cycle, acting where necessary to reduce the products environmental footprint. There is a variety of tools (mandatory and voluntary) to find an appropriate policy to measure the suitable aspects. Measures such as economic instruments, substance bans, voluntary agreements, environmental labelling and product design guidelines.

EUROPEAN GREEN CAPITAL & EUROPEAN GREEN LEAF

Both Schemes give cities the opportunity to track their own progress as well as recognising where there may be more room for improvement and further development.

Green capital is an award that takes into consideration a city's commitment to high environmental standards as well as ongoing and ambitious goals for future environmental improvement and sustainable development. Winners of the award act as role models and set the bar for other European cities to accomplish the same standards of urban environments. European Green leaf is a competition aimed at smaller cities and focuses on green growth and development. The competition seeks green living promotion, concepts and promotion within cities. The winning cities act also as role models for other European cities as well as ambassadors, setting examples for others.

EU CONTRIBUTION TO SUSTAINABLE URBAN ENVIRONMENTS

The Waste Framework Directive introduced new targets for Member States to recycle 50% of their household waste and 70% of construction and demolition waste by 202

Funding is available through the European Union to aid the sustainable development of Urban environments.

URBACT is a scheme that provides financial support to cities to promote sustainable development. It enables cities to jointly develop solutions to major urban challenges. Support from the funds can be supplemented by lending opportunities through the European Investment Bank, and innovative financial instruments such as JESSICA combine resources from the funds and the EIB. This gives cities, and business's motives to work harder to obtain goals of sustainable development.

DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

Brussels, 2.12.2015 COM(2015) 595 final 2015/0275 (COD)

“Article 11(2) of Directive 2008/98/EC sets down a 50% target for preparing for re-use and recycling of household and similar waste and a 70% target for preparing for re-use, recycling and other material recovery of non-hazardous construction and demolition waste by 2020”

“Member States shall take measures to prevent waste generation. These measures shall:

... reduce waste generation in processes related to industrial production, extraction of minerals and construction and demolition, taking into account best available techniques”

“Member States shall take measures to promote sorting systems for construction and demolition waste and for at least the following: wood, aggregates, metal, glass and plaster.””by 2020, the preparing for re-use, recycling and backfilling of nonhazardous construction and demolition waste excluding naturally occurring material defined in category 17 05 04 in the list of waste shall be increased to a minimum of 70 % by weight”

IMPLEMENTATION OF THE CIRCULAR ECONOMY ACTION PLAN

Tools used by government to monitor and regulate the progress and performance of sustainable urban development. The European commission adopted the Circular economy package to integrate an action plan into the development of cities. This entails actions that should be completed within a specific period, it gives clear signals to economic operators and society as a guide forward.

Circular economy indicators – Provides a comparison between countries and their performance in various circular economy sectors.

Recovery rate of construction and demolition waste (percentage):

