

Businessplan 19-4-2022

Green City Netherlands (Race Green City BV)

SPC: Clear Elastomers BV i.o.

Production of products from recycled rubber for buildings and infra.



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1. Introduction

Nothing new under the sun, right?

In ancient Egypt there were already roof gardens and buildings with green facades. Consider, for example, the famous hanging gardens of Babylon from the 7th century BC. Green roofs, however, subsequently fell into obscurity, only to regain attention during the Renaissance period. They only really broke through at the beginning of the 20th century. At that time, the green roofs mainly served as thermal insulation. In the northern countries against the cold and in the southern countries against the heat. The emergence of this type of roof was much more noticeable in the Scandinavian countries and Germany than in the Netherlands and Belgium, where the green roof only penetrated at a later stage and to a lesser extent.

However, this does not alter the fact that there are currently various companies active in the field of green roofs and that the market is growing strongly. A water retention panel has been specially developed for this application by Ceyes BV, Haarlem and its co-founder Johan Godschalk, that is made from recycled rubber from car tires or (sports) fields that have come to the end of their life cycle. In 2020 a first demonstration plant was implemented in Venlo under Ceru B.V. producing water retention panels for the application of water retention on flat roofs. The panels not only insulate the roof on which they are applied, so that substantial energy savings are realized. They also collect rainwater, so that the (municipal) sewers are spared during heavy rainfall. For this reason, Dutch municipalities are increasingly subsidizing the use of such water-retaining roofs and are increasingly prescribed for new construction.

Race Green City B.V. - Clear Elastomers B.V.

Clear Elastomers BV will be founded in May 2022 as a Special Purpose Company of Race Green City B.V. Green City Netherlands was established in January 2021 to make a dream come true by Arvid Prigge to realize the speed up of the greening and cooling of the Netherlands. The company is already "In Formation" and currently last changes are made to the articles of association. The core business of Clear Elastomers BV is the production and distribution of rubber retention panels, tiles or shingles made from recycled rubber granulate from car tires or granulate from synthetic turf pitches. These panels will be used for the construction of green and / or blue-green sloping roofs and green walls, waterbuffering in infrastructure as well as insulation white reflection roofs and sound barriers. Whereas Venlo facilities are producing panels for flat roofs and cow-mats Apeldoorn facilities will produce for sloping and vertical applications and colored panels, tiles and shingles.

Mission, vision en strategy

Mission

Clear Elastomer's mission is to become the market leader in products made from recycled rubber material for water buffering and insulation of roofs and larger surfaces such as parking decks and parking lots.

Vision

Clear Elastomers wants to contribute to the circular economy (sustainability) by stimulating the reuse of car tires and rubber infill of synthetic turf pitches for the construction of green-blue-white-yellow roofs.

It also wants to create a higher added value for customers and society by reducing their energy consumption, preventing flooding and absorbing CO₂, NO_x and SO_x and particulate matter.

Strategy

Clear Elastomers wishes to reach the mission by:

- to produce and sell an adequate water buffer system with low CO2 production and by reusing residual flows of scarce raw materials mainly natural rubbers (latex).
- Continuing to develop circular products and the required special mobile processing units in order to reduce transport costs and related CO2 emissions;
- to develop new products such as green façade, grass through-growth tiles, reflector elements that can contribute to additional water buffering and insulation of buildings and the absorption and or reduction of greenhouse gases and particulate matter.

Circularity

Tire recycling continues to increase. On average 1 tire per car per year is worn, which in the Netherlands leads to 9 million tires per year that are collected by Recybem and then processed with as much reuse as possible. One of the current reuse methods is (still) rubber infill for synthetic turf pitches. Synthetic turf is still gaining popularity as an application for sports fields, but due to discussions about microplastics, the fields will look different in 10 years' time. The lifespan of artificial grass is on average 10 years, after which the mat must be replaced. Until now, the remaining rubber material (rubber infill) that has mainly be used in soccer fields, has merely been dumped in waste deposits or incinerated in waste incinerators. Valuable scarce raw materials are thereby lost, and the environment is burdened. To reuse the used granulate and process it into rubber water retention panels, a special process has been developed and a demo factory has been set up in Venlo to produce water retention panels for application on flat roofs.



A basic efficient factory layout consists of a mobile installation with 4 presses and 1 mixing unit with a processing capacity of 2,160,000 kg of rubber granulate from tire recycling or recycling infill material from synthetic turf pitches This corresponds to around 360.000 tires or 18 football pitches.

The rubber granulate (old tire or rubber infill) is then used for the production of at least 80.000m2 of rubber retention & insulation panels that will be used for the construction of green, blue, white, red, yellow roofs and a combination of colored roofs as well as new applications such as white reflection solar roofs, green noise barriers and water buffering and cooling of paving.

2. Product, technology and applications

The basic material for the production of the panels is obtained from tire recycling and / or the removed rubber infill from synthetic turf pitches. In the Netherlands, 9 million tires are recycled annually, of which the rubber component is an average of 5 kilograms per tire. This means 45,000 tons of rubber on an annual basis of which currently >50% is processed into granulates for soccer fields. In the Netherlands, today more than 2,000 football pitches have been constructed (35,000 pitches worldwide) of which approximately 10% reach the end of their life cycle every year and must be replaced. The granulate (originally from tire recycling) amounts from 120 to 150 tons per field. 200 fields of 120 tons yield 24,000 tons per year of available rubber granulate. Since 1 factory requires some 2,2 tons of rubber this is only 5% of available raw materials from tire recycling and 10% from available rubber infill from sport fields.



Currently discussions are ongoing with municipalities on the dismantling of old soccer fields and the application of the recycled rubber in new sustainable application such as green roofs and watermanagement systems in the same municipality. Based on 120 tons of rubber granulate (average) from a dismantled field and a re-use of 27 kilos of rubber 4,500 m² retention panels can therefore be produced from each field and returned for greening our world in the next 100 years.

Green roof investments range from € 65 per m² to € 270 m². (of which the retention layer € 35). The production costs of the retention panels amount to approximately € 26.50 per m² (60mm) on average at start of the production and will drop to € 21 at full production and repaid loans. The CO₂ footprint to produce Rubber Retention Panels is low, only 12.11 kg per m² and is already "recuperated" in a few years through lower energy costs and CO₂ absorption in our buildings and neighborhood. In addition, 72.50 kg of CO₂ emissions per m² are avoided because the rubber that is processed in the panels would otherwise be burned.

The green roofs and green / blue roofs is a large growth market. This is due to the buffering of rainwater and thus a reduction in water management costs and the insulation of buildings, which reduces energy consumption. Because the roof is no longer exposed to sunlight, the lifespan of the roof doubles. Also the reduction of the Urban Island Heat effect makes an important contribution to the quality of life in the built environment. Finally, the plants on a green roof also absorb CO₂. The economic payback period of such a roof is usually less than 10 years (excluding any subsidies and other government contributions).

The Rubber Retention Panels have a lifespan of more than 100 years. The philosophy of "cradle2cradle" considers that the panels can be recycled again at the end of their lifespan by means of polymerization or UHP water jetting with production of Carbon Black or Rubber Powders for reuse in production of new tires.

Mobile production units for production of panels from recycled rubber

A factory consists of 1 mixing unit and two complete production units with totally 4 presses, each with a production capacity of 20,000 m² of panels per year working 24/5 and 100.000m² in 24/7. The line can also be placed in containers so that you do not need a separate production hall and the units can be reallocated within 1 week if required. A polymer binder (around 8%) and rubber granulate are mixed and then processed in the 4 molds in the press and thermofolding unit with the correct pressure to form specially designed rubber panels. The panels are cold pressed, so not much energy is needed to produce the panels. A pressing takes around 8 minutes and the insertion of the rubbermix in the molds and the extraction from the molds takes around 4 minutes.



Systems

The rubber water retention panel was initially developed for flat roofs by Ceyes B.V.. In Clear Elastomers the vertical and sloping systems will be applied. However it may also produce other products such as green-grass-garden tiles for parking places, playground tiles, signaling tiles and newly currently in development panels such as the nox barrier and the white reflection panel and rubber roof shingles.

