Partners

The project is conducted in close collaboration with key industrial partners, including two **waste-to-energy plants**, a **paper mill**, a **lime plant**, and a **cement plant**, which will test the CARMEN pilot unit one after another.

TU Darmstadt, as project leader, is building the pilot plant and operates it together with the site operators. It will then design a larger CaL demonstration plant.

TH Köln assesses the sustainability and economic performance of the process for different industries.

Merck KGaA contributes financially to evaluate the applicability of results to the pharmaceutical and chemical sectors.

House of Energy organizes events, manages public outreach, and has initiated an advisory board to ensure knowledge transfer and practical relevance.

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CARMEN – Carbonate Looping with a mobile pilot plant

Supported by:
Federal Ministry for Economic Affairs and Energy
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Project

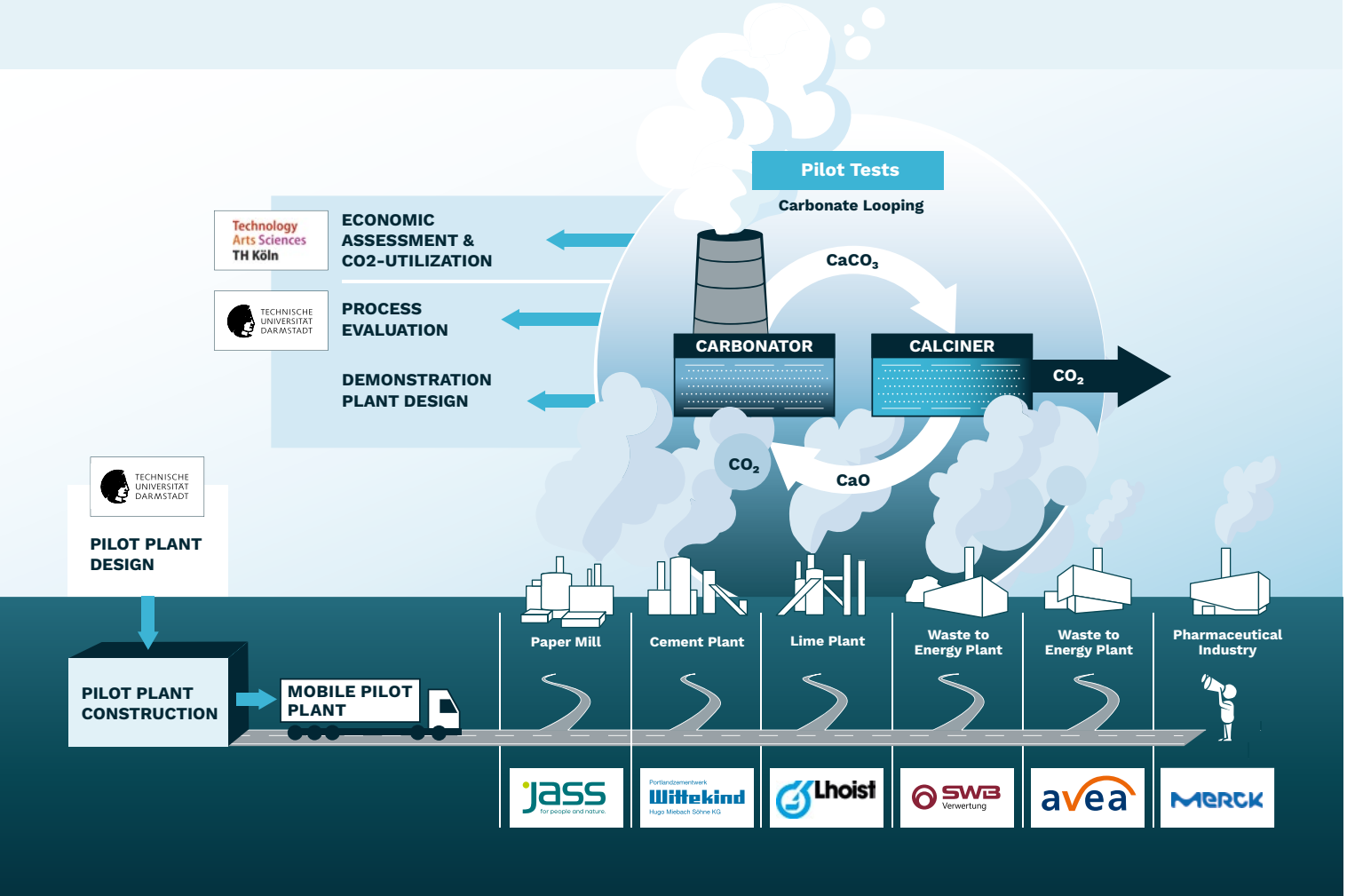
In the CARMEN project, the innovative Carbonate Looping (CaL) process for CO_2 capture from flue gases is being demonstrated under real industrial conditions. A mobile pilot plant is built and operated at five energy-intensive industrial sites. The project aims to reduce industrial CO_2 capture costs and to accelerate decarbonization. CARMEN is a joint project with ten partners led by TU Darmstadt.

Process

In the CaL process, CO_2 is efficiently absorbed from flue gases. This post-combustion method uses lime for CO_2 separation. The CaL-process consists of two connected fluidized bed reactors, the carbonator and the calciner, in which the lime circulates and binds the CO_2. As a result, a CO_2-free flue gas stream and a pure CO_2 stream leave the CaL process.

Advantages

A key advantage of the CaL process is its ability to efficiently recover high-temperature heat, boosting the thermal plant's overall efficiency. In addition, CaL can be retrofitted to existing industrial plants without the need for complex flue gas pre-treatment.



Key Questions

For each industrial site, the following questions are addressed:

- What are the optimal operating conditions of the CaL unit under the site-specific conditions?
- Which CO_2 capture rate is technically feasible and economically viable?
- How can the CaL excess heat be best utilized?
- How can the captured CO_2 be used?
- How can the CaO sorbent be best managed?
- How economical is the process for a demo or industrial plant?