FINLAND – 83

GERMANY – 94

ICELAND – 86

DENMARK – 92

ESTONIA – 98

AUSTRIA – 94

BULGARIA – 96

CZECH REPUBLIC – 90

HUNGARY – 86

IRELAND – 100

LATVIA – 92

ITALY – 97

LITHUANIA – 92

LUXEMBURG – 99

MALTA – 100

NETHERLANDS – 99

POLAND – 96

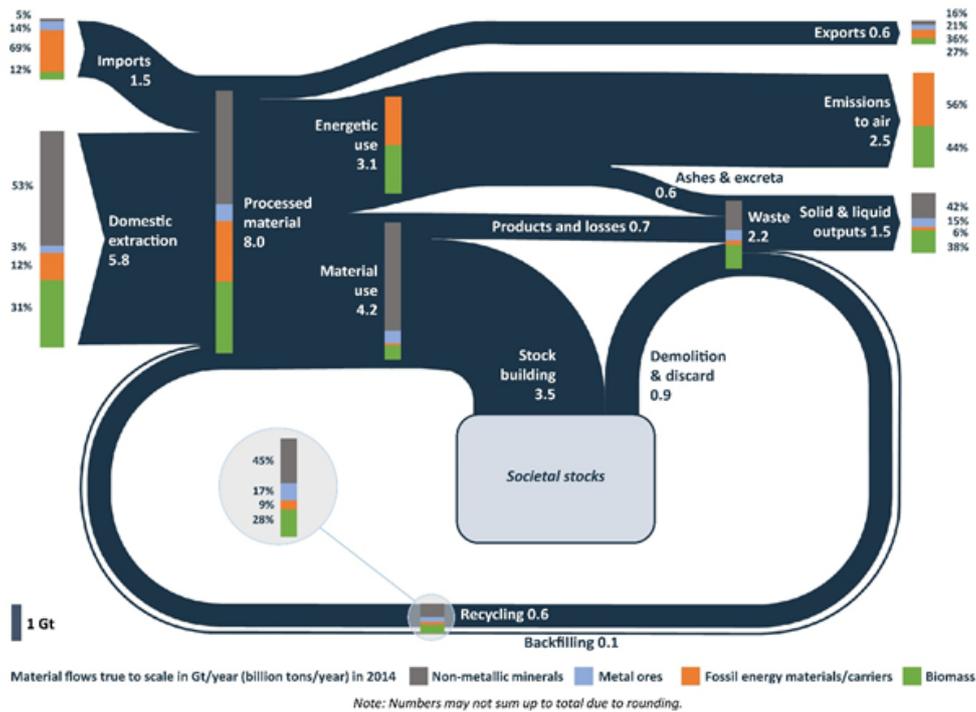
POLAND – 96

PORTUGAL – 96

SLOVENIA – 98

UK – 95

MATERIAL FLOW DIAGRAM (SANKEY)



INCENTIVES

Measures to boost reuse activities, including a clearer definition and rules that expand the scope of reuse activities

General requirements for producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle,

Direct financial incentives for greener product design;

Clearer rules on by-products and end-of-waste criteria to stimulate the sharing of by-product resources among industries and markets for recycled materials

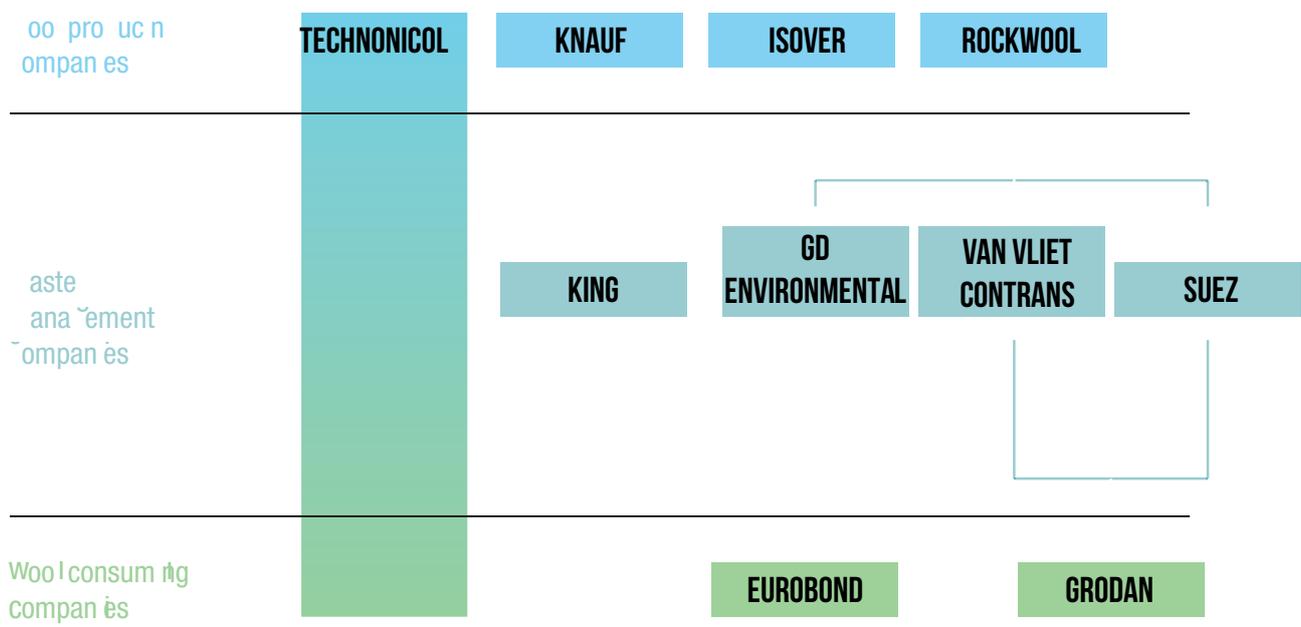
PRESENT SITUATION IN EUROPE/
OTHER COUNTRIES
Mineral Wool Companies:

Which companies are the biggest?

