Making our world more productive

Solid Foundation for Construction Industry

Gases, application technologies and expert consulting for construction projects

Improving performance and productivity through innovative gas technologies

Our gas technologies enhance productivity, quality and safety in construction work. We support all sectors of the construction industry, including residential and commercial building engineering, infrastructure and civil works, and pipeline/ underground installations. Our full-service offering extends from core cryogenic and water treatment solutions to a host of welding, joining and cutting gases plus equipment.

Customers of all sizes – from main to sub-contractors – can rely on us for an uninterrupted supply of gas, innovative process technologies, and the highest product stewardship standards.

We back up our extensive product, equipment and supply system portfolio with wide expertise and service offerings. This includes in-depth advice from our engineers, safety equipment plus hardgoods, and safety training to ensure that all the gases – in the supply mode that is right for you – are installed and handled properly.

This flyer focuses on our offering in the areas of:

- → ground freezing
- → concrete cooling and curing
- → water treatment
- → pipe freezing

Other highlights of our offering tailored to the needs of the construction industry include a full range of welding, shielding and cutting gases, as well as customized cutting and heating solutions. More details on these can be found at www.linde-gas.com, or contact your local Linde sales person.

AGF Eco & AGF trim lances with liquid nitrogen (LIN): Economical, safe, eco-friendly.

Challenges

- Weak soil
- Water ingress
- Need to underpin existing structures
- Collapses and rescue measures
- Highest safety and sustainability standards
- Time and cost pressures

Benefits

- Wide portfolio of lances tailored to different freezing challenges
- Innovative lance designs ensuring rapid withdrawal and low energy consumption
- Expert advice on optimum deployment and positioning
- Optimized turnkey solutions with remote operation
- Support with LIN handling and safety instructions

Solution

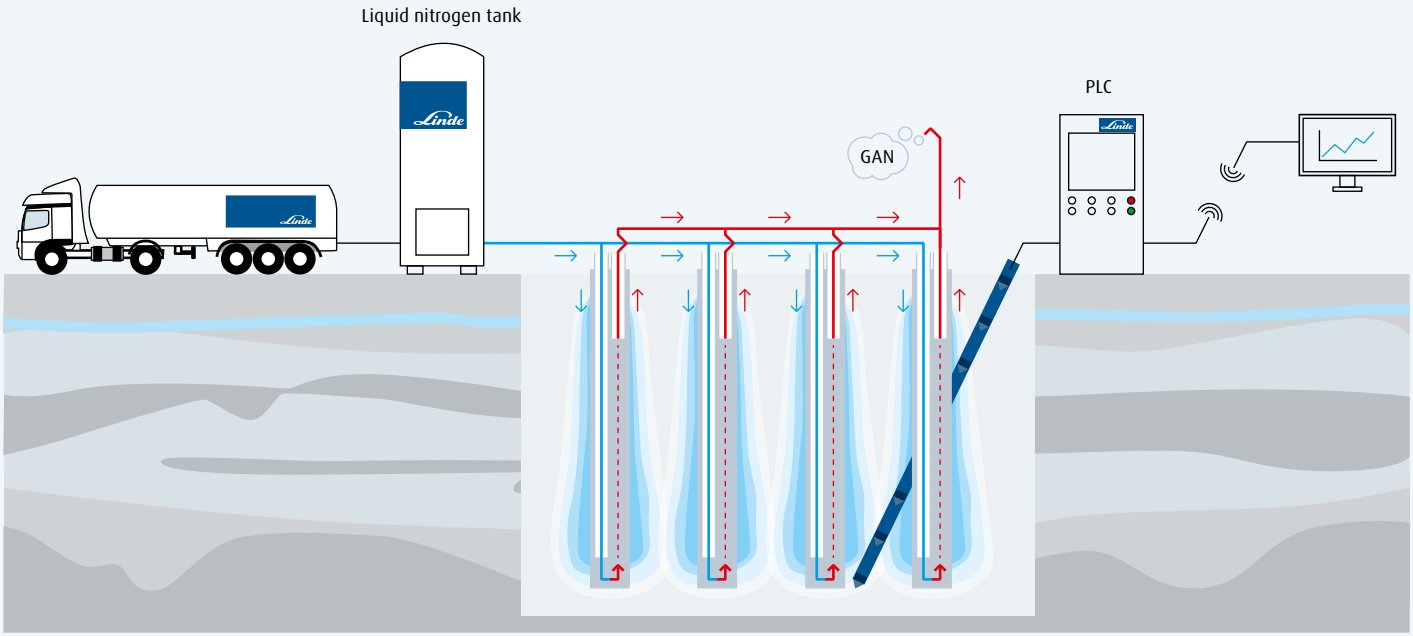
These challenges can be met by stabilizing the ground and soil. This is best achieved by freezing with liquid nitrogen (LIN). Complementing the supply of LIN, Linde has developed an innovative lance portfolio offering the perfect fit for different freezing tasks.