Applications

The rubber retention panels can be used in a wide variety of applications varying green, green blue and combined with solar (yellow roofs). Some municipalities even provide contributions of € 25 to € 30 per m² or up to 50% of the investment costs of greenroofs because of the lower investment costs that they have to carry out themselves in water management systems to process the water coming from buildings in the event of heavy rainfall.



A Blue Roof has the primary function of having a significant effect on water management. A green roof is mainly focused on the function of roof vegetation and not on the effects on water management. Functions of roof vegetation are mainly to improve biodiversity, aesthetic value, and insulation / cooling.

A Green-Blue roof combines the functions of a green and a blue roof and therefore has the function of roof vegetation and has the function of influencing water management. This is made possible by creating ample water storage in the drainage layer in addition to a substrate layer. The

scientific report "Green roofs considered in more detail" by Rioned describes the functional requirements of green-blue roofs from a water management perspective.

Some examples:



Sloping roofs



buffer green parking lots



Rooftop Soccer with water retention



Water retention and creation of parking roofs (possibly with combining with solar)



In cooperation with Leadax and Wienerberger AG group a panel is being developed for application as reflector roof in combination with solar energy panels as well as rubber shingles applied in different colors

Current global problems and how Green-Blue roofs with rubber retention panels offer a solution:

Raw material recovery and waste reduction

Processing old tires and synthetic turf pitches remains a worldwide problem. Only 20% is recycled and 30% downcycled for electricity production. The rest are still being dumped or burned illegally. Upcycling of Rubber Infill from synthetic turf pitches to composite Rubber Retention Panels offers an economical, sustainable and circular solution.

Reduction Urban Island Heat

Urban Island Heat is a big problem in cities. The temperature in city centers is 2 to 5 degrees higher than in suburbs and parks. Buffering water on the roofs lowers the Island Heat by 1 to 3 degrees and thus improves the living environment and reduces energy consumption and the associated CO2 emissions.

Reduction sewage and water management problems

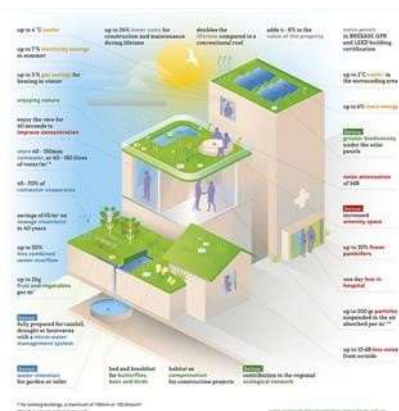
The global warming and climate change cause flooding. The specially designed retention panels store at least 25 liters per m2 and thus regulate the discharge to the sewage and drainage system. In addition, when using a green roof, they provide evaporation to the plants. Major infrastructural municipal investments in water management of about € 10 - € 15 p.p. p.y. can be prevented by this.

Roof protection, energy savings and indoor-climate improvement

The retention panels protect the original roof, doubling the lifespan from 25 to 50 years. Furthermore, the panels insulate the roof, so that the energy consumption in winter for heating and in summer for cooling is significantly reduced. It also improves health and indoor comfort.

Bringing back nature in cities

Green roofs create alternative living spaces for flora and fauna. As biotopes, they form vibrant exciting places in sterile cities. Birds, bees, butterflies, caterpillars find food and protection here.



Subsidies Green Roofs in the Netherlands

Many Dutch municipalities subsidize green roofs and / or facades to stimulate their application in their municipality.

This are municipalities such as: Alphen aan den Rijn, Almelo, Amsterdam, Amstelveen, Apeldoorn, Breda, Capelle aan den IJssel, The Hague, Eindhoven, Groningen, Hengelo, Den Bosch, Hoorn, Leeuwarden, Leiden, Leidschendam-Voorburg, Nijmegen, Nieuwegein, Rotterdam, Smallingerland, Soest, Tilburg, Utrecht, Zoeterwoude, Zwijndrecht.

Amsterdam

Subsidy for green roofs and facades. The subsidy amount is a maximum of 50% of the eligible costs, with a maximum of € 30 per square meter of green roof or façade and a maximum total amount per subsidy application of € 100,000.

If the water storage capacity of a green roof is demonstrably greater than 30 liters per square meter, the maximum contribution is € 50 per m². If the green facade is a construction with plants that are not ground-bound, but in a substrate, the maximum contribution is € 50 per m².

Utrecht

The subsidy for a green roof is € 30 per m², but no more than 50% of the costs incurred, with a maximum of € 20,000. This amount includes the costs of a construction advice (max. € 250). The lower limit for an application is a roof area of 20 m². The roof of a shed or garage can be included in the application for the roof of a house if it complies with the lower limit.

Future research & development

For the benefit of the market, with the currently defined product, both the extensive roofs with the 30 mm retention panels (sedum roofs) and the intensive roofs with the 45 mm panel (shrubs and low vegetation) as well as garden parks with the 60 mm panel can be installed. However, there are many more opportunities that CE wants to capitalize on. That is why we are working on the further development of the product pallet.

1. Post development of the current product.
 - Reduction use of binding agent from 9 % to 7 % and use of biobased binding agent
 - Devulcanisation of rubber granulates for production without binding agent
 - Increase of production volumes: Reduction of cycle time, increase measurements, lighter.
2. Development and testing of new recycled rubber products:
 - New retention models for application on sloping roofs and vertical applications
 - Grass panels for water management on parking lots and children playground
 - White reflector panels for cooling the roof and colored rubber roof shingles.
 - High noise absorbing sound barriers with greening.
 - New concept for upper layers and drainage layers in sport complexes
 - Development of water management systems on parking garages and roofs

In the approved grant in Euract EU 36.000 m² in the triangle Deventer-Apeldoorn-Zutphen will have to be realized between 1-4-2021 and 30-9-2023 with smart roll out to 1.000.000m² of green projects in 2026.

3. The market

The potential of green and blue / green roofs is enormous. Rotterdam, for example, has the most flat-roofs in the Netherlands. This is partly a result of the reconstruction after the bombing on May 14, 1940. 14.5 million m² of flat roof, of which 1 km² in the center, is eagerly awaiting completion.

Currently only 220,000 m² of this has been filled.

If Clear Elastomers were to provide all Rotterdam roofs with rubber panels, the factory would have to produce continuously for 178 years (!). This sketches the market potential for such systems. The Dutch roof area for greening is 675 million m².

The factory processes recycled rubber (rubber granulate) into rubber panels, which will mainly be used for Green and Green / blue roofs and watermanagement in infra. There are thus two markets in which CE will operate: the market in which the basic raw material will be obtained and the market in which the final product will be sold.

First of all, this chapter charts the raw material market. We also look at the market for rubber granulate, (mainly) from synthetic turf sports fields. We then describe the sales market (s) and the competition for the rubber panels from other solutions for Green Roofs.

De market for rubber granulate

The basic raw material for rubber panels is rubber granulate. Rubber granulate consists of small crushed pieces of rubber that have been recovered via recycling from used rubber such as artificial sports fields or old car tires.

Rubber is mainly used to produce car tires. On an annual basis, this leads to 13.5 million tons of end-of-life rubber in Europe. However, only 15% of passenger car tires are recycled into new products. This% is even lower for large tires. RecyBem collects some 9 million tires in the Netherlands of > 50% ends up as rubber infill in soccer fields. While rubber infill is phased out in the next 10 years new sustainable products are required to fill the gap.

Any form of rubber recycling is needed if we do not want to exhaust our basic raw material latex. Also SBR (Styrol Butadiene Rubber, synthetic rubber), which is now produced from petroleum, will soon be at the end of its resources. Alternatives are being investigated, but no material is as flexible and durable as natural rubber (latex).

Production of recycled rubber granulate in value-added low carbon emission products contributes to a sustainable circular world.

A large part of the rubber granulate (>50%) from the recycling of car tires in the Netherlands is currently used as rubber infill in synthetic turf pitches. In football fields in particular, a mixture of 120 tons of sand and 150 tons of rubber granulate is used between the plastic fibers.

Currently, more than 35,000 synthetic turf pitches have been installed worldwide and 2000 in the Netherlands, of which about 10% annually reach the end of their lifespan. Based on 200 fields to be recycled, 75% of which with rubber infill, this means that more than 18,000 tons of rubber granulate are released annually. Of this alone, more than 670,000 m² of retention panels could be produced.