Where are they present?

How do they handle the end-of-life process for the mineral wool?

Do they take it back?



ROCKWOOL

Rockwool is possibly the biggest mineral wool producer in Europe. It has branches in most of the European countries and supplies some of the biggest companies.

ROCKWOOL GROUP

“The ROCKWOOL Group’s expertise is perfectly suited to tackle many of today’s biggest sustainability and development challenges, from energy consumption and noise pollution to fire resilience, water scarcity and flooding. Our product range reflects the diversity of the world’s needs, while supporting our stakeholders in reducing their own carbon footprint.”

The group is made up from different companies: Rockwool, Rockfon, Rockpanel Lapinus, Grodan. It ensures that the rockwool produce is utilised at every stage of its life and even after its end of life.

CIRCULAR ECONOMY

Rockwool is known for establishing and utilising a take-back scheme which sees many of its products used in different industries after their end of life. For example, Rockwool stone wool production uses repurposed materials from other industries such as power plants, steel and aluminium production. Materials after their end of life are then used by the horticulture industry as growing material.

DANISH TAKE BACK SYSTEM

In Denmark, Rockwool offers a take back scheme of stone wool. In 2016 they reclaimed 2.000 tonnes of stone wool from building waste. The company recognises the need to partner with others to deal with waste. In cooperation with their partners Combineering and RGS90 they implement the take back scheme. Incentives such as landfill prices, taxes and legislation ensure that the companies and partner companies are driven towards the take back schemes that rockwool offers.

ROCKCYCLE SERVICE

Daimler roof renovation demonstrates how rockwool replaced and renovated the roof of the distribution centre. Not only did rockwool replace the old stone wool with a more efficient wool, they also took back the old wool for recycling and managed the removal, through the rock cycle service, ensuring their service provided the company with a circular economy solution.



Landfill waste

Our goal: Reduce landfill waste from our factories (tonnes)



ISOVER

Based in: Vamdrup, Denmark. Saint-Gobain

Product: recycling service provider – the company provides various services to aid and guide businesses through provide tools and
Insulation, products

RECYCLING

Isover's own stone wool waste is recycled on site by transformation into briquettes. The company uses a cupola furnace (used in the production of mineral wool). This benefits the environment by substituting the raw materials, such as rock and fuel, with waste materials of a similar chemical composition.

Isover developed a system in 1993 in Switzerland which provided demolition and construction companies with waste collection:

This system provides the service of collection and recycling Isover glass wool waste from buildings. Contractors can return waste in special designed bags free of charge, via building material retailers. These bags are then taken back to Isover factory in Lucens using empty delivery trucks.

Process:

1. Segregation

The mineral wool is separated from other demolition waste.

2. Return of the waste to ISOVER

This is done via empty delivery trucks

3. Oxymelt

Developed in France in 1997, this is the process of recycling mineral wool through melting and placing the wool back into the production stream. The waste is melted via oxygen rich air through a cupola furnace. This process then produces raw mineral wool. Raw vitreous materials can be produced.

5. Production of new synthetic wool

Raw materials can be used for Briquettes, plants, green roofs etc.

CASE STUDY

A brochure on Isover's commitment to sustainable construction. The brochure discusses and address the life cycle of Isover's products for example the mineral wool that is provided by the company. The brochure entails the end of life process for the insulation that is provided as well as guidance for construction and demolition companies.

Using raw materials taken from the mineral wool waste Isover has introduced "winter Mattes" in 2013 as the first in a number of products based on recycled wool.

KNAUF

Based in: The Knauf Group has its headquarter in Iphofen in Germany. They operate in 86 countries with 220 plants 75 raw stone plants. They have subsidiaries in North America, South America, Africa, Asia and Europe.

In Europe, there are 16 subsidiaries. There is one in Finland, in Espoo operated by Knauf Oy.

Products: Knauf Insulation is responsible for the business field mineral wool.

Production sites of Knauf Insulation are in Trata (Slovenia), Ferndorf (Austria), Bad Berka (Germany), St. Egidien (Germany), St. Helens (UK), Cwmbran (UK), Queensferry (UK), Visé (Belgium), Krupka (Czech Republic) and Nova Bana (Slovakia).

