Exploring innovation in precast: A TechnoQuest tour of Sweden and Finland

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In late May 2025, a delegation of U.S. construction professionals, engineers, and precast concrete manufacturers embarked on a technical study tour, PCI TechnoQuest, through Sweden and Finland, exploring the forefront of automated precast and precast, prestressed concrete manufacturing. The weeklong trip began in Stockholm, Sweden, and concluded in Helsinki, Finland, with guided tours of six advanced production facilities—including precasting plants, a production equipment manufacturer, and a material innovator—each selected for its relevance to evolving construction methods.

The itinerary was designed not only to showcase European innovation but to draw attention to operational efficiencies, levels of automation, and industrial integration that could have practical applications in the United States.

Starting with a group reception at the historic Grand Hôtel in Stockholm, the tour included plant visits to Byggelement, Santalan Betoni, SBS Betoni, and equipment supplier Elematic. It also featured on-site demonstrations of Peikko's connection technologies and an introduction to Carbonaide's sustainable materials innovations.

Throughout the journey, participants engaged directly with plant managers, engineers, and research and development specialists, gaining firsthand insight into how these companies are streamlining production, integrating digital tools, and addressing labor challenges through automation. With a growing interest in how to modernize and scale precast concrete operations in North America, this international experience offered valuable takeaways for U.S. manufacturers seeking to stay competitive and efficient in an ever changing construction landscape.