CE is in negotiation with various potential suppliers, such as GBN AGR, Re-Match, CarlRennen.

Disposal method	EU < 1.4 meters		US < 1.4 meters	
	Tyres disposed (tonnes)	Percentage	Tyres disposed (tonnes)	Percentage
Energy recovery	563,690	22.4%	1,035,000	40.9%
Landfilling/stockpiling	775,300	30.8%	567,000	22.4%
Rubber recycling	395,287	15.7%	369,000	14.6%
Used tyre export	189,509	7.5%	135,000	5.3%
Civil engineering	200,607	8.0%	360,000	14.2%
Miscellaneous	394,013	15.6%	63,000	2.5%
Total	2,518,406	-	2,529,000	-

Note: these figures do not include retreaded tyres

CE will initially obtain its rubber granulate from collectors and processors of synthetic turf pitches such as GBN AGR Amsterdam (www.GBN.nl) and Rematch Denmark (www.re-match.dk). GBN part of Antea group in its Amsterdam plant has 16.000ton of wasted rubber granulates available on a yearly basis which is enough input material for 6 plants producing 100.000m2 of water retention panels per year. If necessary, also "virgin" granulate from the recycling of old tires can be used. The supply of the basic materials required for CE is therefore enormous and more than sufficient for its production needs. Johan Godschalk, one of the initiating shareholders of Clear Elastomers B.V. has developed the "Circular League" program for municipalities to dismantle their soccer fields and securing local recycling by GBN, Re-Match or Carlrennen with a return of the recycled products as circular products in the same municipality through local production of products that can be re-used for at least another 100 years.

The market for rubber retention panels: Green and blue roofs

In Europa Germany is the uncrowned leader with > 100 million m2 constructed green roof, or approximately 10% of the available roof quota. Followed by the UK with 3.7 million m2 of roof installed and the Netherlands with 4 million m2. The current size of newly constructed roofs is approximately 8 million m2 per year in Germany, 400,000 m2 in England and 300,000 m2 in the Netherlands. Denmark, Switzerland and Austria are also building many green roofs. Countries such as Italy, Poland, Spain and all of Central Europe have also recently embraced the phenomenon of green roof and green facade. In 2020, more than 600,000 m2 of green roofs were built in the Netherlands under the influence of economic conditions and lockdowns and incentives for green roofs of municipalities. Due to the loud call to accelerate greening in the Netherlands, a significant increase in the number of m2 of green space is expected in the coming years.

The European Federation of Green Roof Associations has collected data on green roofs in Europe.

According to their 2015 report, there was a green roof area of 86 million square meters in Germany in 2014. This number is growing by 8 million square meters per year. Germany has the largest share of green roofs in Europe. Sales were approximately 250 million. In 9 western European countries, the market is estimated at approximately 13 million m2 with € 433 million turnover and for all countries in the European Union at 15 million m2 and € 500 million turnover.

Country	green roof total m2 (2014)	green roof new year m2	ratio extensive	ratio intensive	yearly €	cost per m2
Germany	86.000.000	8.000.000	85%	15%	254.000.000	32
Switzerland		1.800.000	95%	5%	51.300.000	29
France		1.000.000			35.000.000	35
Austria	4.500.000	500.000	73%	27%	27.350.000	55
Scandinavia		600.000	85%	15%	16.050.000	27
Netherlands		300.000	83%	17%	12.000.000	40
UK	3.700.000	250.000	80%	20%	28.000.000	112
Hungary	1.250.000	100.000	35%	65%	5.662.500	57
Belgium		100.000			3.500.000	35
Totaal		12.650.000			432.862.500	34
CE Demo plant	Market Area		4.900.000		160.000.000	33

Market size in immediate vicinity of Apeldoorn

Although a factory such as that of Clear Elastomers can in principle cover an area of 800 km (Leed), CE maintains an area of 150 km around Apeldoorn and on sloping and vertical application (no competition clause with Clear elastomers Venlo) as its working area in its business plan. The factory with 80,000 m2 to 100.000m2 production per year will then serve only 1.6% of the quota of green roofs that is currently being built in its working area per year.

As reported in the Netherlands in 2020 under the influence of the lockdowns, almost 600,000 m2 was constructed, with 70,000 m2 under the Interpolis program "from gray to green" in the private greening of houses and garages. In 2021, Interpolis has started a program for greening industrial real estate with business partner Joosten Kunststoffen. Under RACE foundation (also co-founded by Johan and Arvid), RACE has entered a cooperation with Social Financing, which will start in 2021 with the greening of schools, hospitals, sports facilities and social housing for housing corporations.



With a working area of only 150 km from Apeldoorn, Clear Elastomers will be able to serve the whole of the Netherlands and a large part of West Germany. According to the European Federation of Green Roofs Organizations, 4,900,000 m² of green roofs are being built in this area on an annual basis with a market volume of € 160 million (of which 80% in Germany).

For example, German authorities require that “when greenery is withdrawn from nature for the realization of residential and non-residential construction and industrial projects” a certain percentage of the roofs must be covered with a green roof. The surrendered nature is then returned to a higher level (the roof).

In the Netherlands, Amsterdam is the first city to consider requiring 30% green roofs on new buildings. Subsidies are already given in more than 32 municipalities in the Netherlands. In Belgium, the number is much higher. The municipalities in the Netherlands include: Amsterdam, Apeldoorn, Almelo, Delft, The Hague, Groningen, Leeuwarden, Leiden, Harderwijk, Nijmegen, Rotterdam and Utrecht. Subsidies vary from € 15 to € 30 per m².

Some projects to be delivered in 2022



Swimming pool and hockeyclub house



soundwall 'T gasthoes



Castle and parking lots Huize Ter Horst (Limburg)

The competition

The Green Roofs market is developing rapidly. There is a lot of competition, especially in the lowcost segment of approximately € 27.50 per m². This segment is characterized by “cowboys” who want to make money quickly and cheaply without any knowledge of the facts. No retention panels are used here, but sometimes cheap plastic egg cups material that is intended to prevent the substrate from leaching to some extent. These cheap solutions are only found in the Netherlands and are hazardous for leaking toxics and small plastic pieces into our environment. In other countries such as Germany, Switzerland, etc., people consciously opt for quality, knowledge and sustainability. Due to the economic growth in Europe, the increasing knowledge and experience of the market with the requirements that Green and Green-blue roofs place on materials used and the bad reviews these “cowboys” receive in newspapers, there is a clear shift towards quality products and the engaging professional green roof specialists with professional water management and long lifetime products.

For the innovative, durable rubber retention panel from CE, the competition for the time being can be found in the plastic and foam products that are currently often used in the construction of intensive green roofs. However, these foils and mats have a relatively limited lifespan, which necessitates a costly redesign / redevelopment of the Green roof after a few years. In addition, they have no or insufficient water-storing properties and with different types of foils and mats it is necessary to apply extra weighting materials, because otherwise the Green roof could blow away during a storm (which is not necessary with the CE rubber retention panels due to their weight). . Plastics also cause high CO₂ emissions and high MKI (Environmental Cost) during production and especially governmental customers nowadays must apply materials with lowest MKI. Another important environmental aspect is the fact that the foils and mats are often made up of polymers with all kinds of harmful additives. These are washed out over time and end up in our environment and water. Now a lot of research is being done into “how green our roof actually is” and that is why there is increasing opposition to the use of plastic and foam materials.

In Appendix 4, we provide an overview of the most important suppliers of plastic and foam product systems for green roofs.

In flat roofs mainly Diadrain and Nophadrain. Diadrain is produced by Diadem and sold by Joosten Kunststoffen. Until 2021 these products were some 15 to 40% cheaper but due to price increases in 2022 prices range from € 24 to € 35 per m² (price list € 43 m² 2020) (CE panel € 29.60) but will only last 30 years and the owner of Joosten Kunststoffen is looking for low co₂ products for the same price instead of the diadrain like the ce green city panel for flat roofs. In sloping roofs a German Company Atka has introduced a drainage products which is prices at € 50 per m². . A “Heavy Duty Panel” of rubber or cable sheets is under development with Joosten that will be extremely suitable for the construction of parking roofs and places, resilient roads and erosion projects. These can be made at Clear Elastomers with the same equipment.