RECYCLING

Knauf uses recycled glass for their mineral wool. However, after website research and contacting the company representatives, they do not concentrate on recycling mineral wool at the moment.

Only thing they recycle is unused mineral wool from the production process which is then added to new production cycle of the mineral wool.

PRODUCTION PROCESS

The chemical composition of mineral wool can vary widely. The basic materials for glass wool manufacture include sand, soda ash, dolomite, limestone, sodium sulphate, sodium nitrate, and minerals containing boron and alumina.

Traditional stone wool production is made by melting a combination of alumino-silicate rock (usually basalt), blast furnace slag, and limestone or dolomite. In addition, for both glass and stone wool the batch may contain recycled process or product waste.

For glass wool, other forms of waste glass (cullet) are also used as feedstock.

Glass wool and stone wool production make use of different proprietary technologies, but both include melting, fiberising and curing according to the following general plant configurations:

TECHNONICOL

Based in: The company originates in Russia. Presently, the TECHNOMICOL Corporation integrates 52 production sites in Russia and abroad (Belorussia, Lithuania, The Check Republic, Italy, the United Kingdom, Germany), 6 research centers, 18 training centers and 22 representative offices in 18 countries. Headquarters are located in Russia, Poland, Italy, China and India

Products: TECHNOMICOL is one of the leading international producers of building materials. It produces thermal and acoustic insulation, roofing and waterproofing materials. . The company exports materials to 95 countries worldwide. TECHNOMICOL is among the first Russian companies to emphasize the need of educating builders in new technologies and innovative sustainable material application.

IN-RECYCLING

TechnoNICOL has launched the program “TN-RECYCLING” for the utilization of all types of mineral wool insulation. This can be trimming stone wool, wreckage plates, insulation, removed from buildings during repairs.

The program solves the problem of the proper utilization of stone wool and helps customers to reduce waste disposal costs. It offers free recycling of old mineral wool insulation removed after the renovation of buildings. The customers just have to pack insulation wastes on pallets and load up the track provided by TechnoNICOL. To do this, customers need to contact the company’s call center at and leave a request. It is necessary to name the quantity of the waste, its format and its region.

RECYCLING PLANTS

Three TechnoNICOL factories located in the cities of Ryazan, Krasniy Sulin, and Zainsk take old stone insulation for the recycling. It is the company that delivers wastes to the factory and prepares them for recycling process. TechnoNicol is the only Russian mineral wool manufacturing company which offer such kind of service to all comers. After the stone wool is recycled, the obtained material is reused in the manufacturing process so that fewer natural resources are consumed.

PRESENT SITUATION IN EUROPE/ OTHER COUNTRIES

Companies that use mineral wool

- Where are they based?
- What do they produce?
- What kind of agreement do they have with the mineral wool companies?
- How do they take care of the end-of-life process for their products?
- How do they overcome the difficulties?
 - Sorting
 - Transport
 - Wool purity

EUROBOND

Based in: Cardiff (UK)

Product: wall and ceiling composite panels (both indoors and outdoors). These are made with a stone wool core surrounded by different materials and finishes such as metal, wood or plastic. This way, very good thermal insulation and fire resistance properties are obtained.

RECYCLING

the company follows a strict 'cradle to cradle' approach, recycling 100% of the panels after manufacture, construction and even demolition, without losing any material quality. This way, materials are perpetually recycled in closed loops and 0 waste is generated. The economic advantages are also big, especially in the case of the recovered steel. This recycled material has an increased value that can even achieve cost neutrality in the whole recycling process.

PANEL RECYCLING

Eurobond works in collaboration with GD Environmental (an English waste management company) and its supplying companies, Rockwool and Corus, to manage the recycling of the composite panels. The current capacity of the facility for recycling is approximately 2,000,000m² of panels per year.

Process

1. Segregation

The mineral wool panels are separated from other demolition waste.

2. Delivery to GD Environmental

Although transport isn't cheap, overall the recycling is still cheaper than sending the waste to landfill.

3. Separation of layers

Once in GD Environmental, the company uses a shredding machine to separate the different layers of the panels. Panels of any size and geometry can be fed to the machine. The shredder separates steel and mineral wool with a magnetic belt into different compartments.

The segregating process leaves barely any mineral wool on the steel. There might be a small amount present on the adhesive lines, but this is still acceptable to the steel company.

