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ADVANCING HYDRONIC SYSTEM DESIGN IN COLD CLIMATES: A TECHNICAL OVERVIEW OF THE ECODAN WUZ AIR-TO-WATER HEAT PUMP

As electrification continues to shape HVAC design in Canada, air-to-water heat pumps are becoming a practical option for hydronic heating, cooling, and domestic hot water (DHW). However, in cold climates, concerns around freeze protection, installation complexity, and low-ambient performance remain key considerations.

Canada's climate is defined by some of the world's widest annual temperature swings, especially in cities like Montreal and Winnipeg (ASHRAE Zone 6A & 7A), where both frigid winters and hot, humid summers place exceptional demands on building comfort systems. High heating and cooling degree days across the country make it essential for modern homes to have resilient, dual-purpose solutions.

The Mitsubishi Electric Ecodan WUZ is an all-in-one air-to-water system designed to address these challenges with a cold-climate ready product. For contractors and system designers, its configuration reflects how modern systems can simplify installation while expanding application potential.

REFRIGERANT SPLIT DESIGN AND FREEZE PROTECTION

A defining feature of the system is its refrigerant split design. Unlike monobloc systems that circulate water outdoors, the Ecodan WUZ keeps the hydronic loop entirely indoors, with refrigerant pipe connections between the outdoor and indoor Hydrobox.

This approach offers clear installation advantages:

- Eliminates the need for glycol in most applications, improving heat transfer efficiency
- Removes reliance on heat tracing of outdoor water piping
- Reduces freeze risk during extreme temperatures or outages
- Simplifies commissioning and maintenance

For Canadian applications, this design directly addresses one of the primary adoption barriers for air-to-water systems.

COLD CLIMATE OPERATION AND EFFICIENCY

The system incorporates Hyper-Heating INVERTER® (H2i®) technology, enabling operation in outdoor temperatures as low as -30°C while maintaining 100% heating capacity at -15°C .

From a design perspective, this supports:

- Reduced dependence on supplemental heating
- More stable performance during peak winter conditions
- Greater confidence in system sizing

With a coefficient of performance (COP) of up to 5.05, the system can deliver efficient operation under optimal conditions, helping reduce energy consumption compared to conventional electric heating.

INTEGRATED HYDROBOX AND INSTALLATION BENEFITS

At the core of the system is an integrated hydrobox combining key components:

- Circulation pump
- Expansion vessel
- Plate heat exchanger
- Magnetic filter
- Booster heater

For contractors, this reduces field assembly and system complexity, resulting in:

- Faster installation timelines
- Reduced piping and connection points
- Improved service access as troubleshooting can be performed from the Hydrobox which is installed indoors.
- Integrated design also helps standardize installations across projects.

MULTI-FUNCTION CAPABILITY

The system is designed to support multiple applications:

- DHW Production: Year-round operation with leaving water temperatures up to 70°C
- Space Heating: Compatible with radiant floors, panel radiators, and fan coils
- Space Cooling: Provides chilled water for cooling when paired with appropriate emitters

This versatility makes it suitable for both new construction and retrofit applications, particularly where existing hydronic infrastructure is in place.

CONTROLS, APPLICATIONS, AND INTEGRATION

An integrated Eco Mode adjusts water temperature based on outdoor conditions, supporting efficiency and reducing manual intervention. Available in 2, 3 and 4-ton capacities, the system can be applied across residential and light commercial projects.

Additional considerations include:

- Use of low-GWP R-32 refrigerant
- Quiet outdoor operation as low as 41–45 dB(A)
- Zoning capability and boiler integration for hybrid systems
- Built-in protections such as flow monitoring and automatic air venting

CONCLUSION

Advancements in air-to-water heat pump design are expanding their viability in cold climates. By addressing freeze protection, low-ambient performance, and installation complexity, systems like the Ecodan WUZ provide a streamlined approach to hydronic heating, cooling, and DHW.

For contractors and system designers, understanding these design elements is key to successfully applying air-to-water technology in modern, electrified hydronic systems.

For more information go to www.EcodanWUZ.ca.



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