The advantages of rubber panels

The rubber retention panel will be a clearly premium product compared to its plastic competitors, the price of which will be somewhat higher than the plastic drainage products that are now often used in the market. The main advantages of the rubber panels compared to the competition are:

1. Retain 20 liters of water and drain this in 24 hours slowly to the sewage systems mitigating around 70% of the water run off and preventing waterfloods and damages;
2. Multiple applications of the panels in time. Can be used primarily as water management solution and later as greenroof or as walking path or water management in infra.
3. Multiple re-use and recycle. After 50 years of use in greenroofs the product can be cleaned and re-used again for another 50 years. Worst case the product can be recycled after 100 or even 150 years into again 100% of input for new products. No loss of virgin materials.
4. The rubber adds additional insulating qualities (energy saving for the underlying building), the roof covering protective effect and the lack of maintenance and replacement costs of the panels themselves, a CE Green City panel quickly pays for itself as an investment; The use of a green roof extends the life of the roof by at least 30 years, which already recoups the investment costs on the replacement facility.
5. The panels keep their value and can be sold after use to other customers or within the community. Also A trade-in program is available to secure re-use in other projects..
6. Last but not least: the Rubber Retention Panels contribute directly to a circular economy (the raw material rubber can be reused indefinitely via these panels), it is a sustainable natural product and the use leads to an enormous reduction in CO₂ emissions (see chapter Sustainability and employment aspects). Industries will have to report their CO₂ footprint and reduction in the annual financial reports and pay for the extra CO₂ they emit.

Disadvantages Rubber Retention Panels

One of the advantages of the Rubber Retention Panels (their weight) can in some cases become a "disadvantage". The weight of the 60mm panel is 29kg. The weight of a plastic diadrain plate is only 4.8 kg. This can be a problem for houses built between 1970 and 2000. These often have a limited roof load due to cutbacks in construction at the time. All houses and other buildings are now fitted with roofs that can bear at least 200 kg per m² load (also necessary for solar panels) and an extra weight of 23 kg is therefore no problem. Solar panels can even be mounted on top of the panels, making drilling and fixing in the roof (with leakage) unnecessary and it is known that solar panels on a water or green roof have much more energy yield.

4. Market-strategy Rubber Retention Panels

CE markstrategy

For the sales and distribution of the products from recycled rubber Clear Elastomers can use the same channels as Ceru BV (Johan Godschalk demoplant that is sold to large recycling company) in Venlo such as Joosten Kunststoffen, Diadem, Griffioen, Donkergroen, Patina, Oranjedak, maatschappelijk financieren, Interpolis etc.

Aavid Prigge as partner of Clear Elastomers has organized between 1-10-2021 and 31-3-2022 projects such as St Maartenskliniek in Nijmegen, Sportaccomodations with Accres and Rooftop and new roofing on 500 social houses per year with ZoWonen. See also the list of projects.

Erick Rutten as co-shareholder and seller and installer of green roofs has booked 9,932.m2 of projects still to be delivered in 2022 as well as 12.756m2 in negotiation. Large projects are foreseen such as Enexis that will start to green the electricity transformer houses this year and plans to green all transformer houses in the next year of in total 62.500m2. Also in the program "from grey to green" from Interpolis first industrial projects of 4.170m2 are planned

In Euract EU SUPR grant program already 36.000m2 of demo projects have been approved for implementation in the timeframe of 1-4-2022 till 30-9-2023 offering visibility and booked orders at the price of € 30 per m2. Projects are foreseen in the province of Gelderland which will give a high exposure in the market especially offering social real estate organizations an example how to transform all their f-category energy houses to the lawful required B category

Beside Op Oost grant also a cooperation was signed on March 9, 2021 with "Maatschappelijk Financieren" which currently already resulted in a portfolio of > 20.000m2 in 2022/2024. MF organizes the funding of schools, hospitals, healthcare institutions, municipal centres, sport accommodations etc (semi-governmental market).

In the Netherlands, in the context of the greening and cooling of the Netherlands, governments are currently strongly focusing on "green in the cities" that also solve the water problem. The Race organisation is analysing with different municipalities the real estate portfolio to establish the transition from social real estate (as an example) to industrial real estate. In most cases it turns out that the Total Cost of Circular ownership is lower than based on "out of the pocket costs".

In order to further accelerate the market penetration of Green, Blue-Green and Blue roofs, efforts are being made, among other things, at information meetings for municipalities, housing associations and project developers and participation in construction fairs in Germany and the Netherlands to further promote the product and a new website and marketing material is now available. (videos). Unfortunately, many activities are currently postponed or difficult to organize by C19.

Under the influence of RoofUpdate, sales partner Joosten Kunststoffen has concluded a covenant with Interpolis for greening with a premium discount on the insurance. Currently, this company has 84 million damage annually from hail and thunderstorms on 8,000,000 m2 insured roof size. The green roof potential within this program is 50,000 to 200,000 m2 per year.

Conclusion on direct market demand from affiliated companies

In 2022/2023 CE currently has approximately 36,000 m² of green roofs in portfolio to be installed in intensive roofs and roof gardens, whereby the rubber panels are applied under the Euract Eu subsidy program as well as 20.000m² in the cooperation agreement with Maatschappelijk Financierien and at least 25.000m² from Joost/Joru combination. In 2022 CE expects to produce and sell at least 45,000 m² (breakeven), but by the end of 2023 wants to be at the level of 80,000 m² production per year.

Additional Applications

Beside the application of the panels on sloping Green and (Green) blue roofs and vertical walls, there are numerous additional applications that can be produced with the same production resources and machines that CE will soon have at its disposal. This not only increases the turnover potential, but also offers opportunities to enter other markets if the turnover development for application in green and (green) blue roofs are slower than expected. Some examples are given in Appendix 5.

Flexibility to market demand

The equipment's can be re-allocated in less than 1 week. The demo factory in Venlo for panels for flat roofs produced in a testrun during several months already 15 panels per hour with a top of 20 and a low of 12. Therefor a plant with 4 presses can produce annually 80,000 m² to a maximum of 120,000 m² of retention panels. Development in 120*120 molds as well as lighter weight products will enhance the reduction in cycle times as well as 40% more output increasing te production capacity up to 200.000m². A production facility with 4 presses will at that time have a turnover of minimum € 2,5 million and a net income after taxes of > 10% up to € 5 million and a net income of 15%. If demand develops as expected by CE, it will expand its production capacity as soon as possible in Apeldoorn with multiple production lines or in multiple locations.

This is also in line with the application that Race Green City BV made for the smart-roll-out of the greening of the Netherlands which includes 2 factories for rubber products from recycled rubber to be applied on sloping roofs (1 factory) and water management in infrastructural projects (another factory). Also 3 recycling plants for plastic folies (LDPE, PP, PS) are scheduled for investment in Apeldoorn as well as a factory for innovative new building and insulation materials.

Intercompany benefits

Clear Elastomers BV will benefit from the program that will be launched on 17 may 2022 by Green City.

Green City Netherlands (Race Green City BV) has developed a program that enables them to issue Climate Credits. These are Co2 Credits which also take into account the reduction of water management by water retention in green and blue roofs, the improvement of the livelihood and biodiversity, and the mitigation of the cooling burden that will come in the course of the next 20 to 50 years due to climate changes.

This program ensures the installment of green, blue and other type of roofs and projects with recycled and or bio products that can be recycled several times before going to pyrolysis installations for energy generation.

Green City Netherlands through the Green City Fund will also issue Climate Credits on the co2 emission reduction that are realized by the re-use of wasted rubber reaching 62.848 tons in 15 years.

5. Organisational & legal structure

The start

All investments in factories will be made in the newco : Clear Elastomers B.V.

This company will be established by Race Green City B.V. , kvk 81560672 established at De Zanden 47A, 7395 PA Teuge as a daughter company. The articles of association are currently under review at Gietema Notary at Apeldoorn.

In September 2021 under Euract Eu a subsidy was granted for the investment of a rubber reproduction factory as well as 2 other factories by subsidy partners Takkenkamp group and Clear polymers B.V.

The subsidy amount for the production plant of Race Green City BV (Clear Elastomers BV) will amount € 550.002 (€ 495.002 after deduction of intermediate costs). The investment amount is € 1.197.500 for the equipment and € 47.105 for installation and commissioning.

