

AIRFLOW & ENERGY SAVINGS

- CASES WITH HVLS FANS IN AQUATIC CENTRES

THE GREENEST ENERGY IS THE ONE NOT USED

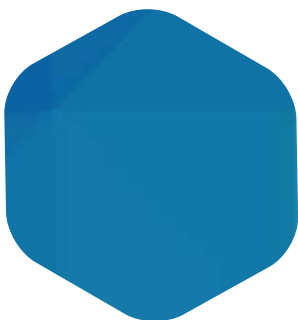
Energy consumption in buildings constitutes around 30% of total energy consumption. The energy is primarily used for heating, ventilation and lighting (International Energy Agency).

Aquatic centers in particular, are some of the most energy-intensive buildings to operate. Water, heating and ventilation all take up a great deal of space in the energy accounts, and it can be hard to change this, without having to make capital investments in the millions.

A large number of aquatic centers have completed budget-friendly projects with Nordicco, with the specific goal of lowering their energy consumption - without compromising their indoor climate.

The idea behind the projects is simple: supplement existing ventilation with more energy-efficient air movement.

The purpose of this case collection is to share some of the success stories. All projects involve installing Nordicco HVLS fans (High-Volume-Low-Speed), which can deliver significant energy savings and a 'here-and-now' effect.



GLADSAXE AQUATIC CENTER

PROJECT INFO

Timeline

Installed July 2022

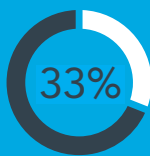
33%

Project Scope

3 x Aggressive Environment
HVLS fans

Results

- 33% reduction of air volume
- Lower district heating use
- Significantly lower electricity consumption



In the summer of 2022, Property Technician Jörgen Vienberg decides to install large HVLS fans in Gladsaxe Aquatic Center in Copenhagen. The center operates on electricity and district heating and is equipped with a MENERGA ventilation system, which runs smoothly.

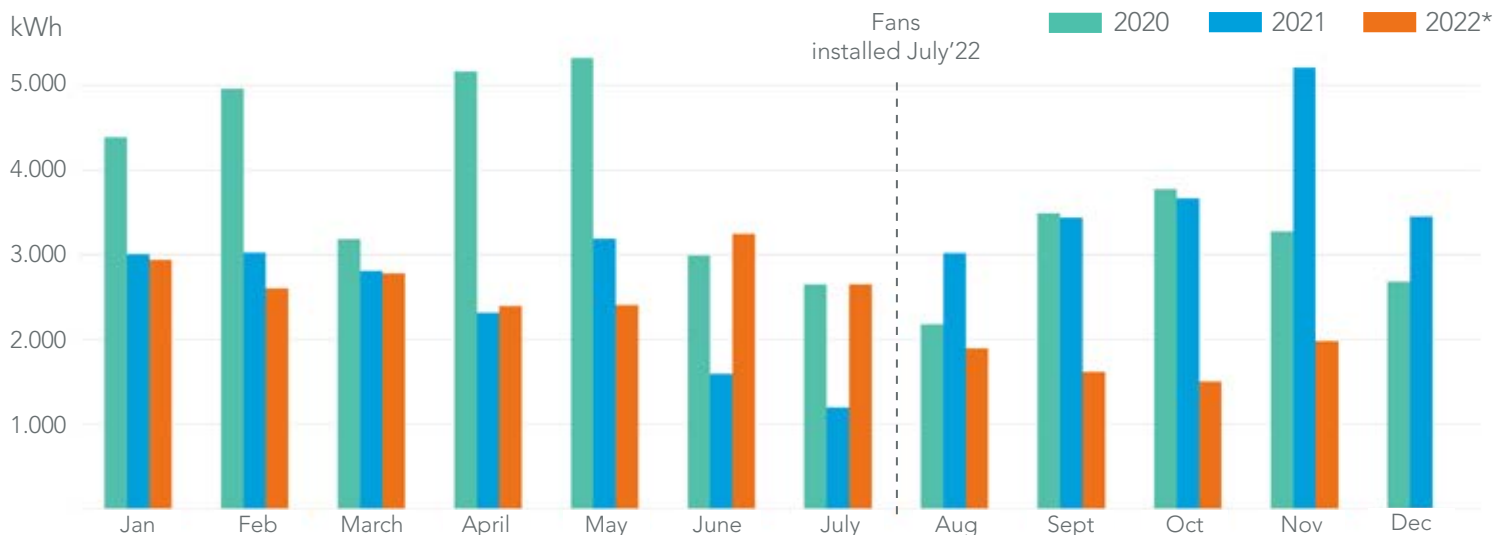
The challenge was, as for many other indoor pools, their large energy consumption as well as a less than optimal air movement. In addition, there was a problem with external doors often being opened by guests.

