Building & Industry
NOVENCO
SCHAKO Group

White Paper

Unilever Caivano, Italy

Unilever ice cream plant cuts energy use by 38% with fan retrofit

Heading for zero-emission by 2030

Unilever's Caivano production facility in Italy, is Unilever's flagship site for industrial-scale ice-cream production, under the Algida and Magnum brands.

The facility produces approximately one billion ice-cream units per year and is distinguished by its highly vertical production from raw cookie wafers and nut roasting to final frozen product packaging. The facility produces more than 800 distinct product formats using over 270 different raw ingredients and has invested in digitalization and sustainability with projects to become a zero-emission, digitally advanced factory by 2030.

Initial estimates indicated 27% energy savings, with a payback period of 2.5 years. Actual results exceeded expectations, achieving 38% savings and reducing the payback period to just 2 years.

Unilever

Driving Energy Efficiency - a strategic partnership at Unilever Caivano site

Unilever Caivano Site

Unilever, Danfoss, and NOVENCO Building & Industry joined forces to deliver efficient cooling and energy performance, key factors to Unilever's goal of zero emissions at the Caivano site by 2030.

This paper reviews the technical and cost challenges and details the customized solution implemented at Caivano.

“The Unilever sustainability target is to reduce greenhouse gasses by 100% on the 2015 baseline”.

Alfonso Iozzino
Utilities Coordinator, Unilever Caivano

Energy losses from fixed impeller system

The previous system relied on outdated, inefficient fans with fixed impellers, mounted directly on the fan wall and driven by basic asynchronous motors.

While sufficient to operate the ice cream hardening tunnel, the system added no real value. Even with frequency drives, the fans ran constantly at full speed (50 Hz), wasting energy and limiting performance potential.

Although a visual site survey was possible, harsh conditions - including temperatures of -43°C, outdated documentation, and limited access during production - made data collection difficult. By analyzing comparable fans in similar tunnels onsite, however, we were able to gather enough performance data to specify the optimal retrofit solution.

Previous installation - at Unilever Caivano

50-60%
efficiency of the previous system

Power, Reliability, and Performance at -43°C

Based on detailed analysis and precise performance calculations, six outdated fans were replaced with six NOVENCO ZerAx axial flow fans (type AZL 900), each powered by a 15 kW Nidec permanent magnet (PM) motor.

PM motors deliver exceptional efficiency not only at full load but especially under variable load conditions, making them ideal for this critical application.

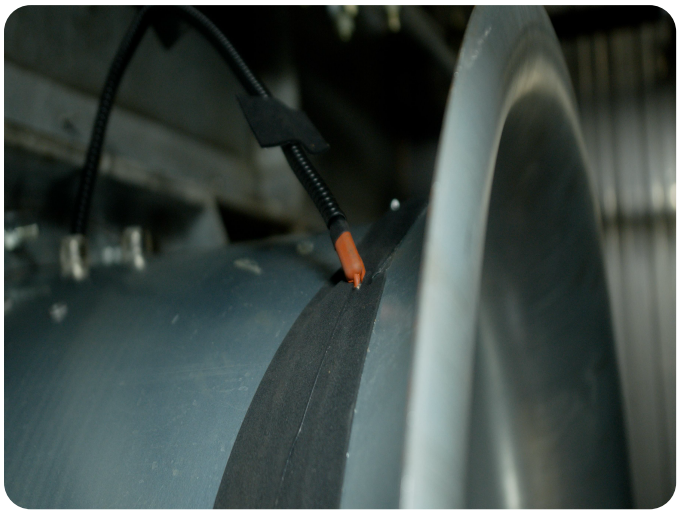
To ensure uncompromised reliability in the extreme cold of the ice cream hardening tunnel, the motors were equipped with:

- Hybrid bearings for 4-8x longer lifetime
- Adapted seals and low-temperature grease for stable operation down to -67°C
- No bearing currents, no pitting - just smooth, consistent performance

The retrofit eliminated the excessive tip clearance of the previous fans. With ZerAx blades operating at just 1 mm clearance, efficiency was maximized. However, these tight tolerances raised a risk - blade freezing during standstill.

ZerAx fan blades operate with less than 1 mm tip clearance for maximum efficiency and minimal energy loss

The solution was to install 200 W heating bands around the rotor casing. These prevent frost buildup, ensuring the fans are ready to operate, even after weekly maintenance stops of the ice cream tunnel.



ZerAx with heating bands

Condensation can damage motors, particularly during temperature swings. Traditionally, this problem is solved with costly space heaters mounted inside the motor casing. However, with the Danfoss FC-102 drive, such heaters are no longer needed. Its built-in DC preheat function delivers a small current to warm the motor from the inside out without any additional hardware or cost.

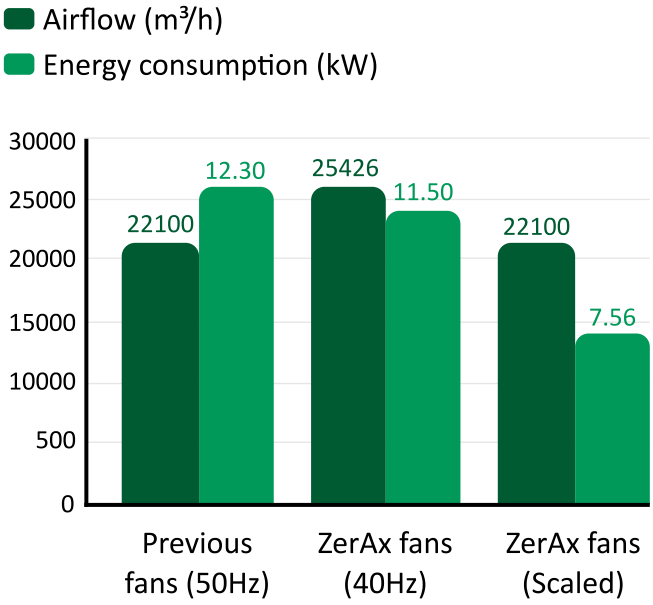
Actual results outperform estimates

Following the retrofit, the performance data clearly showed the improvements. The previous fans provided an airflow of 22,100 m³/h at 50 Hz, consuming 12,3 kW of input power. The airflow of the new NOVENCO ZerAx fans provided 25,426 m³/h at just 40 Hz, consuming only 11,5 kW of input power.