Having successfully delivered a variety of different and complex projects around the world, we have gained vast, hands-on expertise in this area.

Deployment scenarios

Tunneling works, cross passages between tunnels, pit and shaft excavations, tunnel collapses and tunnel boring machine (TBM) retrieval

Ground freezing project with liquid nitrogen



Cooling with liquid nitrogen:
Fast, flexible, cost-efficient.

Challenges

- High temperatures in warm seasons
- Adaptability to respond to strong and sudden fluctuations in climate/temperature
- Strong variations in cooling demands from one customer and project to another
- Different cooling methods required, e.g. booster solution for existing method

Solution

Concrete components (cement, water, aggregates) or freshly mixed concrete can be cooled with liquid nitrogen (LIN) to effectively respond to variations in cooling requirements. LIN is an extremely flexible booster solution.

Drawing on the extensive experience it has gained from numerous international projects in this area, Linde provides rapid LIN solutions for concrete cooling projects regardless of the scale or complexity.

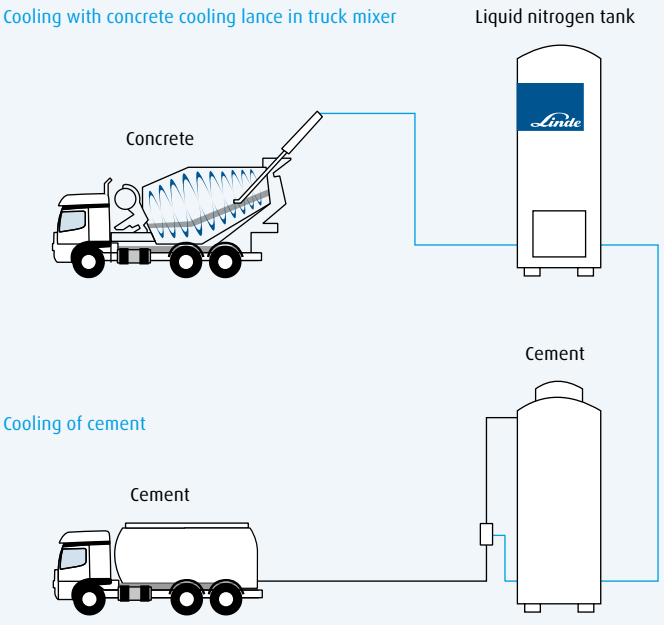
Benefits

- High flexibility in relation to cooling power and method
- Customized solutions from a single source (LIN supply scheme, lance, metering and control equipment)
- Consulting drawing on hands-on experience
- Economic efficiency
- Precise process control for reduced operational risk

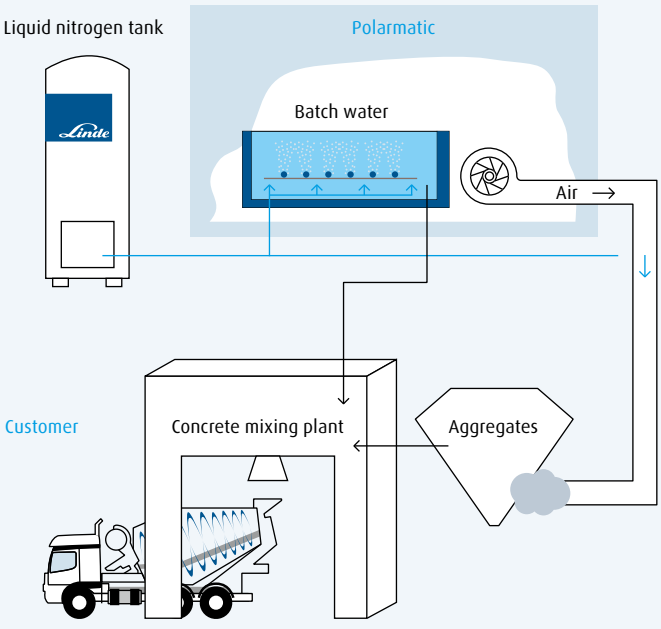
Deployment scenarios

Ready-mix concrete producers who need to comply with defined concrete pouring temperatures for work on bridges, tunnels, foundations, etc.

Different concrete cooling schemes: Cooling with nitrogen lance in truck mixer (up) and cooling of cement in storage silo with LIN (down)



Concrete cooling with liquid nitrogen in Polarmatic cooling system for water and aggregates



Curing with CarbonCure Technologies: Improved operations, smaller carbon footprint.