The solution ended up being 3 HVLS fans of 4 meters in diameter, which were installed in less than a week. Jörgen then slowly adjusted the air volume on the ventilation system: "We first went from 24 to 20,000 m³ per hour and tested what difference it made on the air and whether the users noticed anything. Now we are down to 16,000 m³ of air per hour."

Thanks to the HVLS fans, there has been a 33% reduction in air volume, leading to a significant decrease in electricity usage. The data illustrates a dramatic drop in consumption: 37% in August, 53% in September, 59% in October, and 62% in November, all compared to the same months in 2021. Similarly, district heating usage has decreased by about 5% in the latter half of 2022 compared to projected figures.



Gladsaxe Aquatic Center - Electricity consumption, monthly



Source: Consumption data provided by Gladsaxe Aquatic Center. Note: Data was obtained in beginning of December 2022, which is why this month does not appear on the graph.

IKAST

AQUATIC CENTER

PROJECT INFO

Timeline

February 2023



Project Scope

2 HVLS fans
Northern Sky incl.
Indoor Climate Module

Results

Better airflow and indoor climate.
Electricity savings due to
optimized HVAC operations.

ABOUT IKAST AQUATIC CENTER

Ikast Swimming Center, owned by Ikast-Brande Municipality, traces its origins back to 1959 when it began as an open-air pool. The modern facility, which replaced the original outdoor pool, was inaugurated in 1992. Today, the center spans over 5,000 m² and features a variety of facilities including a sports pool with a large spectator stand, a diving tower, a children's splash area with a slide, a training pool, a baby pool, wellness amenities, a sauna, a café, meeting rooms, offices, and a reception.



The center is not just popular among ordinary guests; it also serves as a vital resource for local schools and the swim club, hosting over 20 different teams weekly. Besides regular operations, it frequently hosts major events such as the Mid-Summer Cup, National Championships, and other competitions.

Kim Neigaard Larsen has been the Technical Manager since 2017, working alongside Center Manager Jesper Harder. Together, they have spearheaded numerous development projects aimed at reducing energy consumption. In 2023, their main focus was on HVLS fans, and Kim has agreed to share their experiences with the technical aspects of the operations before and after implementing the HVLS project with Nordicco.

VENTILATION SYSTEM OVERVIEW

The center is equipped with 10 ventilation systems, 3 of which are primary. These systems incl. rotor exchangers, cross exchangers, and counterflow exchangers.

However, the 3 main systems are designed as heat-pipe exchangers that incorporate a mixing chamber. Kim provides some insight into their primary system:

"The heat-pipe is energy-efficient, which is a significant advantage. However, it also presents a major challenge. The mixing chamber complicates controlling the intake of fresh air, as it obscures the precise measurement of fresh air incorporated during the mixing process."

Despite these complexities, the installation of HVLS fans has not altered their fundamental ventilation principles.



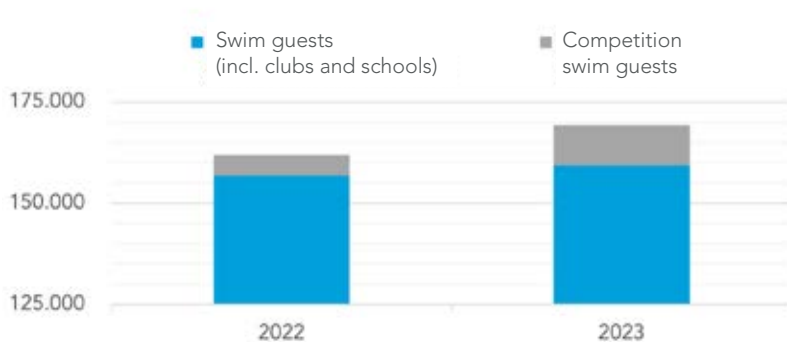
POOR INDOOR CLIMATE AND CHALLENGES WITH RELATIVE HUMIDITY

"I joined Ikast Aquatic Center in 2017 and quickly realized that both staff and guests occasionally found the air quality to be poor. It could often feel clammy and uncomfortable," Kim recounts.