Race Green City BV furthermore will receive € 959.105 as a contribution to the implementation of 36.000 m2 green roofs with circular products and project management of the subsidy program.

Organisational structure & shareholders

Race Green City B.V. will have 1 shareholder being Race Green City BV for 100% while RGC has 3 shareholders;

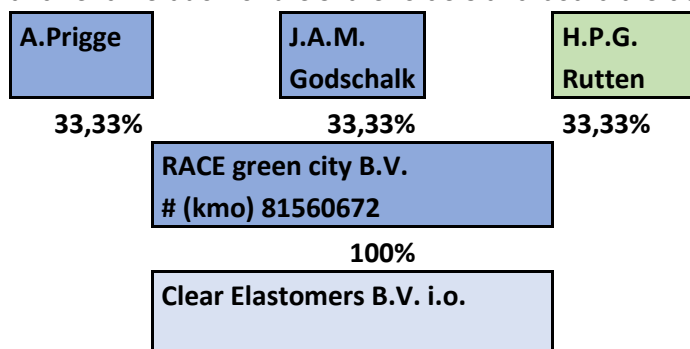
Erick Rutten (33,3%)

Arvid Prigge (33,3%)

Johan Godschalk (33,3%)

The final structure of Race Green City BV as well as Clear Elastomers BV depends on the financial structuring of both companies in the coming months. The first objective for establishing Race Green City BV was to secure the subsidy application which may cover a large part of the investment amount and thus lower the lending base substantially discussions with co-investors / co-shareholders with value added to the market have just started.

Due to health issues of Erick Rutten he will not be involved in the day to day operations of Race Green City BV nor Clear Elastomers BV. In a shareholders and management agreement the roles and remuneration of the shareholders and board are defined.



Management

During the start-up phase, the management of the company consists of 2 persons, who, through their knowledge of the technology and the market, will provide CE with the necessary knowledge, contacts and experience to be able to scale up quickly.

During the start-up phase (1-4-2022 to 1-1-2023) of CE, the management looks as follows:

- a) technical management (interim) Johan Godschalk
- b) financial management Johan Godschalk
- c) Business development , sales & marketing , Arvid Prigge

Functions a) and b) will take parttime (12 hours) in the initial phase (9 months) but in the course of Q4 2022 the technical tasks will be transferred to a local Plant Manager during preparation of installation and after the factory is fully operational. The salaries are based on standard remuneration of similar positions in middle large companies. No bonuses, dividends or license fees may be paid until the time that equity after such payments remains at a minimum of 40%. Under Euract EU € 224.600 in management and € 84.334 in project management will be subsidized for 60% and WBSO income tax reduction will be applied for the development of the new products and processes.

The production planner– Plant Manager

A production planner will be hired in the course of 2022. Due to the co-application and cooperation in Euract EU SUPR grant program with Clear Polymers the current plant manager of Clear polymer can be in charge during the implementation of the several plants. Until his span of control is reached a dedicated plant manager will be hired for Clear Elastomers group of companies/plants. His/her task consists of:

- management of the panel production in accordance with planning, cost and quality goals;
- management of maintenance of all installations, equipment and buildings;
- maintain maximum production time through optimal maintenance and production planning;
- coordination, control and improvement of production, planning, maintenance and quality;
- management and planning of (production) personnel.
- timely production in accordance with production schedule;
- product quality standards, control and improvement;
- correct settings and operation of machines and equipment;
- maintaining proper safety standards, working conditions and environmental standards within the production and maintenance department;
- planning and performing audits, checks and calibration according to rules and regulations;
- general maintenance, planning, organization, costs, purchase and storage of parts;
- planning of production-related purchases and efficient procurement of spare parts;
- stock planning (product and spare parts), regular inventories;
- intake and registration of deliveries and labeling, loading and registration of outgoing products;
- education and training program for employees and personnel;
- maintaining a high level of attention to safety and quality arrangements with the workers and mechanics;
- reporting of production and maintenance according to reporting standards;
- identifying and collecting opportunities for improvement and submitting proposals for improvement to the entire CE management;
- is responsible for and, if necessary, assists with production and maintenance;
- reports to CE management;
- make decisions according to delegated responsibilities.

Research & Development

Research & Development (product improvement and development) will be an important part of the tasks and activities of Johan. An Application under WBSO will be made for the development activities as well as for the development of new products under programs that come available each year under Dutch Governmental and provincial grant programs.

Background of the management team

Arvid Prigge. (www.linkedin.com/in/arvidprigge/)

Arvid is owner of Centre4Moods and "the Vergaderfabriek" in Teuge. He is involved in the marketing of RVO and several municipalities in relation to our future world. His 3D printed meeting facility was the first commercial used facility worldwide. Arvid has a background in facility management in municipalities and police.

Arvid is responsible for business development and dissemination of information and his network in the region of Gelderland offers big advantages in development of the market in the close range of the factory.

Johan Godschalk. (www.linkedin.com/in/johan-godschalk-25b5535a/)

Johan Godschalk 66 years old has an economic and business background. He started as a bank manager at Rabobank International. Then worked for 20 years as Financial Controller, Risk, Credit and Insurance Manager at Ericsson, Arcelor Mittal and New Skies. In 2002 he started his own companies in "waste management" and "renewable energy" under the name Synbioses Group and sold 1 of his companies (Ageratec AB, production of biofuel plants), in 2008 to Alfa Laval. Since 2012, Johan has been involved in the development of UHP water jetting technology for recycling OTR and large mining tires and tracks since 2017 with his company Rubber Upcycling BV. This company also was co-owner 33,3% of Ceru BV in Venlo which company is sold to Granuband Amsterdam. This company is producing water retention panels from recycled rubber for the construction of green roofs on flat roofs under license of Ceyes BV of which Johan is also founder. A company active in developing upcycling technologies from rubber.

Plant Manager:

A former plant manager of Salvadori pressing equipment's has been found available to start up the factory in Gelderland. The factory in Gelderland will be built to the example of the demo plant in Venlo however with improved technology and operations. Although Johan Godschalk is experienced and will perform commissioning and installation the knowledge of an experienced manager knowing the latest progress in technology is required. The injection molding plant has a TRL of 9 (SGS).

6. The Clear Elastomers recyclingfabriek

Clear Elastomers is built on the experience of the first demonstrated application to produce Rubber Retention Panels from recycled rubber in the Netherlands in Venlo.

The factory is set up with machines from recycling equipment specialists MTB from France and Salvadori from Italy. They have co-developed the special design and production technology based on the design of Rubber Upcycling (Johan Godschalk) and will be involved in the development of the special products by Green City Netherlands that will own the IP on these products.

Race green city B.V. needs to organize the production of at least 36.000m² in the Euract EU subsidy program, 20.000m² in cooperation with Maatschappelijk Financiering and some special projects before 30-9-2023 with the aim of 1.000.000m² greening in 2026.

Clear elastomers will therefore have to build at least 2 plants with 2 double presses for the slope roofs and vertical roofs and water management systems in Apeldoorn with a capacity of

100.000m² per year. The model of small-scale production units is preferred for its flexibility, replacement and for maintenance and disturbance reasons.

The production is foreseen in a location of 5.000m² with 6mw of power supply available in Apeldoorn Kaysersdijk but 2 more locations are under review. Location needs to offer the possibility to rent a limited required space and extend when required, but also combine several plants in one space with only 1 plant and production planner. The idea is to combine Clear Elastomers production of rubber products with Clear Polymers production of granulates from wasted agricultural or car foils. Polymer Group is a partner in Euract Subsidy Program.

Required equipment and capacity

A profitable production factory is based on 2 double processing unit, being 4 presses, and 1 mixer which can produce at least 80,000 m² of Rubber Retention Panels on an annual basis 24/7 and when finetuned some 120.000m² and after further development up to 200.000m².

The investment in the 2 pressing units and 1 mixing unit amounts to € 1.197.500 turnkey (without the box system). Transport, installation and connection costs € 47,000. Due to current price hikes prices for some parts might be influenced during q2 2022. In addition, the investments in cabling amount € 60,000 and the other investments amounts to approximately € 100,000. (forklift truck, environmental containers, tooling and spareparts etc.).

