

How VACarbo stores CO₂ in demolition concrete and generates profits through certificates

A case study by VACarbo AG and neustark
Sustainability business model | September 2024



Sector:
Recycling



 **neustark**[®]
Removing CO₂ permanently

**Our today is
your tomorrow.**

VACarbo AG uses neustark technology to store CO₂ in demolition concrete and thus has created an additional revenue stream.

The recycled granulate is reused in the development of sustainable construction projects.

VACarbo AG

Industry	Recycler: Concrete and building materials
Location	Biberist, Solothurn (Switzerland)
Technology	CO ₂ storage in demolition concrete
Plant	CO ₂ storage plant with neustark technology

Parent companies



alluvia



Technology and process

CO₂ storage technology

The CO₂ storage plant treats the entire demolition concrete batch by batch with biogenic CO₂ and stores it permanently. The material is enriched with CO₂ in the plant, where it is bound to the surface of the granulate as limestone within a few hours. The CO₂ is now stored in the demolition granulate – for hundreds of thousands of years.



Biberist plant

- Location: The plant is on the Papieri-Areal site in Biberist, Solothurn, a former paper mill site currently being demolished. The demolition material produced here is fed into the plant.
- Space requirement: The entire CO₂ storage plant requires around 5×30 metres of space, which makes it possible to install it on the former paper mill site. Neustark always adapts its plants to local conditions.
- Logistics: Transport costs are low due to the short distances between the plant and the demolition material.
- Linear storage bins: The so-called row dosing unit with three chambers are the centrepiece of the plant. Here, the demolition concrete from the Papieri-Areal site is enriched with CO₂. The CO₂ is bound to the surface of the granulate as limestone, permanently removing it from the atmosphere within a few hours. The CO₂ is now stored in the demolition granulate for hundreds of thousands of years.

100.000+

The stored CO₂ remains bound in the concrete for over 100,000 years.

Can the CO₂ storage plant be integrated into my existing plant?

Yes. We either install a complete plant on the recycler's premises or retrofit an existing plant, such as a silo.

Bird's eye view of the CO₂ storage plant with a vaporizer (left) and three reaction chambers (centre) in Biberist.



And this is how it works...



Neustark supplies CO₂

The CO₂ is extracted by neustark in the region. It comes from a biogas plant operated by Ara Bern. It is stored on site in the CO₂ tank.



Delivery of demolition concrete

Concrete from demolition projects is transported to the existing recycling plant.



CO₂ enrichment

The demolition concrete is enriched with CO₂ in the linear storage bins.



Mineralisation

The CO₂ is bound as limestone in the concrete within a few hours.



Storage

The bound CO₂ remains safely stored in the concrete for several hundred thousand years.

What is the CO₂ storage capacity of the material?

The storage capacity can be precisely quantified thanks to accurate measuring devices in the plant.

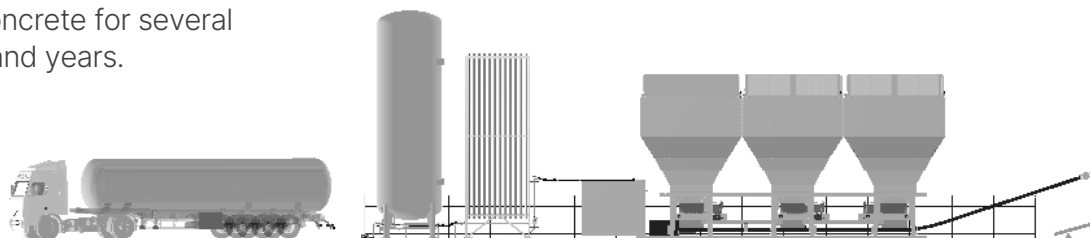
- When treating mixed demolition, the storage of up to 7 kg of CO₂ per tonne of demolition material can be achieved.
- Pure concrete demolition can store up to 10 kg of CO₂ per tonne.

7 kg CO₂/t

Mixed demolition waste

10 kg CO₂/t

Pure concrete demolition (0-16 mm)



Profitability and business model for recyclers

The calculation benefits recyclers: Neustark takes care of the constant supply of CO₂ from the surrounding region, and the recycler can concentrate on the actual carbon storage.

The more tonnes of CO₂ are stored, the greater the reward. This results from reimbursement for the sale of certificates, which neustark operates at the end of the value chain.

Depending on the business case, the recycler can amortise the cost of the plant within 3 to 6 years.

