



Novel Ultra-Efficient Cooling System for a Climate-Resilient Future



Message from the Innovator

Cooling accounts for nearly 20% of the global electricity consumption, and in regions like the Middle East and North Africa (MENA), it can exceed significantly during the scorching summer months. When the temperature rises to unbearable heights, the need for cooling systems becomes a matter of survival. For a scenario without concrete action, the International Energy Agency has already painted a stark picture: a future where energy demands from air conditioners triple, a “Cold Crunch” looming on the horizon. The escalating climate crisis demands urgent action, and the energy sector stands at the forefront of this challenge.

This was the critical realization that spurred the development of SYNERGIA9n1, an ultraefficient, multimodal cooling system that not only addresses the immediate needs of the present, but anticipates the challenges of the future. With SYNERGIA9n1, we have created something groundbreaking — a system that can achieve 50% greater energy efficiency, which substantially lowers greenhouse gas emissions. It is adaptable, scalable, and, above all, it is the kind of innovation that our world desperately needs.



The development of SYNERGIA9n1 follows a decade of persistent efforts. This journey was not linear. It was marked by both triumphs and setbacks. There were times when it seemed like we had reached a dead end, but we did not give up on our goal to revolutionize cooling technology with low-carbon alternatives. From China and Germany, to UAE, and finally in Qatar, many prototypes were conceived and assembled, each iteration a step closer to our vision, each failure a valuable lesson. All this led to SYNERGIA9n1's final prototype securing patents from UK, USA and the World Intellectual Property Organization headquartered in Geneva, Switzerland.

As we roll out the commercial prototype of SYNERGIA9n1, I want to express my deepest gratitude to the remarkable team behind this innovation, and for the invaluable support from leading entities, including the Qatar National Research Fund and the Supreme Committee for Delivery & Legacy.

As proud as I am of what we have accomplished, I am even more inspired by the work still to be done. As we look toward the future, the need for innovation will only grow stronger, and SYNERGIA9n1 is just the beginning. We are keen for its widespread adoption to support a climate-resilient future where we can look back and say, “We did our part. We made a difference.”

Yousef Alhorr

Dr. Yousef M. Alhorr
Founding Chairman, GORD.

What's SYNERGIA9n1?

With its development led by Dr. Yousef Alhorr, Founding Chairman of GORD, SYNERGIA9n1 is a patented and award winning ultraefficient, and multi-modal dedicated outdoor air system(DOAS). SYNERGIA9n1 implements a novel multicore configuration that demonstrates major improvements in cooling and ventilation efficiency. It is designed to cool and ventilate both open and enclosed spaces. Compared to conventional direct expansion (DX) condensing units or air-cooled chiller systems, experimental data indicates that SYNERGIA9n1 is capable of achieving up to 50% reduction in energy consumption during harsh hot and humid summer conditions.



**LOW-CARBON, ULTRA-EFFICIENT, MULTIMODE
COOLING SYSTEM FOR ALL CLIMATES**

The term 'SYNERGIA9n1' is inspired from the system's unique ability to harmonize nine solutions.

Applications

Offering great adaptability to meet various cooling needs, SYNERGIA9n1 can be installed in a wide range of spaces, buildings and facilities that include:



Open areas for sports, leisure, and entertainment



Buildings of all types utilizing fresh air mechanical ventilation systems



Hospitals, surgery suites, laboratories and clean rooms prohibiting circulated air



Industrial workshops and process facilities exposed to airborne particles



Greenhouses requiring humidity and temperature control



Barns requiring climatization and optimum air quality

Benefits

What makes SYNERGIA9n1 truly unique is its ability to be operated in single, dual or triple modes based on the ambient weather conditions and the climatization requirements for the space to be cooled. SYNERGIA9n1 offers a wide range of benefits including:



Energy Efficiency



Multimode Operations



Reduced Carbon Footprint



Diverse Applicability



Ease of Use



High Durability



Improved Air Quality



Cost Effectiveness



Climate Smart System

How it works?

Consolidating nine distinct solutions, SYNERGIA9n1 smartly cools down the fresh air in a multicore system capable of treating the air in three stages where each stage contributes to the reduction of the latent and sensible load of the air, making it a sustainable cooling alternative for various types of outdoor and indoor spaces.

STAGE (I)

In the initial dehumidification process stage, the system employs a multi-layered desiccant system fabricated from composite materials. This part incorporates an integrated showering system ensuring uniform distribution of eco-friendly liquid desiccant throughout the desiccator fabric, which facilitates efficient moisture extraction from the air stream thereby reducing partially its latent load.

STAGE (II)

The second stage implements an indirect evaporative cooling process which utilizes a specialized crossflow water-to-air heat exchanger mimicking mini cooling towers. The air temperature decreases, leading to a reduction in its sensible load as a result of water-air indirect interaction.