Working capital (inventories and stocks mostly) will account for some € 300.000 at start and decrease to maximum € 200.000 when operational in steady mode.

The factory is multi applicable which includes the possibility to produce other rubber products whenever this would be economically more profitable such as the production of playground tiles, stable mats, sporting mats etc.

The processing units will be built by Salvadori.

The normal delivery time for these processing units is 4 to 5 months. However, shortages in the current market might influence delivery times of especially software parts. A factory will be fully operational (plug & run) within 1 week if electricity is available.

Ingenia Consultants & Engineers BV performed a due diligence on the Technology Readiness Level (TRL) of the complete production line purchased. Ingenia's conclusion is that production line is TRL 9, that is, a technology that is technically and commercially ready for use.

Because the entire production unit can be disassembled and transported within 1 week, there is a clear market value of the production line, so that the equipment - if it should be sold on the market - retains a good residual value.

Because the production units are modular, the capacity can be quickly expanded with increasing demand or expanded elsewhere in the Netherlands. In the Netherlands there is expected to be a capacity requirement for 3 to 5 units that can produce a total of 500,000 m².

Construction and operational time

The plant's construction time is 4 to 5 months, while installation and commission will only take 1 week.

To operate profitably production will have to be performed in at least 2 shifts. The output test in the demo plant in Venlo reached average 15 panels (12 budgeted) but without interruptions 20 panels per hour can be produced. In 16 hours per day production and 12 panels for 225 days (45 weeks of 5 days) the break even of 43,200 Rubber Retention Panels is already reached.

De sub contractors and suppliers of main equipments

Salvadori

Salvadori is a family business founded in 1983 by Giorgio, Anna and their sons Paolo, Igor and Samuel.

Since 1990, Salvadori srl has been one of the world leaders in the molding (both hot and cold process) of rubber dust and granules from recycled tires, enabling them to be converted into technical items.

The areas that Salvadori focuses on regarding recycled rubber products and rubber are: urban design, street design, playground equipment, indoor and outdoor flooring, plant culture, construction industry, transportation infrastructure, port infrastructure, sports systems, industrial products, agriculture, civil engineering. In June 2017 Salvadori was bought by the American company TRC USA, a company active worldwide in the field of (machines for) rubber recycling.. (www.salvadori.com/en/recycling/)

Permits and environmental category

No special permits such as an environmental permit are required for the activities of CE, apart from the normal permits. Experience has been obtained by Johan Godschalk for the establishment of the Ce Green City panel demo production company in Venlo. Clear Elastomers will be a B category company in terms of environmental hazard and therefore no special environmental permit by the government is required similar to the company in Venlo and will require also only a category 3 approved production site. The company only produces products from raw materials and is not a recycling company.

For your information: the factory has no waste flows or emissions, the retention panels are only pressed with heated molds at 110 degrees whereas the inflammability temperature of rubber is 200 to 400 degrees for synthetic rubber and 360 degrees for natural rubber. All raw materials that are supplied and used in the system are also used in the retention panels.

Naturally, all necessary insurance such as fire, machine breakdown, board liability, business liability, etc. have been taken out.

7. Financial plan

The financial plan including Profit&loss, Balance, cashflows, prognoses and ratio's is worked out in Excel model 'financial model Clear Elastomers B.V.'

8. Sustainable circularity and employment effects

Energy savings by re-use waste rubber (on the basis of 1 production line for 80.000 to 100.000m² of green city panel)

Based on various reports and studies, including those of "green roofs for Healthy Cities" in Toronto, the following calculations can be made about the energy savings that the construction of green roofs would currently entail when using rubber retention panels. It should be noted, however, that the reduction of the Urban City Heat and building energy are of course highly dependent on the building materials used and the height of the existing insulation.

On the buildings (50 million M²) in Toronto, the initial energy saving would be us \$ 148 million or us \$ 2.96 per m² (42 kWh per m²), the annual saving was calculated at us \$ 34 million so us \$ 0,68 per m² (10 kWh per m²)

If we apply this to 300,000 m² that are currently being constructed annually in the Netherlands, this 300,000 m² will save approx. 426,000,000 kWh in 10 years and the production of the CE (80,000 m² per year) saves approx. 114,000,000 kWh.

After 25 years, 1 production line in the initial factory produced 2,000,000 m² of retention panels and 2,000,000 m² of green roof were installed, saving approximately 584,000,000 kWh in these 25 years (€ 116,800,000).

The lifespan of the rubber panels is at least 100 years. The material does not wear out or degrade when applied to roofs. After 100 years, the use of a green-blue roof alone saves a total of 8,336,000,000 kWh of energy (€ 1.6 billion)

In addition, energy is saved in the production process by using rubber instead of plastics with a significantly lower CO₂ footprint and by using locally obtained residual flows of rubber, local processing and local construction of green-blue roofs, which significantly reduce transport costs (transport kilometers and energy.).

Period	Reduced in kWh		1 factory
	Netherlands 100.000m ²	1 production line 80.000m ²	Reduction co2
year 1	12.600.000	3.360.000	672.000
year 5	138.000.000	36.800.000	7.360.000
year 10	426.000.000	113.600.000	22.720.000
year 25	2.190.000.000	584.000.000	116.800.000
year 50	8.130.000.000	2.168.000.000	433.600.000

Environmental effects of re-use versus incineration of rubber

Burning rubber (including tires) is also referred to as "energizing" tires, known in the US as Tire-Derived Fuel. There is a lot of objection to this because of the heavy metals and other substances that are released during combustion. In this setup, shredded tires are used as "auxiliary fuel" in cement kilns, power plants,

etc. Incineration is very low in the reuse hierarchy but is relatively simple and effective in reducing the waste to be landfilled. To burn the tires, they are first shredded and the metal removed. Tires have an extremely high calorific value (32 to 40 MJ / kg, source <https://home.kpn.nl/vanadovv/Energ.html>).

CO₂ reduction through re-use of rubber in retention panels

When rubber is not incinerated, but recycled, a lot of CO₂ emissions are avoided. In March 2017, Fifa conducted its own impact study (2017, Fifa-rapport 'Environmental Impact Study on Artificial Football Turf') into the environmental effects of the removal of worn synthetic turf. According to the report, the number of synthetic turf pitches on all continents is rising very sharply. The need to replace worn fields increases as a result.

The report indicates that countries like the Netherlands have a ban on landfilling such waste, and that - if the material is not recycled - incineration in waste incinerators is the only way to dispose of the material. The rubber from one square meter of artificial turf then produces 600 Kg CO₂ eq in emissions, according to the research (source: https://footballtechnology.fifa.com/media/1230/artificial_turf_recycling.pdf).

About 3 Kg CO₂* eq is released when one kilo of rubber is burned. These CO₂ emissions are thus avoided if the rubber granulate is used in the retention panels instead of having been burnt. (3kg co is the nummer derived from USA EPA in the period 1990-2007 and is in conformity with RIVM numbers)

To look at how much CO₂ emissions the rubber panels avoid, we have to subtract the CO₂ emissions that the production of the panels entails. To this end, the company SGS has determined the CO₂ emissions in the LCA of the rubber panels in line with NEN EN 15804 and the Dutch Determination Method v2.0.

The CO₂ emission of the production of 1 m² rubber retention panel was determined at 11.0 kg CO₂ eq. since 22.5 kg of rubber is processed in the panels, the co₂eq. m² is 0.489 kg.

On the basis of these 2 data the co₂ reduction can be calculated as follows $3 - 0,489 = 2,51$ kg CO₂ eq. per m².

Effect CO ₂ reduction CE factory versus incineration of rubber (cumulative)				
	Input kg	CO ₂	CO ₂	Reduction
	Rubber	Incineration (Kg eq.)	Re-use in Rubber Retention Panels (Kg eq.)	Kg eq. CO ₂ reduction by reuse
Year 1	280.645	841.935	138.024	703.911
t/m year 2	1.627.741	4.883.223	800.538	4.082.685
t/m year 5	7.016.125	21.048.375	3.450.594	17.597.781
t/m year 10	15.996.765	47.990.295	7.867.354	40.122.941
t/m year 15	24.977.405	74.932.215	12.284.114	62.648.101

Reduction of toxic substances by reducing unintentional combustion

In addition, when used rubber (such as car tires) is stored, uncontrolled fires regularly occur, such as recently in Kampen in May 2018. In addition, combustion is not optimal and the flue gases are obviously not cleaned (as in power plants).