CO₂ certificates in detail

Below we explain how neustark generates CO₂ certificates and how you as a recycler can earn money from them.

- By permanently storing CO₂ in concrete, neustark can generate certificates .
- The certificates are sold by neustark to third parties such as Microsoft.
- The building materials recycler receives a reimbursement for the certificate sold.
- The more the recycler stores, the higher the turnover from the sale of certificates.

Investment decision

Increased efficiency

CO₂ storage technology supplements the existing recycling process by storing CO₂ as an additional source of income.

Rapid amortisation

The investment offers a rapid return on investment (ROI). The costs can be amortised within 3 to 6 years thanks to the reimbursement for the sale of CO₂ certificates and recycled materials.

Climate benefits

The plant effectively removes CO₂ from the atmosphere and permanently stores it in concrete, offering significant ecological benefits.

Location advantage

The location on the Papieri-Areal site has been strategically chosen. Proximity to the demolition site reduces transport distances and minimises logistics costs. The dismantling of the paper mill produces large quantities of demolition concrete, which can now be recycled directly on site.

Sustainability and climate benefits

Neustark removes CO₂ from the atmosphere by storing the CO₂ captured by biogas plants in demolition concrete. As neustark utilises the CO₂ from the already CO₂-neutral biogas plants before it is released into the atmosphere, negative emissions are produced. These make a significant contribution to achieving global climate targets.

VACarbo AG is positioning itself as a pioneer in the sustainable construction industry and offers construction companies the opportunity to realise environmentally friendly construction projects.



Gerd Aufdenblatten
Managing Director of alluvia AG

«With the solution developed by neustark, we were able to position ourselves on the concrete market as a pioneer in sustainability and the circular economy with VACarbo.»

Application and building owner demand

Material properties of the enriched demolition concrete waste

The CO₂-enriched demolition concrete can be used in the same way as conventional granulates for road construction or the production of recycled concrete (RC concrete). VACarbo reports on the CO₂ storage option and the improved material properties when carbonated material ends up in the RC concrete: The water absorption during production is lower, making the concrete more workable. This means that when the concrete is introduced using a crane or pump, it is distributed more quickly

over the specified area. More efficient processing can also be observed when using the vibration needle.



CO₂ storage plant of the Materialbox type in Eschenz (SG)



Silo-type CO₂ storage plant in Zurich

«With VACarbo, we are making building owners an attractive offer: An inexpensive and recyclable product including CO₂ storage. This is the future of construction.»

Building owner demand

The material has also been met with a keen interest from building owners. VACarbo recognises that sustainability is becoming increasingly important in procurement. VACarbo is one of the few suppliers that can already deliver a sustainable product. Carbonated RC concrete has already been produced and used in large quantities, for example in the Liberec building, which is only fifty metres away from the storage plant as the crow flies.



Bruno Stettler
Head of Market/Sales at Vigier Beton AG

«Areal Neuhuus»

Carbonated RC concrete from the plant has already been used here:

Project «Areal Neuhuus» operation centre in Bern

Installed quantity 17.000 m³

The visualisation shows the area of the new «Areal Neuhuus» operation centre in Bern (image copyright: BauSpektrum Architects)

The right plant for your material

At the start of the collaboration, neustark analyses the demolition material and tests the CO₂ absorption potential. This determines which plant is the most efficient for the company. The recycler carries out the usual sampling as soon as the plant is up and running.



The material is ready for tenders

After almost a year of operation, VACarbo AG can confirm:

The technology has proven itself. The processes are well established, and the VACarbo products fulfil all applicable standards, so end customer demand can be met. Carbonated RC concrete is therefore recognised as an alternative to the primary product. Clients, architects and building

owners can promote the use of this material by integrating it into tenders. Together, we can advance climate protection.

Example of product specification in tenders:

- RC share ≥ 40 M. %
- CO₂ storage through sequestration $> 10\text{kgCO}_2/\text{m}^3$

Your contacts to discuss how we can work together



Elmar Vatter
Sustainable Construction Manager

elmar.vatter@neustark.com
+41 79 267 11 10
neustark.com



Luis Schaub
Sales Manager Storage Plants

luis.schaub@neustark.com
+41 79 845 35 80
neustark.com

Note: All data and information in this case study come from VACarbo and neustark. Subject to change without notice.

© 2024 neustark AG
Freiburgstrasse 251, 3018 Bern, Switzerland



Removing CO₂ permanently

**Our today is
your tomorrow.**