Challenges

- Lower carbon footprint in concrete processing due to CO_2
- Meet sustainability requirements in tenders
- Achieve consistent product quality
- Lower production costs by saving on cement

Solution

Linde has partnered with CarbonCure Technologies to solve these challenges. This joint solution combines CarbonCure technology with liquid carbon dioxide (CO_2) supplied by Linde to cure concrete. Once injected, the CO_2 mineralizes and becomes calcium carbonate, which is permanently trapped in the concrete. The mineralization process improves the compressive strength of the concrete, which enables concrete producers to optimize their mix designs while delivering the required strength properties.

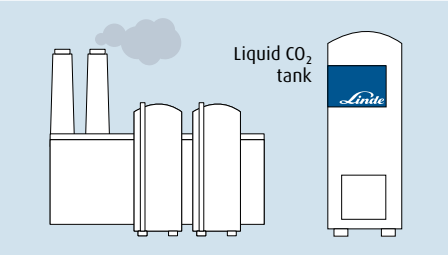
Benefits

- Strategic alliance between Linde and CarbonCure Technologies for optimum interplay and project outcomes
- CO_2 supply solution tailored specifically to the CarbonCure technology package including dedicated connection kit
- Reduction in cement content (by 3–6% on average) — with no impact on quality or performance
- Lower costs
- Greener concrete with smaller carbon footprint

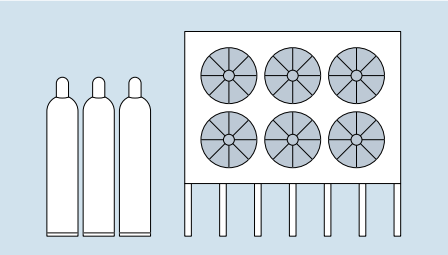
Deployment scenarios

Ready-mix producers, precast concrete producers, general construction sites

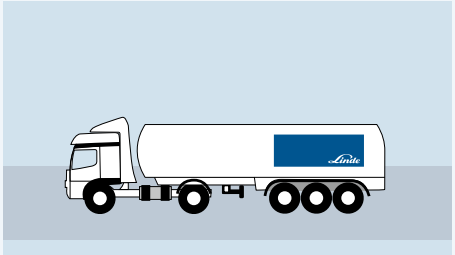
Concrete curing with CarbonCure Technologies



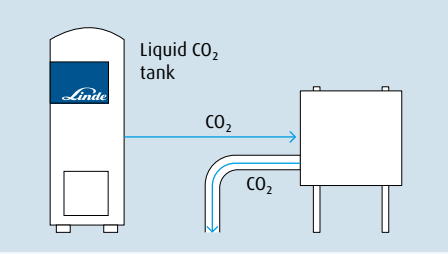
1. CarbonCure is installed at an existing concrete plant supplied by a Linde carbon dioxide (CO_2) tank.



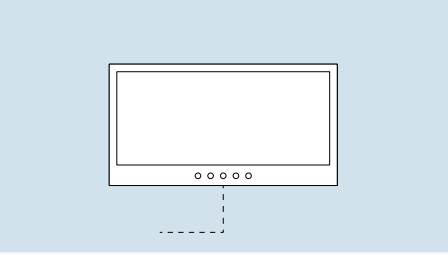
2. CO_2 gas is primarily sourced as a by-product from industrial processes.



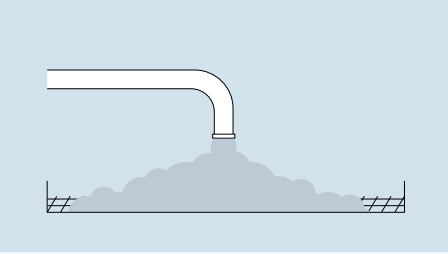
3. Purified CO_2 is delivered by Linde.



4. CarbonCure's proprietary delivery system, contained in the Valve Box, precisely injects the CO_2 into the concrete mix.



5. CarbonCure's Control Box is wired to the Valve Box and integrated with the batch computer; so adding the CO_2 is just like adding an admixture.



6. Once injected, CO_2 reacts with cement to form a nano-sized mineral that becomes permanently embedded in concrete.

SOLVOCARB®: Full pH control on site with fewer chemicals

Challenges

- Reduce chemicals needed for construction washwater treatment
- Adjust pH value quickly and easily to avoid over-acidification
- Shrink carbon footprint

Solution

Carbon dioxide (CO_2) is an effective way to control pH and reduce reliance on harmful chemicals. When dissolved in water, carbon dioxide forms carbonic acid, an effective neutralization agent with the key advantage of an almost flat neutralization curve.

Linde's SOLVOCARB® pH control solution leverages these benefits, giving operators an easy and precise way to adjust the desired pH value even if the raw water parameters are subject to fluctuations – without having to worry about over-acidification.