Managing relative humidity (RH) also posed a persistent challenge: "We've never managed to keep the relative humidity low during peak times such as swim meets and holidays," Kim explains, and he shares an anecdote about one of his experiments with the ventilation system:

"I once cranked our ventilation motors up to 100%. The result was quite dramatic—the hinges holding a 1m² inspection door in place couldn't withstand the pressure, and the door blew off."

Number of visitors



THE PROJECT IS LAUNCHED WITH GREAT EXPECTATIONS

Fast forward to February 2023, when Ikast Aquatic Center saw the installation of 2 large HVLS fans from Nordicco, expertly installed by a professional climbing team. At the time, Kim had high hopes for the project.

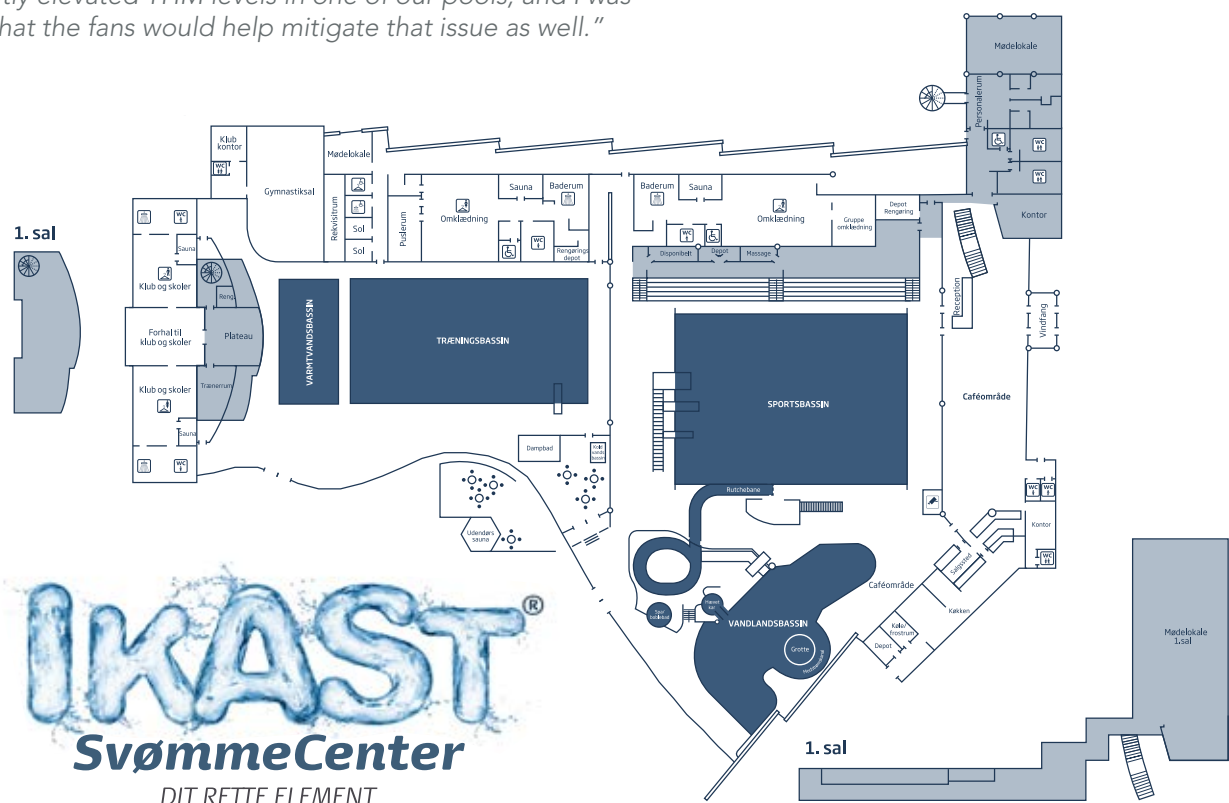
"I was optimistic that we could lower the temperature near the ceiling to utilize that air more effectively, improving the indoor climate overall," he explains. "I also expected better control over relative humidity, along with reductions in our district heating and electricity consumption. Additionally, we were dealing with slightly elevated THM levels in one of our pools, and I was hopeful that the fans would help mitigate that issue as well."