STAGE (III)

The final stage incorporates a vapor compression cycle which utilizes scroll type compressors where process air is chilled when passing through the evaporator system. Air distribution is achieved through electronically commutated (EC) fans with variable speed capability, controlled via custom-developed and optimized programmable logic controller (PLC).

Novelty of SYNERGIA9n1

The term 'SYNERGIA9n1' is inspired from the system's unique ability to synergize or harmonize 3 proven cooling technologies with 6 energy harvesting techniques to realize the ultra-efficient performance in terms of energy saving, carbon emissions reduction and durability.

The proven cooling technologies supported by SYNERGIA9n1 include:

1. Innovative Liquid Desiccant Dehumidification
2. Reimagined Indirect Evaporative Cooling
3. Optimized Vapor Compression Cycle

The energy harvesting techniques supported by SYNERGIA9n1 include:

1. Condenser Adiabatic Cooling utilizing the wetted scavenging air stream
2. Refrigerant Desuperheating using brazed plate type heat exchanger
3. VFD Operated Condenser Fans to reduce energy consumption during partial load
4. Condensate Water Recovery resulting from condensation on the evaporator coil
5. Refrigerant Waste Heat Recovery to heat up diluted desiccant for reconcentration/regeneration
6. Desiccant Heat Rejection via evaporatively cooled water for enhancing dehumidification capacity

Why 9n1 ?