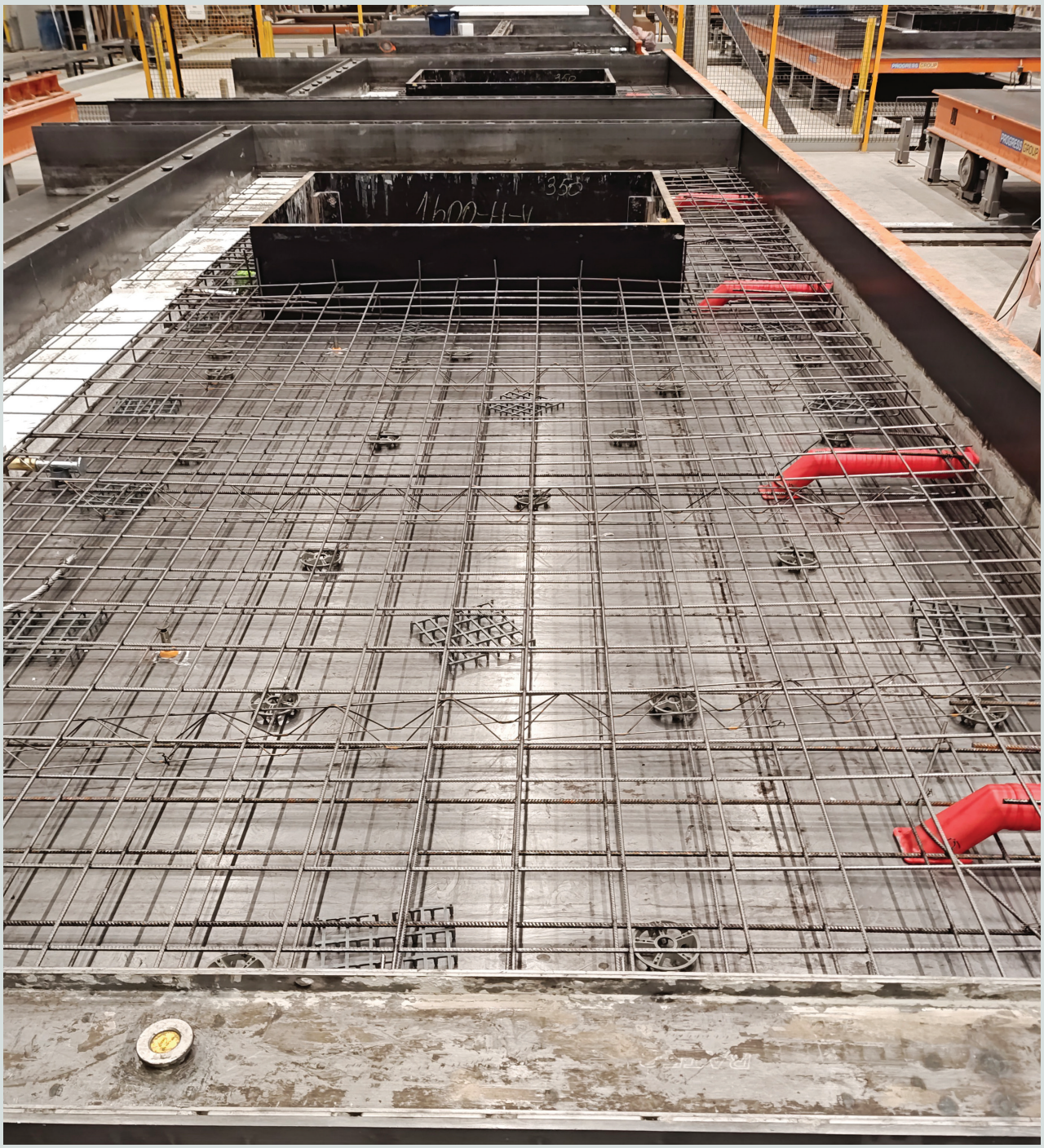
Byggelement

Byggelement, founded by Swedish construction giant Peab, represents one of the most advanced examples of vertically integrated precast concrete manufacturing in Scandinavia. Established in 2004 with a focus on double-wall and filigree slab production, the facility now operates with about 300 employees and delivers on Peab's broader strategy of controlling its construction value chain from raw material sourcing to on-site assembly.

Located outside of Stockholm, the current production facility reflects a significant capital investment of €30 million (about US$32.5 million) and boasts an annual production capacity of 300,000 m^2 (3.2 million ft^2) of precast concrete elements.

Byggelement's automation strategy combines systems from both Elematic and Progress Group, with an integrated mesh production line supported by Ebawe software. Its daily production goal is 600 to 700 m^2 (6500 to 7500 ft^2), but due to market slowdowns, current output is about 150 m^2 (1600 ft^2) per day.

About 95% of plant operations are automated, including reinforcement, formwork handling, and concrete placement. The



Similar to a panel in the North American detailing process, this panel at Byggelement near Stockholm, Sweden, sits in a quality control position to ensure that reinforcement and connection hardware are in the correct locations while the panel waits for the table to move to the casting position, which is next in line. The red grout sleeves accept projecting dowels from the panel below. Courtesy of Jason Lien.

facility also operates with 600 tonnes (660 tons) of automated lifting capacity.

From a sustainability standpoint, the plant is powered by 100% hydroelectricity, uses electric trains for internal transport, and incorporates green steel reinforcement. Cement replacement using slag cement reaches up to 55%, significantly lowering the CO_2 footprint. This high-slag mixture does result in longer curing times, necessitating ongoing efficiency adaptations.

Cultural experience and transition to Finland

Before departing Sweden, the group had the opportunity to visit the Vasa Museum in Stockholm, home to the remarkably preserved 17th-century warship Vasa. Salvaged in 1961 after more than 300 years on the seabed, the ship offers a striking example of early naval engineering, materials, and construction methods, a historical contrast to the modern concrete technologies explored throughout the trip.

That evening, the group boarded Tallink's Silja Symphony, an overnight ferry that traveled across the Baltic Sea, arriving in Helsinki the following morning. This scenic overnight voyage offered time for reflection and discussion among participants, setting the stage for the next phase of plant visits in Finland.

Santalan Betoni

Santalan Betoni in Helsinki produces 5000 to 7000 wall panels annually, serving Finland's midrise residential market. The facility stands out for its use of Graphic Concrete and innovative brick inlay techniques that differ from traditional U.S. methods. Rather than using thin brick and face mixtures, Santalan employs a tray system lined with a fabriclike material. Bricks are stabilized with an "icing" technique before the concrete backup mixture is placed, eliminating brick tipping and movement and simplifying final concrete placement.