“
Before the fans, we've never been able to keep relative humidity down during peak times such as swim meets and holidays.
”

In his quest to improve air quality and temperature control, Kim discovered a significant temperature differential within the center:

"I noticed that the temperature near the ceiling, about 9 meters up, was 38°C, while at 2 meters it was only 30°C. I wanted to harness that heat energy at ceiling level and redistribute it to where it would be more beneficial."

This insight led Kim to consider a large ceiling fan. "After a lengthy search for a fan that could endure the challenging environment of a swimming pool, I came across Nordicco at a conference a few years back".





February 2023, where 2 large HVLS fans from Nordicco are being installed by a professional climbing team.

PROJECT RESULTS & BEFORE/AFTER DATA

Kim has followed the HVLS project closely throughout 2023 and made operational adjustments on an ongoing basis. He's deliberately not done other projects at the same time, so as not to disturb the results. The following operational adjustments have been made after installation:

- Reduced max speed on the 3 primary ventilation systems by 10 percentage points, specifically from 60% to 50%.
- Air volume was reduced from 8,100 to 7,200 m³/h in the Training area and from 9,000 to 7,700 m³/h in the Sports area.
- Air supply pressure lowered from 600 to 450 Pa in the Training area and from 450 to 330 Pa in the Sports area.

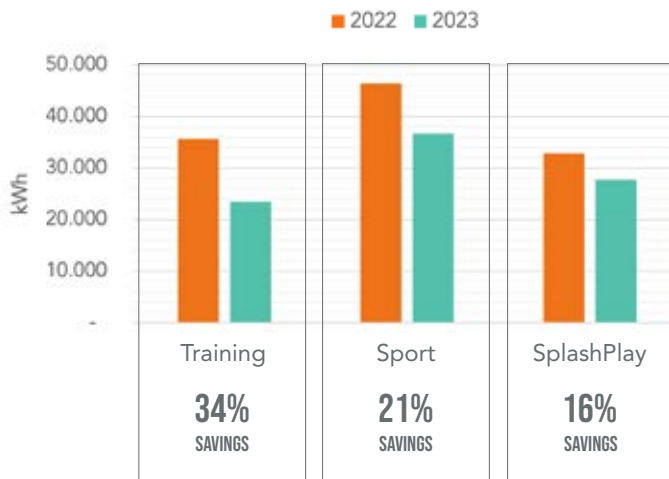
The improvement in indoor climate was particularly noticeable after the fans were installed. Before, the center often felt clammy and uncomfortable during busy periods, but this challenge was now solved. Kim highlights the positive feedback: "There are no more complaints from guests. That's really positive! Both staff and guests can feel the difference, and the improvement in the indoor climate has been remarkable."

VENTILATION

The main result regarding ventilation is an enhanced air flow and a more energy-efficient air circulation. They've followed before/after data closely in connection with operational adjustments.

They've achieved annual electricity savings of 12,183 kWh in Training and 9,738 kWh in Sport, corresponding to 34% and 21% respectively. As far as electricity consumption is concerned, the project has thus exceeded expectations.

Electricity Consumption, Ventilation - per area



THM

THM tests have confirmed that it's been possible to reduce the ventilation operations without causing any significant changes in THM levels.

The tables below show Ikast Aquatic Centers THM data for the two pools, Sport and Training, in 2022 and 2023:

Training	pH	Chlorine bound, mg/l	Chlorine free, mg/l	CFU	THM µg/l
Oct/21	7	0,2	0,9	30	11
April/22	7,3	0,2	1	<10	9,1
Oct/22	7,2	0,3	0,9	10	7,1
April/23	7	0,3	0,9	30	9,8
Oct/23	7,2	0,3	0,9	10	10

Sport	pH	Chlorine bound, mg/l	Chlorine free, mg/l	CFU	THM µg/l
Oct/21	7	0,3	1	10	20
April/22	7,3	0,2	1	<10	14
Oct/22	7,2	0,3	0,9	10	14
April/23	7	0,2	1	<10	14
Oct/23	7,1	0,3	0,9	<10	15

HEATING

On the heating side, Ikast didn't achieve the expected savings:

"We've used roughly the same amount of heat, but we have also raised the air temperature by 1.0° C in Training, as the guests on the side of the pool felt a little cold. We therefore raised the temperature to counteract a chill factor."