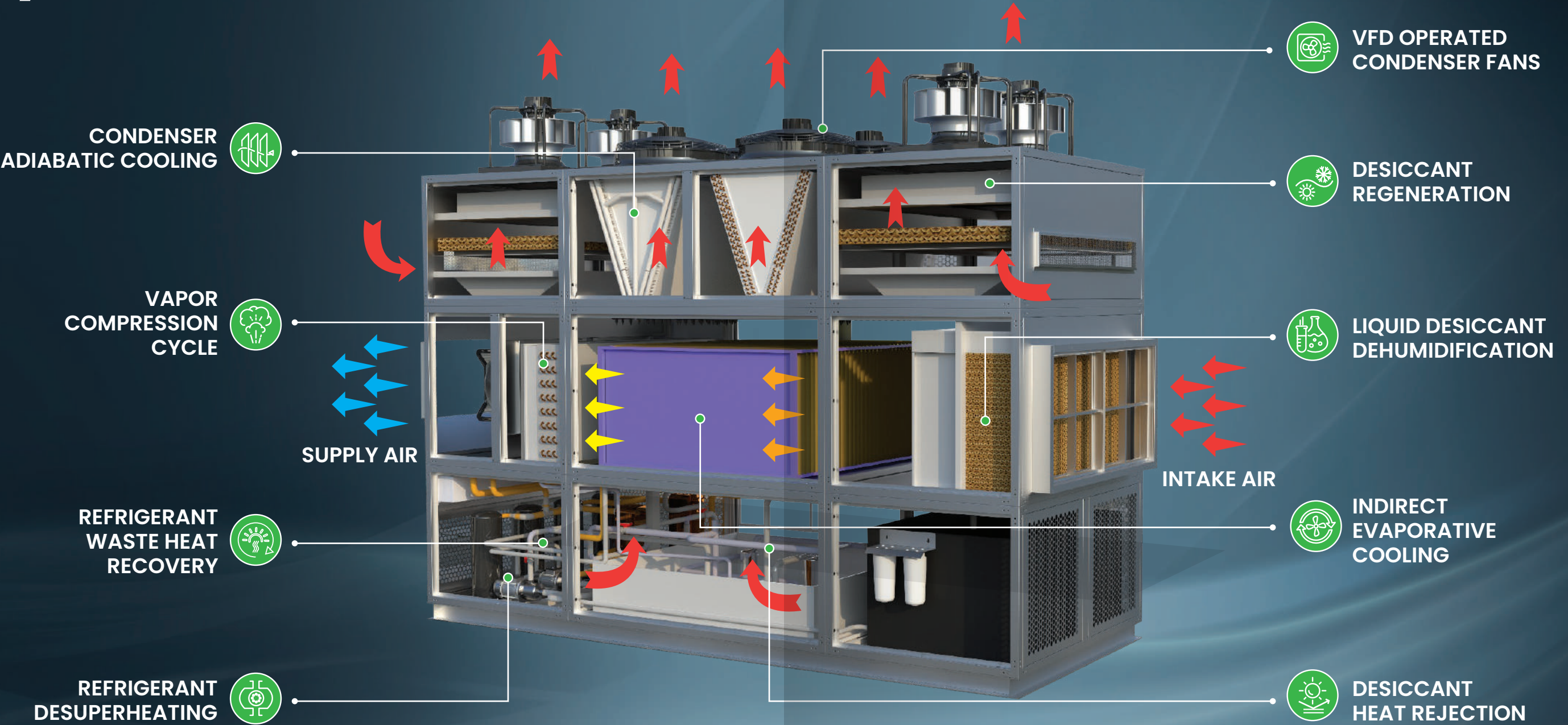
3 COOLING TECHNOLOGIES



6 ENERGY HARVESTING TECHNIQUES

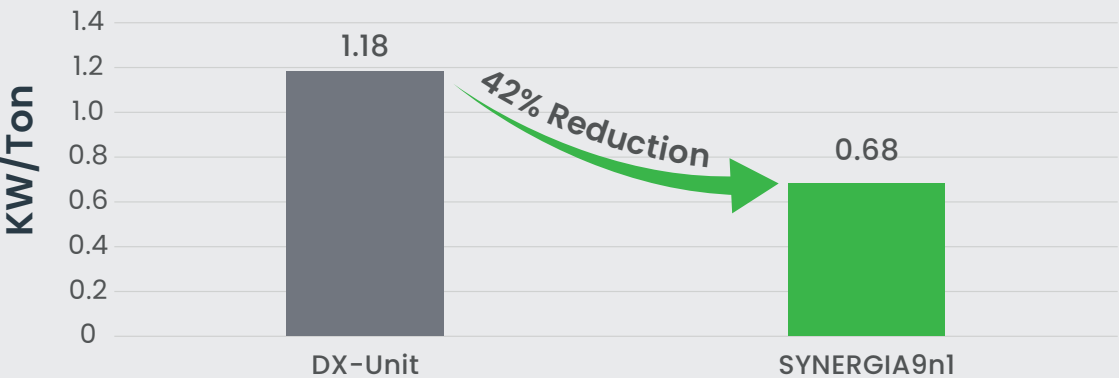


First-of-its-kind System



SYNERGIA9n1 & DX-UNIT Real Time Performance Comparison

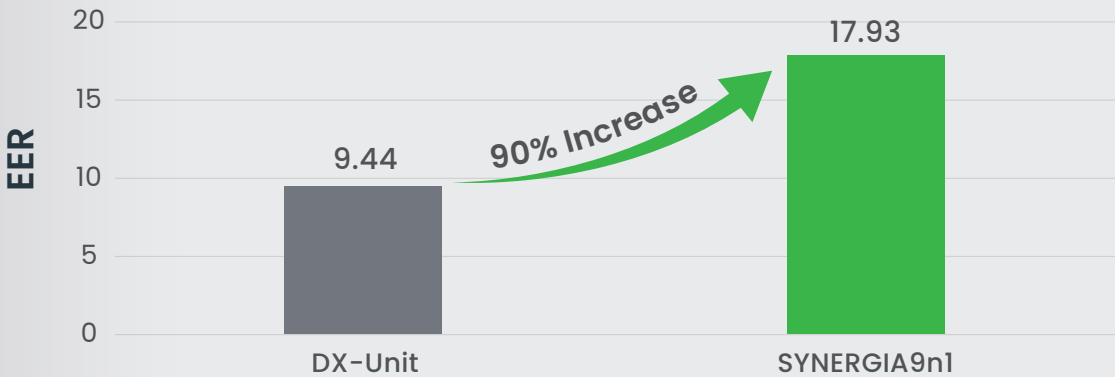
SYNERGIA9n1 & DX-Unit KW/Ton Comparison



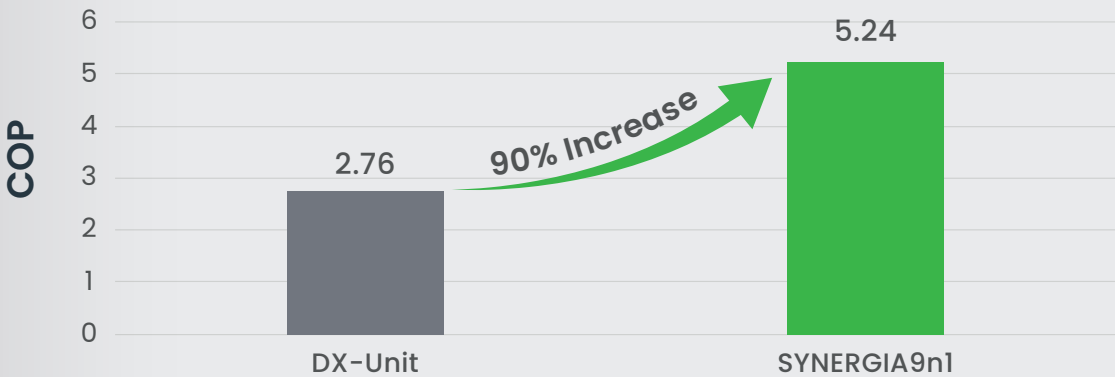
Testing Conditions:

- Set point temperature : 18°C
- Air flow rate : 11,000 CFM
- Run time : 24 Hours
- DBT : 45°C
- WBT : 29°C
- Date of testing : 22 to 23rd Sep 2024

SYNERGIA9n1 & DX-Unit EER Comparison



SYNERGIA9n1 & DX-Unit COP Comparison



International Recognitions



Energy Innovation of the Year 2022 award by the Association of Energy Engineers (AEE), USA



Best Patent in Energy Efficiency Award in 2024 by the League of Arab States (LAS).

