



Just Transition Platform – Project fiche:

LOW EMISSIONS INTENSITY LIME AND CEMENT (LEILAC-1)

Paris, France (EU headquarters), Lixhe, Belgium (Leilac-1 plant)

This document is part of a series presenting information and lessons learned on policy approaches at national, regional or local level supporting a just transition to a climate-neutral economy. The Just Transition Platform (JTP) assists EU Member States and regions to unlock the support in this transition. Visit the JTP website: https://ec.europa.eu/regional_policy/funding/just-transition-fund/just-transition-platform_en

Member State:

France (EU headquarters), Belgium (Leilac-1 plant)

Region:

Paris (EU headquarters), Lixhe (Leilac-1 plant)

Sector:

Cement and lime

Total project budget (€):

EUR 20 970 635

Financing conditions (co-financing rate in %):

Around 57 %

Sources of funding:**EU funding:**

EUR 11 932 231, Horizon 2020 grant

National funding:

n/a

Regional funding:

n/a

Duration:

66 months (1 January 2016 – 30 June 2021)

Responsible managing authority / agency / company:

Calix (Europe) – in 2021 they founded Leilac as a spin-out company, keeping Calix as the parent company.

Summary

Leilac is a technology partner working towards a sustainable future for cement and lime production. Their goal is to develop a cost-effective solution to reduce carbon emissions and enable producers to take immediate action against climate change. The Low Emissions Intensity Lime And Cement (Leilac-1) project has successfully demonstrated the separation of unavoidable process emissions from cement and lime production, without using any additional chemicals or processes. Leilac's

unique technology focuses on affordable abatement of unavoidable CO2 emissions through an indirectly heated calcination approach, which efficiently separates CO2 for use or storage. Their technology is designed to operate on various energy sources, including electricity and alternative fuels, making it a flexible and economical pathway to carbon-free cement and lime production.

Type of activities:

Leilac-1 aims at decarbonising cement production, in an efficient and cost-effective way. Leilac's novel calciner (kiln) represents a breakthrough in carbon capture technology. Unlike traditional methods that require additional chemicals or processes, Leilac has innovatively redesigned the calcination process by separating the heat source from the chemical processing of raw materials. Instead of trying to separate gases from gases, Leilac's technology keeps the CO₂ released from raw materials pure, which reduces the cost of carbon capture significantly. Leilac's modular design of purpose-engineered steel tubes indirectly heats the calcination reaction, which results in a pure stream of CO₂ process emissions that is kept separate from any furnace exhaust gases or air.

Goals and approach:

The primary objective of this project is to develop a cost-effective, scalable and transferable solution to reduce carbon emissions in cement and lime production. The ultimate goal is to establish a novel technology and approach within the EU that can be replicated globally with ease. The project's overarching aim is to promote a just transition by facilitating the decarbonisation of cement production not only in developed countries but also in developing countries, thereby creating local employment opportunities and enhancing skills in the field of cement decarbonisation.

Important outputs, results or achievements:

Leilac-1 has developed, built, and operates a pilot plant capturing around 5 % of a typical cement plant's process CO₂ emission. Constructed next to the Heidelberg Cement's plant at Lixhe, Belgium, the pilot has shown that over 95 % of the process CO₂ emissions could be captured from cement or lime production without significant energy or capital penalty.

Moreover, the [Leilac Technology Roadmap to 2050](#) was developed to guide the use of the Leilac technology for the cement and lime industry, providing cost-effective pathways to carbon neutral industrial production of cement and lime. The Roadmap contributes to the goal set out in the Paris Agreement, aiming to limit global temperature increase to below 1.5 degrees Celsius.

Scalability¹ and transferability²:

The ultimate goal of the Leilac technology is to be scalable and transferable. In fact, with ongoing support from partners in industry and academia, and an additional EUR 16 million in funding from the EU's Horizon 2020 programme, Leilac-2 commenced in 2020. Leilac-2 aims to develop a module that can be applied at any scale, with the objective of capturing 20 % of a full-scale cement plant's process emissions.

Key success factors and lessons learnt:

The role of EU funding in the development of the Leilac project was invaluable. In 2014, when Calix first patented the heated calcination technology for application in lime and cement, carbon capture technologies were not receiving much attention. The Leilac project benefited greatly from the EU funding as well as a cooperative and collaborative approach. The good outcome of the project would not have been possible without a consortium of partners that brought together expertise and knowledge from various companies. While the collaborative approach did present some challenges, it was essential for the project's success. Working together, the consortium was able to overcome these challenges and make significant progress towards reducing carbon emissions in the cement industry.