4. Delivery to primary companies

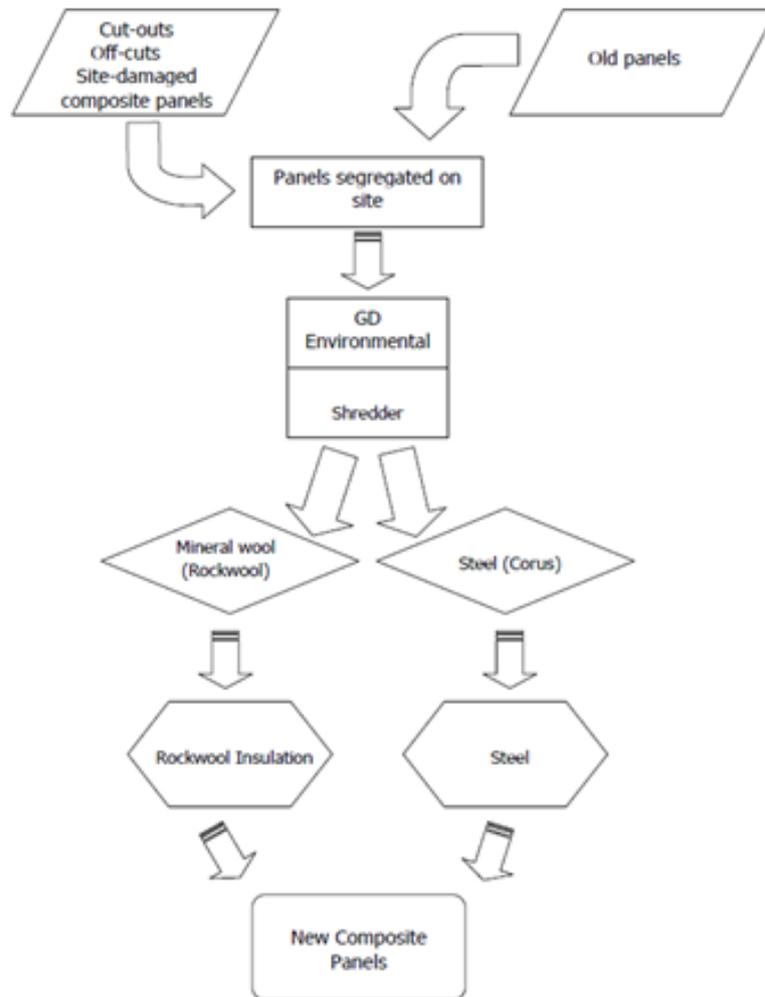
The separated materials are each compressed to be delivered to Rockwool and Corus.

5. Re-entering into the manufacturing process.

Rockwool: They reprocess the wool by adding it again to the manufacturing line (Normally with no further processing needed)

Corus: They use it to create new recycled steel.

EUROBOND



6. Manufacturing of new panels

Eurobond receives both primary materials again to make new panels

CASE STUDY

Apart from demolition waste, Eurobond takes back other kinds of construction and manufacturing waste, as well as whole refurbishment projects, as can be seen in the case of the refurbishment of a computer data centre for Goldman Sachs Investment Bank. An area of around 17000 m² of composite panels was restored. Most of the waste recycled came from demolition waste. However a big part was also collected from off cuts and on-site damaged composite panels generated during the installation of the new ones.

GRODAN

Based in: Grodan's head office is based in the Netherlands, although the company operates in North America, Canada and Poland

Products: The company specialises in growing solutions using stone wool. They offer a crop specific range of substrate slabs for vegetable growing. As well as using stone wool Grodan has developed a number of technological solutions for this purpose. The technology not only utilises stone wool within its second life, it offers a new way of cultivating which Grodan argues is a revolutionary way of growing crops and vegetables.

Grofit: Stone wool cubes covered by a solid disk of stone wool.

ROCKWOOL GROUP

The company is part of the Rockwool group which operates in a number of countries. They have input from external stakeholders - growers, retailers, scientific researchers, policy makers and non governmental organisations. They take part in several organised events in which they reach organisations from different sectors, such as food production and environmental solutions companies.

END-OF-LIFE PROCESS

The end-of-life process is managed by the company in collaboration with its clients and with a number of waste management companies distributed in different parts of the Netherlands. This way crop growers will always have a waste management plant near them where they can take the used stone wool slabs once they reach their end-of-life.

