

ROCKWOOL Ltd application to NRW for recycling permit variation

BACKGROUND

ROCKWOOL Ltd is part of the Danish-headquartered ROCKWOOL Group. Sustainability sits at the heart of what we do – producing materials that help tackle climate change and mitigate its effects in the built environment. Our products are already net carbon negative in that over the lifetime of its use, the insulation ROCKWOOL sold globally in 2021 will save 100 times the carbon emitted in its production.

We also recognise that even companies that are in the energy saving business must do more to help meet the Paris Climate Agreement's goal of keeping the temperature rise well below 2°C. That is why we have committed to the Science Based Target initiative, becoming one of the few energy intensive industries to obtain verification and approval for our decarbonisation goals, which represent a one third reduction in our carbon impact by 2034.

Additionally, the ROCKWOOL Group has set a series of sustainability goals that aim to reduce our footprint, including a major focus on supporting a circular economy. Within this, we have ambitions to increase our recycling volumes and reduce the amount of virgin material going into production. At our Bridgend factory, we have a permit that enables us to recycle new stone wool insulation material produced on site. However, ceiling tiles made by our sister company, Rockfon in Poland, France, Sweden and the Netherlands, sit outside of the scope of our recycling permit.

In order to support our recycling ambitions and reduce waste to landfill, we seek in this application a permit variation that will allow us to take back Rockfon ceiling tiles from a specific project for recycling at our Bridgend factory. We set out below:

- The details of our current recycling permit
- The composition of the stone wool insulation products we currently recycle under our permit
- The composition of the stone wool ceiling tile products for which we are seeking permission to recycle
- A comparative analysis of the emissions impact of recycling stone wool insulation and stone wool ceiling tiles

In the longer term, it is our ambition to achieve a permanent permit variation that enables us to recycle Rockfon ceiling tiles as well as for other materials produced in the ROCKWOOL Group, such as stone wool façade panels made by our sister company Rockpanel.

DETAILS OF OUR CURRENT PERMIT

Following an application submitted on 18th July 2002, ROCKWOOL Ltd was issued with a recycling permit by the Environment Agency Wales (now known as Natural Resources Wales (NRW)) on the 26th March 2004. This permit remains the basis for our current recycling activities, and it details the parameters for the recycling of our customer returns.

The permit includes the following stipulations:

- ROCKWOOL Ltd may recycle waste insulation with the EWC code 17 06 04 (table 2.2).
 - As 17 06 04 is the waste code for all non-hazardous insulation materials, including mineral wool and plastic foam materials, the context of this listing is important.

- The introductory note on page 2 of the permit states:
*“Recycling at the installation:
As indicated above, waste wool and wool off-cuts are recycled within the plant at the installation in Pencoed. Customers are also encouraged to return waste wool to be recycled at the site rather than sending it to landfill.”*
- Table S2.2 on page 17 of the permit defines the permitted waste type that can be accepted as “17 06 04 Insulation materials other than those mentioned in 17 06 01 and 17 06 03 “
 - Taken in isolation, this definition covers most insulation types and does not limit the point of origin.
 - However, when read alongside the narrative from the introductory note, a more reasonable interpretation would be that the permit applies to stone wool waste from products made in Pencoed – competitor material cannot be ‘returned’ to us as it did not originate from us.
- We are not permitted to recycle insulation waste classified as 17 06 01 or 17 06 03 (table S2.2)
- Waste material can only be accepted if it “conforms to the description in the documentation supplied by the producer and holder” (point 2.3.3)
- The maximum quantity of waste that may be stored for recycling at any one time is 250 tonnes (table S2.2)

A written question was sent to NRW at the start of May 2022 to clarify the permit intent, particularly with regards to materials not produced at our Pencoed site as we are keen to expand our recycling offer to products sold in the UK (but manufactured at ROCKWOOL sites outside the UK) by our sister companies, Rockfon, Rockpanel and RTI.

At a meeting held in May 2022, NRW confirmed that the permit allowed us to bring back only ROCKWOOL stone wool waste manufactured in Bridgend for recycling, but indicated an openness to the idea of expanding our recycling offer as it makes sense from a sustainability perspective.

It was agreed that we would apply for a permit variation. The first phase will look at a specific Rockfon project currently underway with a view to potentially seeking a permanent change at a later date. In order to progress this, we were asked to prepare this written submission detailing the impact of accepting Rockfon waste on our emissions (both those currently covered by our permit and any that might newly arise as a consequence) so that NRW could judge the application on a benefit vs impact basis.

To facilitate this, the following sections detail our current recycling activity, product composition and emissions regime as well as details of the potential Rockfon recycling project and detailed chemical analyses of ROCKWOOL and Rockfon samples.