In the end, heat consumption is therefore largely the same before/after HVLS – despite the now slightly higher air temperature.

WATER

Regarding water consumption, the data show that they used 85 m³ more water in 2023 compared to 2022 in the Training pool and 55 m³ more in the Sports pool. Kim explains that this makes sense when comparing the years in detail, since in 2023 there were more guests and also an extra competition event than in 2022:

"The filters for water treatment have been rinsed more, but when we look at stand-by consumption (evaporation) of the pools, there's no difference year to year," he says.

IKAST

AQUATIC CENTER



NORTHERN SKY® REVEALS THE CO₂-CONCENTRATION IN THE AIR

After adopting the online management platform Northern Sky and installing indoor climate sensors, Ikast has significantly improved its ability to monitor CO₂ levels in the air.

'I can now see the exact CO₂ content, which is fantastic - I actually didn't have access to this data before,' Kim remarks about this feature. He adds:

"Before we installed the ceiling fans, I relied on guest feedback and my own senses to determine when the indoor climate in the swimming hall became unbearably poor.

Now, with the CO₂ sensors and ceiling fans integrated as one system, I can directly check the management platform to know when it's time to circulate more fresh air."






Kim has also performed 'smoke tests' to see the airflow with and without HVLS fans.

Scan to watch:



ADVANTAGES & DISADVANTAGES OF HVLS – ACCORDING TO KIM NEIGAARD LARSEN:

-  HVLS effectively mixes air within the aquatic center at a much lower cost than using a traditional ventilation system. In the case of Ikast, it wasn't financially feasible to circulate the air near the ceiling without HVLS.
-  The chill factor can be a downside, requiring careful consideration of temperature settings and the placement of stationary guests, or opting to run the fan at a low speed (RPM).
-  Based on my experience, regardless of the ventilation system in place, HVLS will always make a positive difference. This is because the fan aids in air mixing and consumes almost no electricity.



Kim Neigaard Larsen originally trained as an air conditioning technician and has always been driven by technical curiosity. He also serves as a lifeguard judge in his spare time.

TAARNBY MUNICIPALITY

PROJECT INFO

Timeline

Spring/summer 2022

Project Scope

3 Aquatic Centers
2 Sports facilities
1 School
1 Culture Center



Photo - example of Northern Air Aggressive Environment installation.

Taarnby Municipality has deployed HVLS ceiling fans in several venues, including three aquatic centers, as part of a project led by Climate and Energy Advisor Rune Klitgaard.

The primary challenge in these swimming halls was the enormous energy consumption. Simply reducing the operation of the ventilation systems risked compromising the already strained indoor climate, exacerbated by high relative humidity. To address this, Taarnby Municipality opted to install Northern Air® Aggressive Environment fans, specifically designed for harsh environments, in three facilities.

These HVLS fans allow for reduced energy consumption without sacrificing indoor air quality. Apart from the aquatic centers, standard Nordiccø HVLS fans have been installed in two of the municipality's sports facilities. With a total of 14 fans distributed across various locations, the goal is for Taarnby Municipality to achieve significant energy savings.

However, these savings are expected to vary by location, as the most substantial reductions typically occur in the largest facilities. Furthermore, the decision to install HVLS fans was driven by their ability to offer a quick and cost-effective solution.



WATER-HOUSE

NORTH DENMARK

PROJECT INFO

Timeline

Installed in 2022

Project Scope

3 Aggressive Environment
HVLS fans

Result

Significant energy savings
1 year pay-back period

The aquatic center 'Water House' in Hjørring Municipality installed large HVLS ceiling fans from Nordicco to reduce the building's overall energy consumption. The idea behind the project was to partially replace the ventilation task with more energy-efficient air movement, which is precisely what HVLS fans provide. Simplifying, the goal was to 'turn up the ceiling fans and turn down the ventilation system.'