1. Separation

The material is segregated into three residual waste fractions: plastic waste, the remains of plants (organic waste) and stone wool granulate.

Residual drainage water is carefully separated, so as to prevent it from leaking into surface waters.

2. Repurposing

The organic waste can be used to make products such as compost.

The shredded substrate slabs, blocks and plugs are recycled into raw material in a low-energy process for various manufacturing processes like brick, cement, potting compost or soil improver production. Some of this raw material is turned into stone wool briquettes and used in the ROCKWOOL factory to create new stone wool products.

The plastic wrapping used for Grodan products is turned into plastic granulate and used in the plastics industry to manufacture refuse bags.

WOOL PURITY

Stone wool consists of 5% solid material in the form of stone fibres. The remaining 95% is made up of pores. Stone wool is designed for Precision Growing in a greenhouse.

GRODAN

Precision Growing focuses on ‘root zone management’- determining the environment for root growth. Everything that happens in the stone wool substrate has an impact on the functioning of the root environment and therefore the development of the plant.

When the mineral wool enters in contact with humidity the thermal and insulation properties are degraded. However, for plant growing these properties are not important. Therefore even though purity might be an issue when recycling mineral wool for insulation, it is not for Grodan’s products.

WOOL TRANSPORT

The mineral wool transport to the recycling spot is made by the customers or the waste management companies, therefore Grodan doesn’t have to worry about it. Furthermore this transport is made easier by the fact that Grodan works with several companies distributed in different areas of the country, so there will always be a recycling spot nearby.



PRESENT SITUATION IN EUROPE/
OTHER COUNTRIES
Mineral Wool Companies:

Which companies are the biggest?

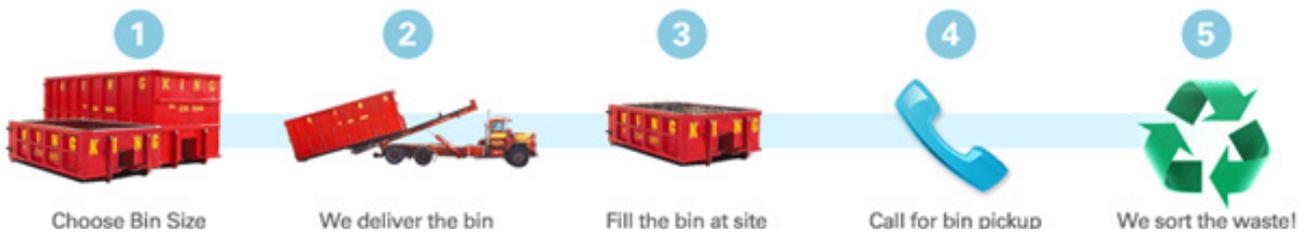
Where are they present?

How do they handle the end-of-life process for the mineral wool?

Do they take it back?

KING

King Recycling & Waste Disposal is a Canadian privately owned company that is specialized in multi-material recycling and waste removal. It provides Toronto and the surrounding areas with waste disposal bins for residential, commercial, industrial, and construction needs and then collects them full of any non-contaminated mixed waste, clean fill or asphalt and begins the separation process. Clean Fill is considered to be inert soil, brick, block, or small bits of concrete. Mixed Waste is wood, drywall, metals, plastic, cardboards, renovation waste, and demolition waste. Asphalt cannot be mixed with Clean Fill or Mixed Waste, it should to be placed in a separate bin. Mixing of Clean fill and Mixed waste materials is charged additionally. Restricted bin materials are Asbestos, Flammables, Food Waste, Solid Hazardous Waste, Containers with Liquid Content.



WASTE COLLECTION SERVICES

The size of the bin can be chosen from the company’s website. Then the customer needs to call one day ahead so the bin will be delivered on site on time. The bins are filled by the customers can be used for up to five days before they have to be returned to the garbage dump in Toronto. It is possible that the length of time can be prolonged. Then the customer needs to call so the company can pick up the bin and recycle the waste.