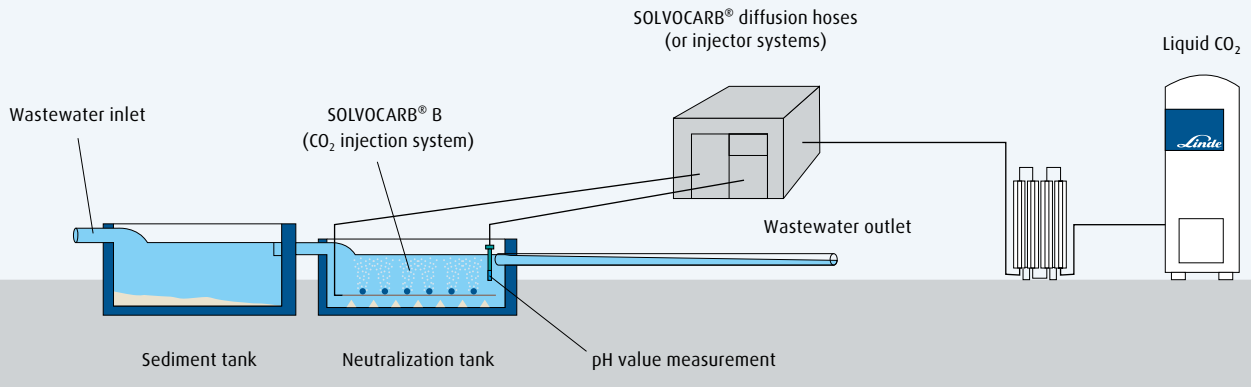
Benefits

- All-in-one SOLVOCARB® gas management solution including metering and dissolving systems, dosing units, and CO_2 supply package (tank, bundles, connection kit)
- Tight control over water quality and pH value
- Highly effective solution designed for ease of handling
- Reduction of maintenance costs
- Fewer chemicals required

Deployment scenarios

Ready-mix concrete producers who need to comply with defined concrete pouring temperatures for work on bridges, tunnels, foundations, etc.

Typical construction wastewater neutralization process



Cooling with liquid nitrogen:
Non-intrusive pipeline isolation

Challenges

→ Avoid delays and cost involved in draining entire pipe system to perform installation or maintenance work

Solution

When installation or maintenance work is necessary on pipeline systems, pipes can be partially frozen to avoid having to drain the entire pipe system and shut it down completely. Linde supplies liquid nitrogen (LIN) cooling solutions with supporting equipment/services to facilitate this type of non-invasive pipe freezing.

In this process, pipelines are temporarily blocked at certain points by freezing parts of the liquid in the system. A sleeve, adapted to the diameter of the pipeline, is tightly fixed to the pipe at the freezing point. The sleeve is then filled with liquid nitrogen (LIN). This leads to the formation of an ice plug, which seals the pipe off completely.

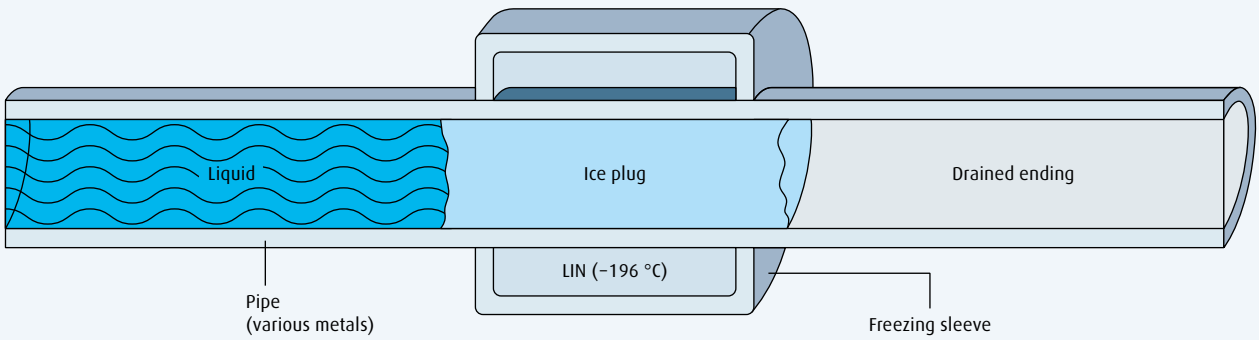
Benefits

→ Entire pipeline system does not need to be interrupted for drainage
→ Works with wide variety of fluids
→ Full service offering spanning consulting, process equipment, gas supply scheme and process/gas monitoring services
→ Dedicated sleeves for different pipe dimensions

Deployment scenarios

Infrastructural pipeline systems with contents such as water, acids, paints, oils, various chemicals, sewage

Non-invasive cryogenic pipe freezing with liquid nitrogen



Linde GmbH
Dr.-Carl-von-Linde-Strasse 6–14, 82049 Pullach, Germany
www.linde-gas.com/construction

0000483_TICS_0622