Since the installation in 2022, WaterHouse's technical department has closely monitored the project, making ongoing adjustments and fine-tuning both the ventilation and heating systems. This approach has enabled them to cut energy consumption without compromising the indoor climate or user experience.



The HVLS fans have led to significant energy savings at the WaterHouse. Both Hjørring Municipality and the technical department at the swimming hall have been tracking the results. Specifically, Gregers Larsen from Hjørring Sports Facilities (which the WaterHouse is part of) reports savings of 144,000 kWh in heating, 40,000 kWh in electricity, and 312 m³ in water consumption.

According to Ole Magnussen, energy consultant at Hjørring Municipality, these results mean the project will pay for itself in about one year, which both the technical department on-site and the Municipality are very pleased with.



FACTS

- 144 MWh heat savings
- 40,000 kWh electricity savings
- 312 m³ reduction in water use
- 1 year pay-back period



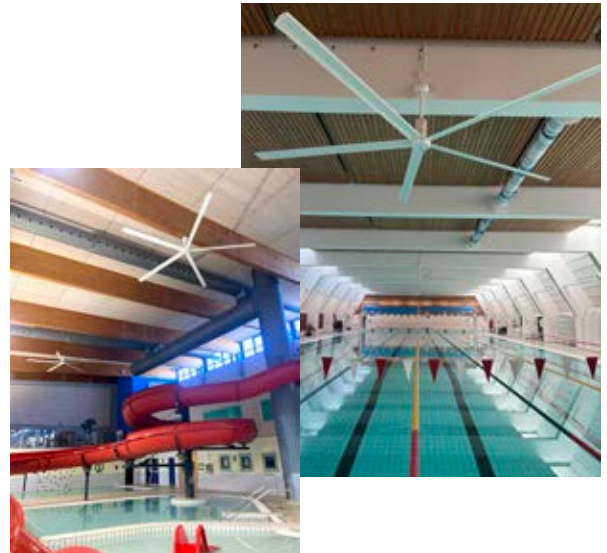
Scan and see
the whole
interview on
YouTube:



NORTHERN AIR® AGGRESSIVE ENVIRONMENT

The Northern Air® Aggressive Environment is a white HVLS fan specially designed for harsh environments, such as swimming halls or other areas with high humidity. HVLS stands for High Volume Low Speed, indicating that this type of fan moves large amounts of air slowly, efficiently, and with few revolutions per minute (RPM).

- Effectively mixes air in large spaces
- Specially coated and IP54 rated for durability
- Energy-efficient and silent direct-drive motor
- Designed and manufactured in Denmark
- Passed 'Ball Impact Test' – DIN18032-3



TESTED BY FORCE TECHNOLOGY

Force Technology has conducted tests on the Northern Air® Aggressive Environment fan. These tests evaluated the system's durability in corrosive environments and included an accelerated corrosion analysis (IEC 60068-2-52:2017), as well as tests for resistance to solids, IP5X (IEC 60529:2013), and water, IPX5 (IEC 60529:2013).

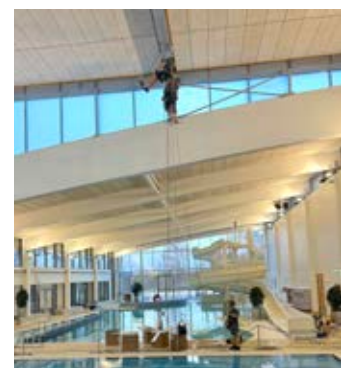
The results of these three tests confirm that the Northern Air® Aggressive Environment system overall has an IP54 rating, while the Drive control housing itself has an IP55 rating. Additionally, the accelerated corrosion analysis of the system's C4 coating demonstrates significant resistance to the onset of corrosion.