Disposal Bin Dimensions

	3 cubic yards [2.3m ³]	9 x 6 x 1 (L x W x H)		20 cubic yards [15.29m ³]	15 x 8 x 5 (L x W x H)
	5 cubic yards [3.82m ³]	10 x 7 x 2 (L x W x H)		40 cubic yards [30.58m ³]	20 x 8 x 7 (L x W x H)
	8 cubic yards [6.12m ³]	10 x 7 x 32 (L x W x H)	2-in-1 Bin: 14 yrd container 12 x 8 x 4 (L x W x H) with two compartments to accommodate two separate materials in one service.		
	10 cubic yards [7.65m ³]	10 x 7 x 4 (L x W x H)	Sizes for Clean Fill Matter: :3, 5, 8, and 14 cubic yards		
	14 cubic yards [10.7m ³]	12 x 8 x 4 (L x W x H)	Sizes for Mixed Waste: 5, 8, 10, 14, 20 and 40 cubic yards		
Restricted Bin Materials: Asbestos, Flammables, Liquids, Solid Hazardous Waste, Drums, Food Waste					

VAN VLIET CONTRANS

Van Vliet Contrans is a waste management company based in the Netherlands, and one of the ones that work with Grodan to collect and recycle the stone wool growing slabs once they reach their end-of-life.

WASTE MANAGEMENT PROCESS

1. Collection

The company collects used stone wool mats from greenhouse horticulture companies in the southwest of the Netherlands and other horticultural regions of the Netherlands. On an annual basis the company collects 120,000 cubic meters of rock wool mats.

2. Recycling process

The stone wool is first shredded. After this it is left for two months to dehydrate so that excess water gets time to drain and evaporate from the material. The wool is then put into a sieving process that separates the plastic from the rock and any green residue.

The material is sieved until there are three components left, plastic remains, green remains and any other remains left from the growing process, and the rock wool granulate.

3. Repurposing

Once sieved the rock wool granulate is ready to begin its second life in the building industry, where it is made into bricks.

RENEWI

Van Vliet Contrans also participates in a business group, Renewi, which focuses on creating products from waste and encouraging a circular economy between the participating companies. This is done through the network of companies involved with the business, creating a hub of innovation and ideas to establish new methods of reusing and utilising waste streams and waste products.

Through strategy and business models, they look to find all potential ways to work together to utilise waste after the end of life, emphasising innovation and resourcefulness.

Of the 15 million tonnes of waste they handle a year, 90% is either recycled or used for energy recovery.

SUEZ

Suez is an international industrial and service group focused on water and waste management. The group offers different collection and management services.

Its branch in the Netherlands specialises in services in collection and processing of many different kinds of waste. Out of these one of them is mineral wool, which the company collects from Grodan and processes to give back to Rockwool so it can be recycled.

CONSULTING AND CO-WORKING

What distinguishes SUEZ is the importance it gives to adapting the service to each company's individual situation through thorough consulting and coworking services. The organisation offers free advice based on an analysis of the company's waste flow, studying the type of waste, the brands involved and the interaction with the waste. The main goal is to work alongside the company to come up with the best solution so that they don't have to worry about their waste management and can do it with the maximum cost efficiency.

C&D WASTE SORTING

In the case of construction and demolition waste the company puts special effort in sorting the different kinds streams correctly and efficiently so that they can be processed to be given a new life.

During the sorting SUEZ plays an active role in managing the whole deconstruction process in demolition sites and making sure the separation of materials is optimal. For this the company uses a system based on the delivery and collection of different containers (one for each waste stream) from construction and demolition sites.

Although the company emphasizes the need to sort the waste in the construction site it still offers two possibilities:

Off-site sorting

It can also be done after collection if the company doesn't want to do it (due to lack of space, for example)

On-site sorting

The company relies on construction and demolition specialists who can offer extensive advice and guidance services, including some like:

- Advice on the number and the size of the containers used
- Advice on how to integrate the management into the company's activity
- Education and guidance of the operational staff onsite
- Site audits and diagnostics
- Dedicated contact
- Management and coordination
- Controlled logistics and recovery services
- Administrative and regulatory management (hazardous waste)

- Recovery of secondary raw materials
- Training
- Reporting

C&D RECYCLING

The company also puts special effort into giving waste a second life, promoting a circular economy.

The building site debris from the demolition is recycled into mineral materials which are used in the public works sector as backfill and for roadwork. Some of this hazardous waste, such as asbestos, is removed carefully and finally transformed into secondary raw materials such as glass, metal, solvents etc.