Panel design complexity is high, averaging 1.57 panels per mark number, which is similar to the U.S. architectural

All of the precast concrete production facilities on PCI TechnoQuest, including Santalan Betoni in Helsinki, Finland, produce their own engineered mesh. The daily production requirements are developed in Tekla and downloaded to the mesh fabricator to build the mats of reinforcement, minimizing waste and allowing for more accurate bare placement. An additional advantage is that engineered mesh has a yield strength of 75 ksi (500 MPa). Courtesy of Jason Lien.

market. There are five to seven insulation types with overall panel thicknesses reaching 20 in. (500 mm), including 10 in. (250 mm) of insulation. Most panels are noncomposite.

To reduce global warming potential (GWP), Santalan incorporates slag-based cement replacements and has experimented with up to 40% replacement, but slower strength gain has delayed full implementation. The plant currently lacks an accelerated curing chamber but anticipates future investment to support this lower-carbon concrete material.

Peikko

Founded in 1965 in Lahti, Finland, Peikko is a global forerunner in engineered building solutions with more than 2000 employees and operations in more than 30 countries. The company has evolved into a €350 million international provider of innovative products for both precast and cast-in-place concrete construction. Its portfolio includes reinforcing systems, bolted connections, Deltabeam Slim Floor Structures, and large anchor systems for wind turbine foundations.

Deltabeam, used in conjunction with hollow-core slab, offers a competitive solution to post-tensioned and mildly reinforced concrete framing by creating an attractive entry point for a thin plate precast or precast, prestressed concrete system. Peikko's commitment to research and development is evident in its creation of fiber wythe connectors for insulated panels and its in-house ECO Galvanizing process. Automation plays a central role; robotic welding, automated material handling, and tight tolerances support scalable and repeatable production. These capabilities position Peikko connection components as superior replacements for heavily loaded connections in critical structures or for streamlined standardization. Stainless steel is required by Finnish code for all exterior elements, a standard Peikko meets with a dedicated fabrication facility.

In 2024, the company produced more than 24,000 Deltabeam

This carousel table at Santalan Betoni has a precast concrete panel on it. The top form surface is being finished using a finish machine that controls rotation velocity and pressure, and the operator is off to the side to guide the equipment and ensure safe operation. For the final detail, a finisher will only touch the edges of the panel. Courtesy of Jason Lien.

These panels in storage at Santalan Betoni are waiting for delivery. The final details, which have been completed, consisted of threading pull string through the electrical conduit. A unique blocking technique for the door jamb is used with cast-in reinforcing bar combined with a lumber tension strut to prevent movement of the jamb in storage and transport. This was a common stiffening technique throughout the plants visited. Courtesy of Jason Lien.

The top and bottom flanges of a Deltabeam at Peikko in Lahti, Finland, are separated by spacers while it waits for the installation of its side plates. The assembly is tacked together before inserting the beam into an automated welding machine to automatically weld each web and each flange simultaneously. Courtesy of Jason Lien.

Complete Deltabeams await shipment at Peikko. Courtesy of Jason Lien.

units, all made from recycled steel to reduce CO_2 emissions by 50% and delivered via biodiesel-powered trucks. Digital design and manufacturing are integrated through Tekla's building information modeling software, further driving efficiency, safety, and sustainability across Peikko's global operations.

SBS Betoni

SBS Betoni in Lahti began operations in 1951 and today integrates precast concrete, ready-mixed concrete, and construction services under one roof. The operation runs with about 200 employees, just 10 of whom are office staff. All engineering and detailing for SBS, as well as the other precast concrete companies visited during PCI's TechnoQuest, are completed by the architect and engineer of record. There are no in-house or consultant precast specialty engineers as in the United States.

The plant operates 60 casting beds, with a large curing chamber housing 40 beds and featuring automated heat control via thermocouples and cylinder monitoring. Wall panel operations include brick inlays, graphic concrete, and extensive use of manual wood formwork, though notably, there is no computer numerical control equipment in the mold shop here or at the other precast concrete companies visited.

Hollow-core production takes place indoors using Elematic extruders. Common section depths are 320 and 500 mm (12.5 and 19.7 in.). A specialized Elematic device allows recesses in slabs for bathroom applications.

The final assembly of the hollow-core saw at Elematic in Akaa, Finland, is being used to make crosscuts to a test piece of hollow-core. Courtesy of Jason Lien.