Key challenges:

One of the most significant challenges faced by this project was securing funding to support the development of the technology. It was critical not only in the initial stages of the project but also during its implementation. This is especially important as the project aims to develop a full-scale carbon capture plant, which requires constant financial support. However, managing more funds entails a higher level of risk, as it involves balancing the needs and expectations of a larger number of stakeholders and may require more compromises to be made.

Tools for supporting economic diversification and reskilling/ upskilling via projects:

- supporting firms to become more innovative and adjust from 'traditional sectors' to new technologies;
- encouraging knowledge exchange and cooperation between larger and smaller firms.

Central framework conditions³:

Access to innovation funding is essential to kickstart projects such as Leilac-1. However, the project's goal is to become more accessible in the future. To achieve this, constant governmental support is crucial, as well as industry buy-in, particularly for decarbonisation projects

Outlook:

Following Leilac-1, the Leilac-2 project commenced in April 2020 at HeidelbergCement's plant in Hannover, Germany, and it is planned to be finished by 2025. It aims at forming a robust and replicable module, capturing 20 % of a full-scale cement plant's process emissions. Meanwhile, Calix and partners are already planning a full-scale project to capture 100 % of CO₂ process emission (between half a million and one million ton of CO₂ per year). At the same time, several carbon abatement projects are being developed across the globe, seeking to set the benchmark for the sustainable decarbonisation of cement and

lime. Its retrofittable modular design is being developed to enable the rollout of the technology globally and as quickly as possible in support of the global climate change goals. For this reason, Calix will not be the engineering provider for the majority of the installations: instead, the Leilac technology will be licensed to customers and delivered by their preferred engineering company.

¹ Scalability entails that a policy approach can be adapted to a bigger scale than just the local context.

² Transferability entails that a policy approach can be applicable to a similar setting and replicated.

³ Framework conditions encompass the institutional, informational and socio-economic factors that determine a given environment (contextual information), e.g. market conditions, access to finance, tax regulation, infrastructure and support.

Other comments:

Another important goal of the project is informing the industry and wider public about cement and lime production and how carbon capture technology is essential in this sector.

An interactive explanation of the Leilac technology can be found on their website: <https://www.leilac.com/technology/>

Leilac-1: Lixhe, Belgium



Source: [Wikipedia](#)

Leilac-2: Hannover, Germany



Source: [Wikipedia](#)

Partners & contacts:

- Calix (in 2021 changed name to Leilac) – LEAD;
- HeidelbergCement;
- CEMEX;
- Tarmac, a CRH company;
- Lhoist;
- ECN (later incorporated into TNO);
- Imperial College of Science Technology and Medicine;
- Process Systems Enterprise Limited (PSE);
- Quantis Sàrl;
- The Carbon Trust;
- Solvay.

Website / Social media:

<https://www.leilac.com/>

<https://www.linkedin.com/company/leilac/>

https://twitter.com/Leilac_Global/

<https://www.youtube.com/@CalixLimited>

Sources:

Interview with representative of Leilac, date 21.4.2023.

Leilac website, <https://www.leilac.com/>.

Leilac Technology Roadmap to 2050, <https://www.leilac.com/wp-content/uploads/2022/09/LEILAC-Roadmap.pdf>.

Horizon 2020 Fact Sheet <https://cordis.europa.eu/project/id/654465>.

Lower CO2 emissions on the horizon for cement (2019). <https://cordis.europa.eu/article/id/406925-lower-co2-emissions-on-the-horizon-for-cement>.

A concrete step towards achieving net-zero carbon emissions in cement production (2019). <https://cordis.europa.eu/article/id/411659-a-concrete-step-towards-achieving-net-zero-carbon-emissions-in-cement-production>.

Cembureau (n.d.). Cementing the European Green Deal. Reaching climate neutrality along the cement and concrete value chain by 2050. https://cembureau.eu/media/kuxd32gi/cembureau-2050-roadmap_final-version_web.pdf.

IEA (2022). Cement tracking report. <https://www.iea.org/reports/cement>.

Sahoo, N., Kumar, A., & Samsher, S. (2022). Review on energy conservation and emission reduction approaches for cement industry. Environmental Development, 44, 100767. <https://doi.org/10.1016/j.envdev.2022.100767>.

Susaki, M. (2023). How carbon capture is helping clean up the cement industry. <https://www.euractiv.com/section/energy-environment/opinion/how-carbon-capture-is-helping-clean-up-the-cement-industry/>.