With these new raw materials the company manages trade in secondary raw materials in European networks

WASTE TRANSPORT AND PROCESSING

For the processing stage the company counts on many recycling factories in different locations, each specialised in different kinds of waste stream and with specific equipment. Suez takes care of the transport of the waste from the construction sites to the Construction / Demolition installation in Groningen and also the transport of the processed waste to other processors and final processors.

CONCLUSIONS AND RECOMENDATIONS

ROCKWOOL

This company demonstrates the way their clients are offered an opportunity to give back their insulation post consumer use. As many demolition and construction companies often do not know what to do with the material this gives them an alternative without having to do any work themselves. Rockwool does most of the work and deconstruction themselves as well as taking away the old rockwool (and potentially replacing it).

ISOVER

Like rockwool they provide the service for the customers, in which the customer has very little work to do. Isover also provides various services that mean that the waste is managed directly by them, saving the customers from working out the logistics of the waste removal. By recycling the waste on site Isover reduces the transport of the materials which not only reduces costs but also environmental impact of their service.

GRODAN

The company utilises the wool post-consumer use. Their methods demonstrate how the material can benefit other industries and how this technology can be more of an upcycling alternative. Rather than producing something that has less properties and is therefore less effective, the wool can be used to grow food in an efficient and environmentally friendly way. Another good example is how the company provides it's clients with different waste management plants depending on the area so that they will always have a nearby factory where they can take their waste. This makes it easier to recycle the wool and serves as an incentive for companies to take part in the process.

VAN VLIET CONTRANS

The company continues the lifespan of the wool even after they have been used by companies such as Grodan. By using the wool mats for horticulture the properties are changed and therefore not suitable to turn back into wool. However, the wool does have the right properties for briquettes. This could be explored further to see if there are other products that could utilise the same properties. This way new uses could be found for the mineral wool received by Ekopartnerit, maybe in other companies in the Topinpuisto group or in the Turku area. Just like in Renewi, a solution for the mineral wool waste received could be reached in collaboration with other companies, in order to establish a circular economy within this environment.

EU

Funding available through the EU ensure there is a way to fund these methods.

SUEZ

Its strength lies in the importance the company gives to on-site sorting and the facilities and flexibility it offers to companies for this task. Many times companies prefer off-site separation of the construction and demolition waste, due to the lack of space or the extra costs and difficulties.

SUEZ solves this problem by offering extensive support services in order to make this task as easy as possible so that the client companies are encouraged to take part in it. This is done by free advice and management of the waste separation, education of the workforce and personalization of the process to the company's unique situation, all done by specialists. With these solutions Ekopartnerit would have the possibility to solve the mineral wool sorting problems and increase the mineral wool's purity.

KNAUF

It is one of Europe's biggest mineral wool producers. They also concentrate on environmental and sustainability issues and are certified in various quality and environment standards. However, from their website their recycling methods mainly concentrate on the recycling of glass. Information about the reuse of old mineral wool was rare. As Knauf has a subsidiary in Espoo, we would recommend contacting them there directly to find out possibilities of reusing the mineral wool directly in the Finnish area and also sensitize them of the new market of reusing mineral wool not only for financial reasons, but also for promoting a more green image for their company.

TECHNONICOL AND KING

The companies could benefit for the TechnoNICOL established system of recycling mineral wool by using a separate factory for recycling the collected mineral wool.

The KING Company is a great example of creating a whole circular economy system. They provide different sizes of bins for a wide range of wastes for clean and mixed fill that could be rented from the customers for a few days. The customer is responsible for the filling of the waste. When KING receives a call for the pick of, they arrive and take the filled bin and deal with the recycling of the waste.

In conclusion, the possible solutions for managing mineral wool's recycling to prevent it from ending up in landfills can be summarized into two main points:

- Incentives: both for funding the recycling process (EU funding programmes) and for client companies to participate in the circular economy programmes.
- Cooperation: On one hand with other companies that might be able to utilise mineral wool for other innovative uses that don't require a high wool purity. On the other hand, cooperation with mineral wool producing and consuming companies by contacting them and organizing a mineral wool recycling scheme and close the mineral wool's life cycle.

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Olli Väntsi

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07024 98389 - 0

Flumroc – Home (flumroc.ch)

Flumroc – Recycling

Wie aus Wolle Steine werden: Recycling von Steinwolle - Mineralwolle - Der Dämmstoff :
Mineralwolle – Der Dämmstoff

Forum | Nachhaltiges Bauen • Baustoffe • Ökobilanz Steinwolle

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