The plant features dual flying bucket systems, a shock table in a soundproof room, and gang-stressing systems for double tees and hollow-core production. Customizable hydraulic formwork for double tees includes adjustable stem height and flange width with embedded curing systems throughout the beds. All product storage is under one roof, an uncommon but valuable feature for climate protection and product quality.

Elematic

Elematic in Akaa, Finland, is a global leader in precast concrete production equipment, with expertise in automating precast concrete production equipment and hollow-core systems. The Akaa facility houses final assembly for extruders, saws, flying buckets, and more.

Their vibration-free shear compaction method offers uniform consolidation and durability while minimizing equipment wear. Products include 2 m^3 (2.6 yd^3) flying buckets, automatic lubrication systems, adjustable magnetic header systems, casting slabs up to 32 in. (810 mm) high, and modular rail systems.

Elematic supports highly automated precast concrete workflows, offering scalable solutions suitable for U.S. precasters seeking to modernize or expand hollow-core and panel production.

Carbonaide

Carbonaide in Joensuu, Finland, is pioneering a CO_2 injection curing system where concrete is exposed to controlled doses of CO_2 inside a curing chamber. This carbonation curing method accelerates strength gain while permanently sequestering CO_2 in the concrete matrix.

Although current U.S. curing setups may limit short-term adoption, Carbonaide demonstrates a compelling future model for reducing embodied carbon and GWP for precast concrete.

In 2025, Carbonaide announced a strategic partnership with Elematic to develop curing chambers and integrated systems optimized for CO_2 curing. This collaboration underscores the importance of cross-sector partnerships in building scalable, low-carbon solutions.

For PCI-certified producers in the United States, tools like environmental product declarations and life-cycle-assessment modeling are already influencing plant practices. Innovations such as Carbonaide offer a long-term path to further reduce environmental impact, especially as GWP reduction becomes a defining feature of competitive, high-performance precast concrete manufacturing.

Conclusion

This international TechnoQuest tour through Sweden and Finland offered a rare, in-depth look at the ways that advanced precast and precast, prestressed concrete manufacturing is being implemented across northern Europe. From automation-integrated production lines and sustainable curing technologies to precision-engineered connection systems and digital fabrication tools, the plants visited demonstrated a level of coordination, innovation, and environmental responsibility that can inform future U.S. precast concrete operations.

The tour was more than just a technical experience, it was an eye-opening opportunity to see how challenges familiar to U.S. manufacturers, such as labor constraints, product complexity, and sustainability targets, are being tackled through thoughtful investments in process, people, and technology. These firsthand observations underscore the need to maintain a global perspective on manufacturing practices and to remain open to adapting proven strategies from abroad.

Continued engagement with international peers and technologies through tours such as PCI's TechnoQuest will be critical as U.S. precast concrete producers work to modernize their operations, reduce environmental impact, and remain competitive in an ever evolving construction market.

About the author

Jason Lien, PE, FPCI is executive vice president of Encon United in Denver, Colo. He is a PCI Fellow and a PCI Titan. In addition, Lien is a member of PCI's Educational Activities Concil and Marketing Council and PCI's Continuing Education, Council Chairs, Fellows Nominating, Marketing Communications, Officers and Directors, Online Academy, and Student Education Committees. He is currently on the PCI Board of Directors and the PCI Foundation Board of Trustees.

Abstract

In late May 2025, a delegation of U.S. construction professionals, engineers, and precast concrete manufacturers embarked on the PCI TechnoQuest, a technical study tour through Sweden and Finland, to explore the forefront of automated precast and precast, prestressed concrete manufacturing. The weeklong trip included guided tours of six advanced production facilities, showcasing European innovation in operational efficiencies, automation, and industrial integration. Participants engaged with plant managers, engineers, and research and development specialists, gaining insights into how these companies streamline production, integrate digital tools, and address labor challenges through automation. The tour highlighted sustainable practices, such as CO_2 curing technology and the use of green steel reinforcement, offering valuable takeaways for U.S. manufacturers seeking to modernize and scale their operations while reducing environmental impact.

Keywords

Automated manufacturing, carbon reduction, CO_2 concrete curing, construction innovation, construction labor challenges, concrete material innovations, PCI TechnoQuest, precast concrete, precast concrete connection technology, precasting plants, prestressed concrete, sustainability.

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