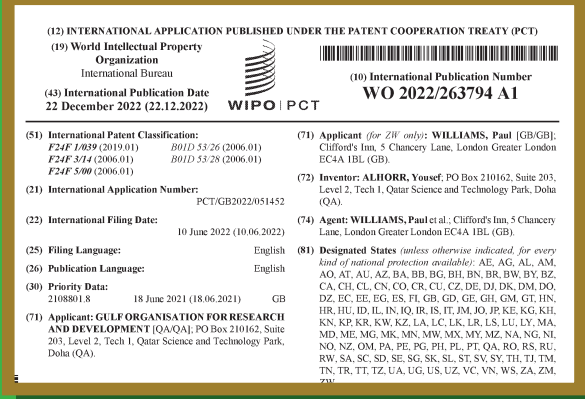
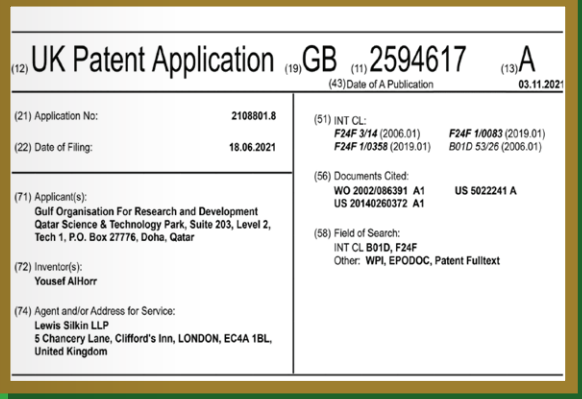
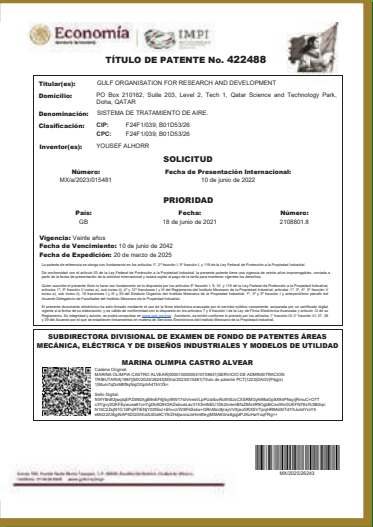
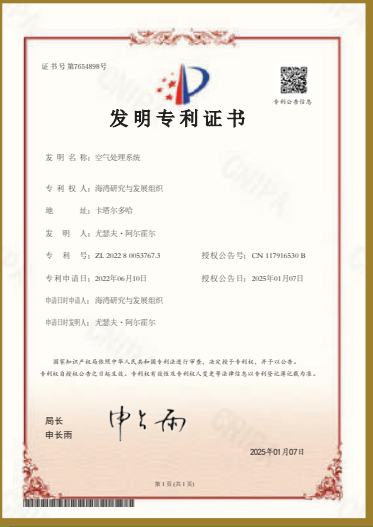


TAKREEM Award for Environmental Development and Sustainability.



General Secretariat of the Gulf Cooperation Council (GCC) Award and Gold Medal at the 15th International Invention Fair of the Middle East

Patent Protection



GRANTED PATENTS (WIPO Switzerland, UK, USA, China and Mexico)

State-of-the-art unit control system

The operation of SYNERGIA9n1 with its underlying solutions is orchestrated through a proprietary coded programmable logic controller (PLC) utilizing internet of things (IoT) devices such as sensors and meters which seamlessly connect to the internet, enabling them to collect, exchange, and act upon data via purposely developed online device management system. The two-way communication command facilitated by the dedicated online portal allows the operator to monitor and control the unit remotely, in addition to providing health check and troubleshooting capabilities leading to lower operations and maintenance costs.



A future-proof
cooling system for
climate-conscious
businesses

ABOUT GORD

SYNERGIA9n1 is a product of the Gulf Organisation for Research & Development (GORD) is an organization headquartered in Qatar Science & Technology Park (QSTP). GORD provides a holistic energy ecosystem for organizations to enhance their energy performance through climate-adaptive solutions that support continuous improvement principle towards environmental sustainability.



To learn more about SYNERGIA9n1



Tel: +974 4141 5000
PO Box: 210162, Doha Qatar
www.gord.qa