Using fan affinity laws, delivering the same 22,100 m³/h requires just 7.56 kW - achieving 38% energy saving compared to a one-to-one replacement.

Installation of ZerAx fan

Originally projected at 27%, the higher actual savings reduced the payback period from 2.5 to just 2 years.



Compliance & tech specs

This section summarizes the compliance standards and technical specifications for the Unilever Caivano site, including key performance data, system details, and relevant certifications to enable accurate evaluation and comparison

ZerAx fans in the ice cream tunnel, where extreme low temperatures demand maximum efficiency and reliability

The ZerAx fan is far above EU efficiency requirements

The new solution at the Unilever Caivano site achieves efficiencies well above both the previous (40%) and current (50%) EU minimum targets. This demonstrates a strong compliance margin: the fan not only meets existing EU regulations but also aligns with the more stringent 2024 directive.

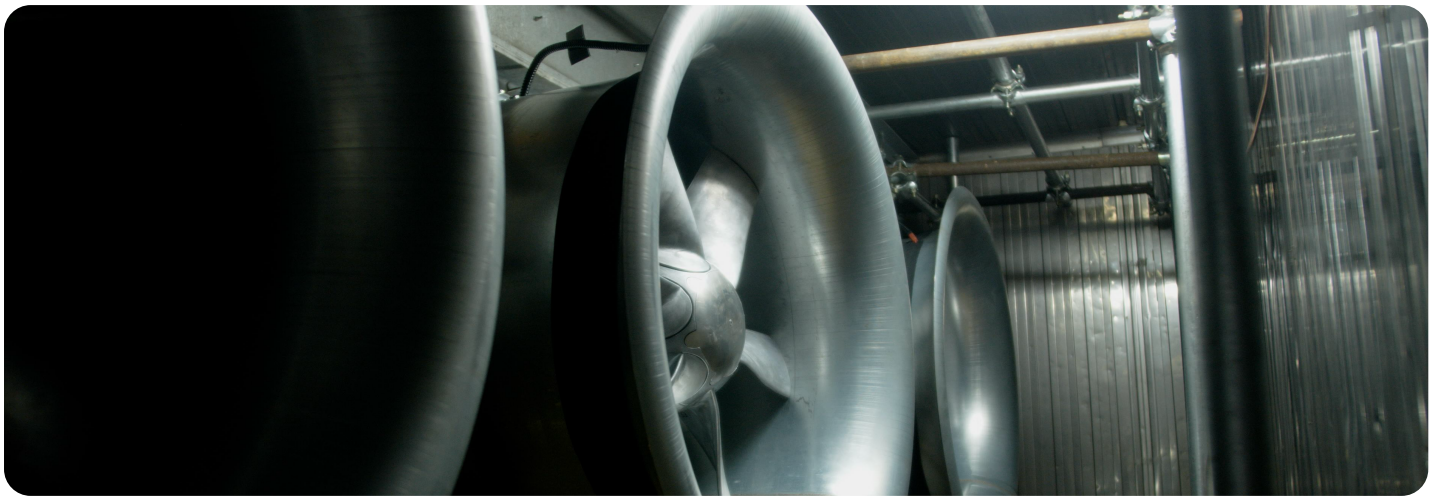
- **Current fan efficiency grade target:** 40% (EU 327/2011 Tier 2)
- **Future fan efficiency grade target from July 2026:** 50% (EU 2024/1834)
- **ZerAx fan efficiency grade:** 86.2% (well above compliance)

The table below highlights the key technical differences between the previous and current systems at Unilever.

	Previous installation	ZerAx AZL axial
Diameter	900 mm	900 mm
Hub size	300 mm	350 mm
Blade angle	N/A	53°
Motor rated power	13 kW	15 kW
Motor make and type	Woods 4P AC (1.500 min^{-1})	Nidec LSHRM 4P PM SynRM (1.500 min^{-1})
Motor efficiency class	IE1/IE2	IE4
Frequency converter	N/A	Danfoss FC-102 15 kW
Heating band	None	Jevi – 200W
Standstill cavity heating	None	Yes – via Danfoss FC-102

Smarter cooling and greater efficiency

Higher airflow enables faster cooling inside the ice tunnel - an outcome the previous fans were unable to achieve.



With special seals and grease, the motor operates safely down to –67 °C, exceeding the –43 °C requirement and reducing service needs.

The added capacity allowed Unilever's engineers to update the ammonia evaporator control strategy. Fans now adjust dynamically to cooling demand instead of running at a fixed speed, improving efficiency and unlocking further energy savings.

In addition to 38% energy savings and a 2-year ROI, the ZerAx retrofit provides additional benefits:

- Increased system reliability
- Longer service intervals
- Enhanced equipment safety
- Demand-based operation for smarter energy use

About NOVENCO

NOVENCO Building & Industry is a global leader in high-efficiency ventilation solutions. With decades of engineering expertise, we develop fans and fan solutions that deliver exceptional energy efficiency, reliable performance and long-term durability - even under the harshest conditions.

The flagship ZerAx® fan series sets the benchmark for efficiency, durability and environmental performance across industrial and commercial applications.

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