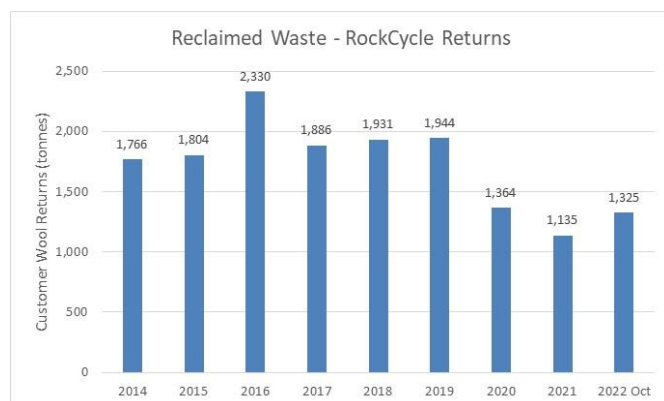
CURRENT RECYCLING ACTIVITY AND ENVIRONMENTAL IMPACT

ROCKWOOL Ltd's current recycling programme, RockCycle, currently accepts off-cut waste from customers of our own stone wool insulation, including insulation products with facings applied by ROCKWOOL Ltd. Returns are only accepted if they are uncontaminated with other materials or chemicals.

In addition, we recycle all wool waste from our manufacturing process in a closed loop system. Customer returned waste stone wool is currently less than 5% of the total wool waste recycled on site.

The following graph sets out the volume of returned stone wool recycled at our Bridgend facility from 2014 onwards:

Table 1



As set out in REACH regulations, stone wool is a name given to man-made vitreous (silicate) fibres with random orientation with alkaline oxide and alkali earth oxide ($\text{Na}_2\text{O}+\text{K}_2\text{O}+\text{CaO}+\text{MgO}+\text{BaO}$) content greater than 18% by weight. The fibres are fulfilling the Nota Q of the Directive 97/69/EEC and the regulation n° 1272/2008 (IV) and are not classified carcinogenic.

ROCKWOOL Ltd's stone wool products are produced to a strictly controlled chemical composition. The material safety data sheet (MSDS) for ROCKWOOL stone wool contains the following information:

Table 2

Substance	EC identification number	REACH registration number	Content (% weight)	Classification, labelling and packaging (EU Regulation (CE) 1272/2008)
Stone wool ¹	926-099-9	01-211-947-2313-44	95-100%	Not classified ²
Synthetic thermosetting polymer binder			0-5%	Not classified
Mineral oil			0-0.5%	Not classified
Silicon oil/emulsion ³			0-0.5%	Not classified

Materials returned by customers are fed through a rod mill to grind them down along with wool waste arising on site. Ground stone wool waste is then mixed with other raw materials and bound with cement to form cement briquettes in a purpose-built briquette plant at the production facility. The composition of the cement briquettes follows one of a number of pre-determined recipes to achieve the end fibre chemistry requirements. The briquettes are one of the raw material inputs into the furnace where they are melted and spun into new stone wool products.

Recycling of ROCKWOOL stone wool will not give rise to different emissions from our usual production process as the chemical composition of returned ROCKWOOL stone wool mirrors the composition of new stone wool produced on site.

Variations can occur when recycling materials with facings i.e. those with a glass tissue or paint coating, but this typically comprises less than 5% of the product by weight. In introducing Rockfon ceiling tiles to our recycling, details of which are set out below, we are confident that we would be able to maintain the same upper limit.

ROCKFON PRODUCTS AND POTENTIAL RECYCLING PROJECT

Rockfon manufacture ceiling tiles with a stone wool core. The size and density of the tiles is variable depending on end use. The binder content is comparable to ROCKWOOL stone wool insulation at around 3-4%. The tiles are typically faced with glass fibre fleece (tissue) and water based dispersion paint. Some products also contain aluminium laminate.

Table 3

Substance	Content (% weight)
Stone wool	>78%
Synthetic thermosetting polymer binder	<5%
Mineral oil	<0.2%
Non-woven glass facing	5-9%
Water based paints (dry)	0-8%

This particular refurbishment project comprises materials from 47 different outlets totalling 14.1 tonnes (assuming all material is returned and none is lost as unrecoverable waste).

Based on the current rates of wool processing carried out on site and using typical production recipes the following proportions can be determined:

- Estimate of total mass of Rockfon waste received – 14t
- Internal wool waste processed – 800t / week
- Proportion of Rockfon waste in wool waste mix – 1.75%
- Proportion of Rockfon waste in briquettes using typical recipe – up to 0.9%
- Proportion of Rockfon waste in raw material mix – up to 0.5%

Based on the assumption that the waste all arrives as one load and is processed in the same week. In reality we would expect the material to come back in several loads, further reducing the proportions.

ANALYSIS

Core material

Stone wool made from volcanic rocks, slag materials from steelmaking, recycled stone wool waste and process wastes are the base materials for both ROCKWOOL insulation and Rockfon ceiling tiles, representing typically 97% of the products produced at our Pencoed plant and more than 78% in Rockfon ceiling tiles.

As shown in the following table, a comparative analysis below of Pencoed produced insulation roll (WER) and Rockfon (RF-EOL) tile produced outside the UK shows slight variation in the oxides, but no significant difference. Similarly, the trace elements have comparable concentrations.