RIVM has investigated which harmful substances are released during fires with certain types of materials, such as car tires, plastics or wood (report no. 609021051/2007).

Studies show that the following groups of substances are formed during the combustion of rubber: carbon monoxide, carbon dioxide, sulfur dioxide, hydrocyanic acid, hydrochloric acid, many hydrocarbons (more about this below), PAHs, soot particles and heavy metals: zinc, calcium, silicon, aluminum, iron, copper, chromium, nickel, antimony, titanium and lead.

Component	Emissionfactor (g/kg)	Component	Emissionfactor (g/kg)
Kooldioxide (CO ₂)	3000	Alkenen en alkynen	0,5 – 5
Koolmonoxide (CO)	50 – 250	Fenolen	0,1 – 0,5
Benzeen	1 – 10	Furanen	0,05 – 0,2
Tolueen	0,3 – 1,5	Aldehyden ²⁾	0,05 – 0,4
Ethylbenzeen	0,1 – 0,5	Alcoholen en esters	0,1 – 1
Xylenen	0,2 – 01	Thiazolen en thiofenen	0,02 – 0,1
Overige alkylbenzenen (som)	0,1 – 3	Zwavel dioxide (SO _x)	10 – 25
Styreen	0,1 – 0,8	Zoutzuur	0,5
Naftaleen	0,5 – 1	Blauwzuur	(10-25) ³⁾
Totaal PAK's	1 – 3	Isocyanaten	4 ³⁾
Methaan	0,5 – 1	Fijn stof	5 – 120
other alkanen	0,1 – 1,5	Dioxinen	0,5 – 3 ¹⁾

Next to reduction of CO₂ emissions also NO_x, SO_x, Pm10, other emissions and heavy metals are reduced substantially.

End of life situation

The rubber Rubber Retention Panels do not degrade and will last for many decades without any problems. Up to 100 years if desired. This means that, in the event of a building being demolished, for example, the panels can be reused 100% by reusing them on another roof. Even if they are no longer reused in this way, it is valuable material. By scraping (cutting into small pieces) the tiles can be reused as a base material for new rubber tiles (and other similar products). This way the rubber is not lost and can be used again and again. At the moment, for example, discarded playground tiles (made from the same rubber as the retention panels) are recycled in this way and pressed again into new tiles.

Employment effects

CE wants to take major steps forward with this local initiative. The production activities for the Clear Elastomers plant are largely feasible through the deployment of, among others, people with a distance to the labor market, asylum seekers and the disabled. And because the implementation takes place locally and transparently, the results are clearly visible, which will lead to a better response from society. This approach will demonstrate that a new approach through the CE concept can lead to a rewarding system. The company offers substantial employment in which Social Employment is also integrated into its business operations. In short, a sustainable solution from different perspectives.

PERSONNEL (FTE)	2022	2023	2024	2025	2026
operational	0,6	6,0	9,0	12,0	12,0
management	0,3	2,0	3,0	3,0	3,0
total direct employment	0,9	8,0	12,0	15,0	15,0
Indirect employment	2,7	25	38	47	66

Also indirect jobs, construction and maintenance green projects can be performed by persons with a distance to the job market.



Attachment 1. Benefits for users

The advantage of using the rubber retention panels lies for the users in three areas: energy savings through heat insulation, protection of the existing roof (longer life) and improved indoor liveability (sound insulation).

Energy savings through heat insulation

Research shows that an extensive green roof serves as good insulation in winter and summer. On a flat roof without greenery, the temperature can reach 70°C in summer. With a green roof, the temperature remains at approximately 37°C due to the plants that evaporate or "sweat". The plants are like people...!

A green roof significantly reduces the need for air conditioning in the summer and provides insulation in the winter. The insulation in winter depends on the degree of humidity of the different construction layers. In the summer, the insulation is optimal, because the layers are dry and therefore also reflects the heat well. Due to a lower need for air conditioning in the summer and lower heating costs in the winter, a green roof provides significant energy savings. With the current increases in energy prices, a green roof is becoming more and more attractive!

Example: Office saves > 23% energy per year.

An average office uses approximately 1250 MJ (megajoules) per m² per year. The heating of a building accounts for 39% of this. The cooling by air conditioning for another 4% of the total energy load. That is 538 MJ per year. A green roof provides a reduction of 23% less energy consumption for heating and 75% less consumption for air conditioning.

This means that a green roof saves 150 MJ per year. 1 MJ equals 0.0316 m³ gas. Conclusion: on an average office of 1000 m², a green roof saves about 4,740 m³ gas per year.

Example: Household saves ± 230 euros per year

Households have a different energy requirement than offices. Households spend on average 47% of the total amount of energy on heating the house. Refrigeration equipment uses an average of 10% energy (generally refrigerators). The use of air conditioning and fans in Dutch households is still very limited, so the effect of green roofs on cooling has been omitted from the calculation for a while. According to research, households can save 23% of their heating costs by installing a green roof, depending on the state of the roof. In one year, more than 26,364 MJ of gas is burned per household in the Netherlands. This gas has a total value of ± 434 euros. A saving of 23% means that approximately 230 euros per year can be saved in heating costs. There are currently 7,600,000 households.

The Netherlands has an area of 41,526 km²

Of this, 1000km² is built on, of which 400km² with a flat roof and 675km² roofs suitable for green roofs (houses, buildings and industry)

Individuals

The use of electricity: private individuals 23 billion kWh and business 91 billion kWh. Every household uses an average of 3,500 kWh

Use in gas: The Netherlands consumes 40 to 50 billion m³ per year. Every household uses an average of 1500m³.

The Netherlands has 7.6 million households with 291 million m² of roof and a private use of 11.4 billion m³ of gas.

Assuming a 23% reduction in energy (heating), which is now mainly regulated by gas, the use of gas in the Netherlands would decrease by 2.6 billion m³ of gas per year if all households were provided with green roofs (= € 1.6 billion).).

If, in accordance with the current discussions, the gas central heating boilers were replaced by electric boilers, an additional electricity demand of 90 billion kWh would be added in the Netherlands (7.9 kWh per m³ gas). If this had to be reduced with green roofs with green roofs, this would result in a reduction of 20 billion kWh (= € 4 billion). Electricity is currently 2.4 times more expensive than gas.

Offices

An office uses an average of 1250mj per year - green roofs reduce usage by 150mj (4.74m³ gas).

The Netherlands has 118 million m² of office space, of which 16.5 million is vacant. (use per year 125 billion mj - 3 billion M³ gas)

If all offices are fitted with a green roof, then the energy consumption will be reduced by 15 billion mj = 470 million m³ gas (€ 300 million).

Non-residential construction

35% of the total construction production is non-residential construction, including shops, business premises, logistics, agriculture, schools, healthcare institutions, offices of approximately 350 m².

Excluding offices, this amounts to approx. 230 million m²; Achievable reduction in gas consumption is estimated at 1 billion m³ (€ 600 million).

Attachment 2: SWOT analyse

Hoge marge en winstpotentieel door patentbescherming en kennisvoorsprong op het gebied van applicaties.