PLUG & PLAY INSTALLATION PROCESS

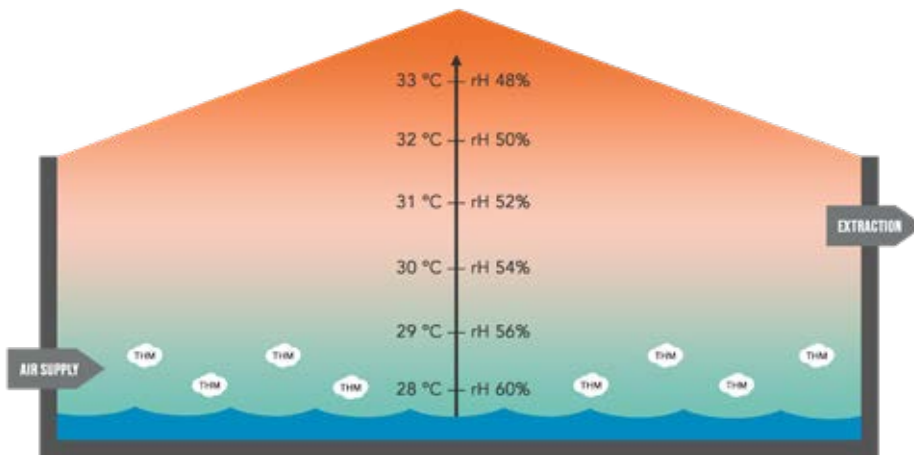
Installing a Nordicco HVLS fan is a Plug & Play process, as all components and factory electronics are delivered assembled. Therefore, the installation process simply involves mounting the motor unit and securing the blades.

The challenging part is that installers must work safely and stably under the ceiling. This often requires a lift or scaffolding, but in swimming halls, professional climbers are also a commonly used method for installations, especially if it's done directly over a deep pool or in other hard-to-reach areas.

The installation time largely depends on the design of the ceiling as well as its height. Typically, a standard installation in an aquatic center takes about one day per system - from arrival on-site to complete installation and clean-up.



HVLS IN AQUATIC CENTERS



WITHOUT HVLS INSTALLED

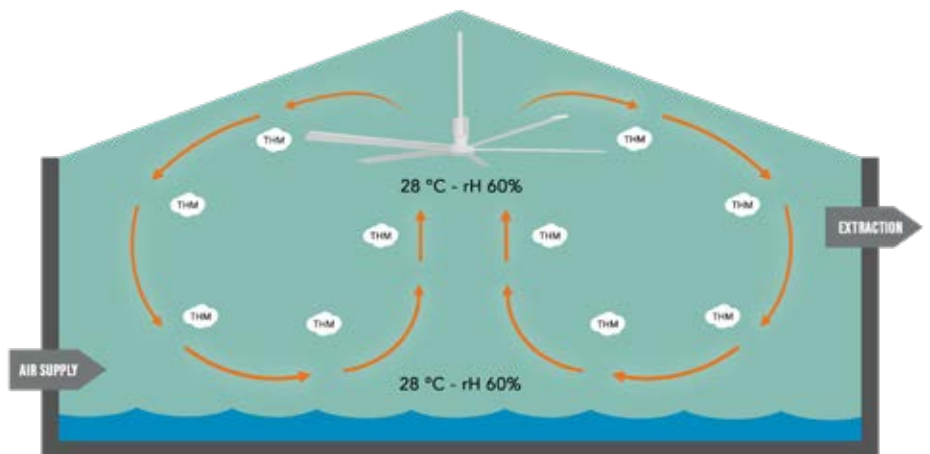
Many swimming halls face challenges in fully utilizing the air within the space. Particularly, the air that gathers under the ceiling can be difficult to circulate effectively for some ventilation systems.

Additionally, these facilities might struggle with THMs (Trihalomethanes) at the water surface. There might also be a noticeable temperature gradient and differences in relative humidity (RH) at various heights, which could be better exploited.

WITH HVLS INSTALLED

Installing an HVLS fan can optimize the existing ventilation. In some cases, THMs can be more evenly distributed throughout the space, reducing their concentration at the water surface.

The air under the ceiling can also be better utilized, and typically, the major benefit is that the load on the existing HVAC system can be reduced, as the HVLS fan takes over part of the air circulation task.



SELECTED REFERENCES FROM AQUATIC CENTRES



GET A FREE BUILDING CONSULTATION

Most people are surprised by the significant impact HVLS fans can have on their facilities and how attractive the business case looks.

Are you ready to enhance your facility's efficiency and comfort?
If you're interested in having your facilities evaluated and would like to arrange a free, no-commitment consultation, please reach out to us.

Our team is eager to guide you through the possibilities our solutions offer.
Discover the difference.

// The Nordicco Team



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