Specifically, some elements such as Zn, Pb, Mo, Cu and Sb have slightly higher concentrations in the RF-EOL material whilst other components – Cr, V and Ni – have lower concentrations than the WER material.

	actual production (WER)	RF-EOL
	FORCE	
Task	122-29488.0001	
Journal	E22-1006	E22-1005
ICP-OES	%	
SiO ₂	39,0	38,0
Al ₂ O ₃	18,0	18,0
TiO ₂	0,8	1,8
Fe ₂ O ₃	6,0	6,2
CaO	19,0	16,0
MgO	8,0	7,3
Na ₂ O	2,5	2,9
K ₂ O	0,4	0,7
P ₂ O ₅	0,2	0,5
SO ₃	0,3	0,1
ICP-MS	ppm	
As	1,2	2,8
Cd	0,035	0,070
Zn	53	320
Pb	3,9	24,0
Cr	400	350
Mo	0,75	2,40
Mn	2800	1400
V	430	210
Cu	36	180
Ni	120	57
Co	140	250
Sb	0,74	2,50
Hg (CVAAS)	<0,02	<0,02

The dedicated elements are those which are mentioned in the BREF note¹ (Best Available Techniques Reference Document), namely As, Co, Ni, Cd, Se, Cr, Sb, Pb, Cu, Mn, V and Sn.

Facing materials

Rockfon ceiling tile facing has a different chemical composition to the core stone wool material, as with ROCKWOOL insulation products that have glass and paint facings.

Recycling process

Rockfon ceiling tiles will be mixed with other stone wool waste during processing. The quantity of stone wool waste processed and recycled on site is significantly higher than the proposed Rockfon returns therefore the total amount of facing material in that mix will always be less than 0.5%. Additionally, while the paint used for facing materials is water-based, any organic content will be combusted when it passes through our afterburner and be emitted as small amounts of CO₂ and water. Trace elements not included in the list are below the detection limit of the ICP (if present at all) and so will not have an impact on emissions.

Dioxins and furans emissions

A scan of historic data from the Group found two reports, one from Toronto and one from the UK. Dioxins and furans were detected in quantities of picograms and nanograms respectively. The UK analysis was carried out prior to the installation of the clean combustion systems which are now in

¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012D0134&from=EN>

“COMMISSION IMPLEMENTING DECISION of 28 February 2012 establishing the best available techniques (BAT) conclusions under Directive 2010/75/EU of the European Parliament and of the Council on industrial emissions for the manufacture of glass”

operation across all 3 lines and will give rise to even lower concentrations of gaseous emissions for metals, chloride, dioxins and furans etc.

An analysis of chloride and fluoride content of Rockfon tiles was commissioned and the following results obtained:

Material	Cl	Fl
Rockfon-EOL	660ppm	320ppm
ROCKWOOL UK	<100ppm	<100ppm

The analysis has shown that the Rockfon-EOL Material has a higher chloride and fluoride content than stone wool produced in the UK, however the levels are still low. We believe this increase is due to differences in the raw material composition of the stone wool core rather than the paint.

Taking into account the consumption rate calculated previously and basing the numbers on Line 3 (worst case), we would expect to see an additional <3ppm HCL and <2ppm HF before abatement. Taking abatement into account, these low numbers would suggest no additional risk of dioxin and furan creation compared to the current situation.

VOCs

Flue gases are processed in afterburners. The following statement was prepared by ROCKWOOL Group colleagues on their efficacy in removing VOCs:

“Afterburners (>850 degrees) are an efficient abatement solution to remove VOCs from the flue gas and are used on both the melting and downstream processes in ROCKWOOL factories across Europe. In the EU-based ROCKWOOL stone wool factories the afterburners are specified to abate the flue gas of VOCs to below concentration-limits stated in the BREF on glass manufacturing. VOC-emissions across the ROCKWOOL group have been monitored over many years and are well below the BREF limit, which underlines that the afterburners are effective at removing VOCs. It is not expected that the melting of Rockfon products will have a significant effect on VOC-emissions from the melting process with the current abatement setup.”

Conclusion

Based on the above products compositions taken together with the relative recycling volumes (see Table 1 and the following section), we believe that there would be no meaningful difference, either from a process or emissions perspective, in recycling via cement briquettes the stone wool produced at WER and the stone wool in Rockfon ceiling tiles produced at other factories within ROCKWOOL Group.

On this basis, we ask that a permit variation be granted that will allow us to take back Rockfon ceiling tiles from a specific project for recycling at our Bridgend factory. Details of the project are set out in the following section.

ROCKFON RECYCLING PROJECT DETAILS

Customer: McDonald's

Product quantities: Takeback product will originate from 47 refurbishment projects around the McDonalds UK estate, totalling 9400m2 broken into four collection lots (maximum quantity estimate):

- 5 x projects totalling 1000m2 of product
- 23 x projects totalling 4600m2 of product

- 13 x projects totalling 2600m2 of product
- 6 x projects totalling 1200m2 of product

Collection process: The takeback products will be collated by Reconomy for delivery to South Wales for processing if this permit variation is approved.

Product details: The takeback product comprises Rockfon ceiling tiles produced in 2013. Below is a sample of the material from the project, date stamped 02/04/13, thereby confirming that the products are comprised of Nota Q fibres.

