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ÚSTAV POZEMNÍHO STAVITELSTVÍ

HOUSE WITH TATTOO STUDIO

RODINNÝ DOM S TETOVAČÍM ŠTÚDIOM

SEMINARY WORK – HEAT PUMP

BACHELOR'S THESIS

BAKALÁRSKA PRÁCA

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PZP Ambient Heat Pump – The Ideal Solution for Low-Energy Homes

1. Introduction

With rising energy costs and increasing environmental awareness, efficient, eco-friendly heating solutions are gaining popularity. Heat pumps have emerged as a key technology in this field, especially in low-energy and passive homes, where they ensure cost-effective heating, domestic hot water, and even cooling.

Among the most advanced systems on the market is the PZP Ambient air-to-water heat pump, known for high efficiency, quiet operation, and long-term sustainability. This seminar paper explores the principles of heat pumps, their benefits, installation process, and their economic and ecological impact, with a focus on the PZP Ambient model, which will be the sole heating source in a low-energy house.

2. HEAT PUMP

2.1. What is a Heat Pump and How Does it Work?

A heat pump is a renewable energy system that transfers heat from the external environment (air, water, or ground) to provide heating and domestic hot water. It works on the reverse refrigeration cycle, extracting low-temperature heat from the surroundings, compressing it to increase the temperature, and then distributing it within the building.

2.2. Types of Heat Pumps:

- Air-to-water – extracts heat from the outside air and transfers it to water-based heating systems.
- Ground-to-water – utilizes underground thermal energy via collectors or boreholes.
- Water-to-water – derives heat from groundwater sources.

The PZP Ambient model operates as an air-to-water system, which is easy to install, making it an ideal choice for new homes and energy-efficient renovations.

2.3. Installation and Usage of the PZP Ambient Heat Pump

Installation Process:

1. Site Selection: The heat pump unit is installed outdoors, preferably on a concrete foundation or wall mount.
2. Hydraulic Connections: Connects to the home's heating system (radiators or underfloor heating).
3. Electrical Setup: Requires a dedicated electrical connection, typically 400V or 230V.
4. Refrigerant Circuit & Testing: The system is filled with eco-friendly refrigerant.
5. Control System Configuration: Smart thermostats allow efficient temperature regulation.

Operation and Maintenance:

- Automatic Operation: Adjusts to outdoor temperatures.
- Periodic Filter Cleaning: Ensures optimal airflow.
- Annual Professional Inspection: Checks efficiency, refrigerant levels, and connections.
- Defrost Mode in Winter: Prevents ice buildup on the outdoor unit.

Lifespan: Well-maintained PZP Ambient heat pumps typically last 15–20 years.

2.4. Economic Analysis – Cost Savings and Return on Investment

Initial Investment and Operating Costs:

PZP Ambient Heat Pump: €8,000 – €12,000

Installation: €2,500 – €4,000

Total Initial Cost: €10,500 – €16,000

Annual Electricity Cost: €500 – €900

Comparison with Alternative Heating Systems:

PZP Ambient Heat Pump: €700/year, €14,000 over 20 years.

Gas Boiler: €1,800 – €2,200/year, €36,000 – €44,000 over 20 years.

Electric Heating: €2,500 – €3,500/year, €50,000 – €70,000 over 20 years.

Return on Investment (ROI): Estimated payback period: 5–8 years.

2.5. Ecological Benefits – Carbon Footprint Reduction

CO₂ Emissions Comparison:

PZP Ambient Heat Pump: 400 – 800 kg/year.

Gas Boiler: 4,000 – 6,000 kg/year.

Electric Heating: 5,000 – 7,500 kg/year.

Heat pumps cut CO₂ emissions by up to 85% compared to gas heating!

Integration with Renewable Energy:

- Can be paired with solar panels to achieve net-zero energy consumption.
- Uses environmentally friendly refrigerants, minimizing its climate impact.

2.6. Why is the PZP Ambient Heat Pump Ideal for Low-Energy Homes?

Heat pumps are an ideal solution for low-energy homes due to their high efficiency and minimal energy consumption. The annual energy demand in such homes ranges between **15–40 kWh/m²**, ensuring low operating costs. A major advantage is their ability to maintain a **stable indoor temperature**, operating efficiently even at extreme temperatures as low as **-25°C**.

Another key benefit is the **availability of government incentives**, such as the **New Green Savings program in the Czech Republic** and support from **EU green energy funds**.

Additionally, the system is **highly versatile**, providing not only **heating** but also **cooling** and **hot water production**, enhancing overall home comfort. PZP Ambient heat pumps are also known for their **long lifespan**, making them a more reliable alternative to traditional gas or electric boilers.

3. CONCLUSION

The PZP Ambient air-to-water heat pump is a cost-effective, environmentally friendly, and high-efficiency solution for low-energy homes. With significant operational savings, reduced carbon footprint, and smart automation, it represents the future of sustainable heating.

By choosing PZP Ambient as the sole heating system, homeowners benefit from lower energy bills, government subsidies, and a long-lasting investment. Given its ability to integrate with solar energy, it provides energy independence and carbon neutrality for modern homes.

Investing in a heat pump is a long-term step toward sustainability, financial savings, and a greener future!

4. SOURCES

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