Sterktes

- ✓ Bewezen recycling technologieën in een innovatieve mobiele toepassing bij c40 steden.
- ✓ Bescherming door merk en modellenrecht.
- ✓ Snelle introductie en marktpenetratie
- ✓ Aantoonbare veel hogere toegevoegde waarde versus concurrerende producten en technieken
- ✓ In een aantal markten geen concurrentie door Unique Design Points en kostenbesparingen
- ✓ Grote marktflexibiliteit in toepassingsgebieden.
- ✓ Groot gedifferentieerd markt bereik.
- ✓ Getoonde interesse van grote zeer gekwalificeerde markt partijen
- ✓ Een zeer gemotiveerd en deskundig MT

Zwakte

- De toepassing en het vermarkten van de technologie vereist samenwerking met (capabele) derden
- Bestaande organisatie heeft beperkte slagkracht op gebied van financiën en mankracht.
- IP rechten en modellen rechten geven maar een beperkte voorsprong dus aanvullende octrooien zijn noodzakelijk

Kansen

- ✓ Zeer brede en toegewijde interesse van potentiële kopers
- ✓ Hoge marge en winstpotentieel door modelbescherming en kennisvoorsprong op het gebied van applicaties en bijbehorende functionele garanties.
- ✓ Milieu & energie verordeningen en bewustzijn.
- ✓ Kwaliteitsverbetering door toepassing composieten leidt tot vergaande besparingen en nieuwe applicaties
- ✓ Het product kent vele toepassingsvariëteiten
- ✓ Unieke eigenschappen maken product en technologieën een potentiële marktleider
- ✓ Licentiemarkt en/of strategische samenwerking is aantoonbaar aanwezig

Bedreigingen

- De huidige financiële situatie, het spanningsveld en tijdsfactor
- Onvoldoende financiële middelen en (deskundige) mankracht met praktische kennis en 'hands-on' mentaliteit.
- Concurrentie: kopiëren product en technologie

Attachment 3: USP's of Rubber Retention Panels

Disadvantages Rubber Retention Panels versus competition

- || Higher purchase value € 21.20 (30mm), € 24.40 (45mm) and € 29.60 (60mm) rubber buffer panel compared to plastic (* but high residual value) o Pricelist plastic alternative: DE 20 mm € 13.00 / M2, DiaDrain 25mm € 20.50 / DiaDrain 40mm € 27.00 / M2M2, DiaDrain 60mm € 42.90 / M2. A buy back guarantee for 50% for the Rubber Retention Panels diminishes this difference completely. In 2021 price of HDPE increased by 20%.
- || Weight 27.5 kg compared to 4.8 kg at 60mm thickness (** but does not slide or shift - no extra ballast material required)) o In buildings built between 1970 and 2000 in particular, the roof load can cause problems when using 60mm panel.

The USP's of the Rubber Retention Panels are many:

- || 100% recyclable even after 100 years. High residual value, "deposit" options. Material costs for panels is approximately 40% of the total cost price. Residual value at least € 10 per m2
- || Heavy, sturdy product that does not slip or shift
- || Up to 5 to 8 times lower CO2 production footprint (compared to recycled plastics), so 60 to 70 kg CO2 / m2 lower emissions.
- || The current ETS-EU price of CO2 is € 30 per ton of CO2. In 2030, the target price is € 125 per tonne. (€ 2 to € 8 CO2 reduction per m2).
- || A much higher LCA value and very low MKI (€ 1) value.
- || Designed and produced according to circular principles
- || Made from local waste - Solution rubber granulate and synthetic turf infill waste problem. (no combustion) (reduction of CO2)
- || Decrease in scarce use of raw materials. (rubber)
- || Increased roof life (2 * as long as: 50 years instead of 25 years) = much lower life cycle cost
- || Better insulation than plastic (lower energy consumption). Higher RC value 0.17 per mm.
- || Better sound absorption, Increased acoustic insulation, Absorbs vibrations
- || Lifespan of the product (at least 100 years, so low Life Cycle Circular Cost) Cannot freeze or break.
- || No leaching and maintenance of rainwater purity
- || Produced locally according to LEED principles. Buildings can accumulate up to 23 additional suffering points.
 - || More sustainable buildings receive up to 0.5% lower interest rates on loans from financiers.
 - || High pressure load of the panels possible, making the product suitable for garden parks, parking garages and industrial infrastructure.
 - || Government procurement procedures prescribe the purchase of locally sourced, locally produced, lowest CO2 footprint products.
 - || The indestructible character of the rubber panels makes new circular payment methods possible such as pay per m2, pay for use.
 - || Lease companies see opportunities for leasing projects with green roofs with rubber panels. (movable property)
 - || Solar panels can be attached to the rubber panels and provide counterweight as well as by planting for cooling of the solar panels, which then generate more energy.
 - || Panels can also be used in civil engineering solutions such as parking roofs, roads, erosion, surface water storage in cities, noise reduction.

Attachment 4: Competition

Current suppliers of plastic and foam type systems are:

- Mobiroof (part of Mobilane)
- Zinco (construction heights 6 > 18, weight 60 > 165 kg / m², with and without solar panels)
- Firmus (size 45 * 49 * 8.5, weight 35kg / m² dry, 48kg wet)
- Optigreen (supplies all types of roof and facade vegetation)

MOBIROOF

Bindels Tuinen Oefelt, Dealer (less than 800m²)

Costs € 20.00 / m²

Cassette material: regenerated polypropylene

Dimensions: 54x54x9 cm, 3.44 cassettes / m²

Water buffering: approx. 20 liters / m²

Weight: 38 kg / m² dry and approx. 58 kg / m² saturated

Roof pitch: up to max. 10 ° Findings:

- 1- Dry quickly, the tray is high which drains water (too) quickly
- 2- Fertilize at least 2x
- 3- Little water buffer
- 4- Degradation in case of (heavy) frost?

No answer when asked how MOBIROOF will develop in the longer term

The other competitors have similar systems:

Zinco:

The company produces propypolene roof mats from plastics that contain 4 times as much CO₂ per m² as rubber Rubber Retention Panels. In addition, contain very nasty environmentally harmful substances that can leak out.

FIRMUS:

Has many points of sale in network, including gardeners. Supplies the Sedum roof cassette system from Firmus Sedum.

OPTIGROEN:

Is active worldwide with a wide range of systems. Own webshop: www.groenedaken.net.

Especially for the do-it-yourselfer they have a webshop for a green roof from 1 to 50 m²

Attachment 5: Addition application Rubber Retention Panels

Additional application for CGCP panels produced by the same production means and equipments.

1. Parking lots and spaces



The number of parking garages, places, lot can be retrieved from a report from the largest park group and sources such as www.dgbc.nl declaring het

2. Parking lots with water retention (NRL Eindrapport: Climate Proof Cities)



Because of the emerging hardening of urban areas and the extreme rainfalls more than 90% of all cities experience waterfloods and nuisance. Through water retention under pavements and streets and Water-playyards and other water leisure projects this problems ca largely be solved.

3. Water retention and shock proof sportfields



www.fieldmanager.nl In the current sports system, the lava and / or sand layer and even infill can be replaced by an CGCP panel. The CGCP is applied directly under the artificial grass or even natural grass and serves both as a water buffer and gradual water drainage as well as a flexible layer for shock absorption.

4. Water retention in roads www.transitiepraktijk.nl



For example, under road foundations, a hollow space can be created by RRP panels. The rainwater ends up in it via the wells in the street or through the asphalt and ensures water storage, but the use of rubber also creates a resilient layer that provides sound insulation.

5. Retention panels made from other waste streams

<https://www.volkskrant.nl/nieuws-achtergrond/10miljoen-tennisballen-wachten-op-tweede-leven-b2ffd2c/>

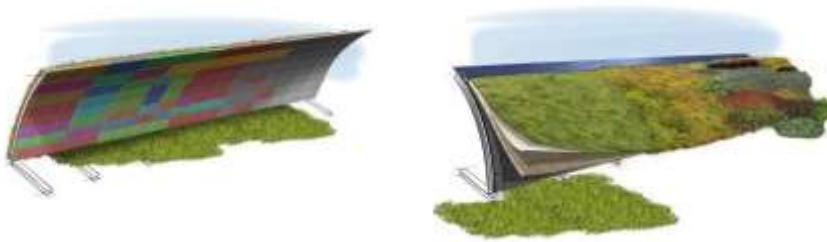


From tennis balls a lightweight CGCP panel can be made for application in sloping roofs

6. Sound barriers

Hundreds of kilometers of noise barriers are constructed in the Netherlands every year. On the one hand by Rijkswaterstaat along the roads and highways, on the other hand by ProRail along the railways.

Under Green City Netherlands Arvid Prigge i.c.w. Joru en Joosten has developed a concept for green or colorful noise barriers. This is due to a number of municipalities that do not want to have concrete Berlin wall in front of their houses.



7. TNO : Intereg Program Germany,

As part of an Interreg scheme, Joosten Kunststoffen have been asked to set up three international projects, one in the Netherlands, one in Germany and 1 in Spain or Italy, to test and measure the influence of water buffering and cooling in cities. Green City Netherlands has been requested to work together with Joosten to initiate and implement new ideas.

