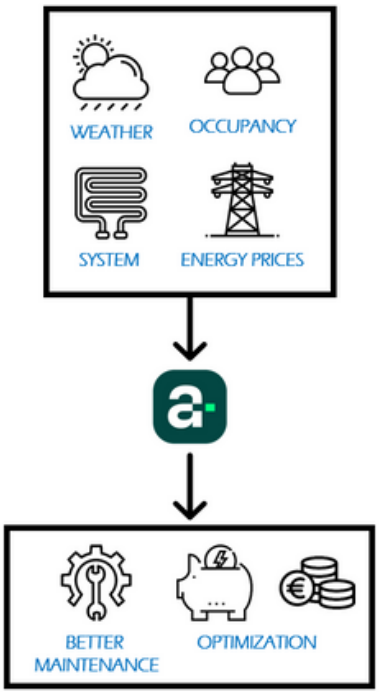
ALMMA

ALGORITHMS FOR MONITORING AND THE MANAGEMENT OF HVAC SYSTEMS

IREC
Shaping Energy for a Sustainable Future

THE CONCEPT



ADDED VALUE

- Optimization balancing comfort-cost-environment
- Increased lifetime of equipment

TRL

7

REGISTERED

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PRODUCT DESCRIPTION

- Two complementary control algorithms improve operation and performance of heating and cooling systems
  - **Fault detection and diagnosis (FDD)** algorithm assesses heat pump performance and identifies anomalies to reduce energy and operational costs
  - **Model predictive control (MPC)** enables to plan and operate heat pumps or other HVAC systems in an optimal way based on external inputs
- Takes into account the specificities of the system, short-term forecasts of weather, occupancy and prices
- Possible to integrate with existing platforms

APPLICATIONS

- Heat pumps
- Flexible heating and cooling loads
- Control and operation of HVAC systems

DESIRED PARTNERS

Heat pump manufacturers, facility managers, aggregators of flexibility, owners or constructors of buildings, developers of energy management systems

EXPECTED BENEFITS

- 20-30% energy savings
- Fault detection
- Improved thermal comfort
- 30% reduction of energy bills

technical details

KEY ELEMENTS OF PREDICTIVE CONTROLS

Predictive and price-driven rule controls reduce energy costs and environmental footprint of heating and cooling. It uses simplified models to predict the behavior of the system and defines the optimal energy management strategy for heating and cooling. The input data is the forecast of weather, energy market prices and occupancy in the building, so that the predicted scenario consider future boundary conditions. The developed solutions manage thermal mass of the buildings to enhance energy flexibility. In addition, the algorithms are able to include solutions of active demand-side management through existing protocols like Smart-Grid ready or OpenADR, to enable direct connection to flexibility aggregators.

KEY ELEMENTS OF FAULT DETECTION

Automated fault detection and diagnosis techniques can prevent the deterioration and identify possible faults, which leads to savings in energy, service and operating costs. Our solution uses machine learning to learn the behavior of the heat pump. A constant monitoring of the heat pump measurements ensures that any deviation from normal operation is detected and diagnosed, using the default sensors that comes with the heat pump.

IMPLEMENTATION

Collaborations with industry: HITACHI/Johnson Controls - BAXI - EPRI, Naturgy- Schneider Electric. Solutions validated in lab environment and in a real residential building for the management of centralized domestic hot water systems.

Heat pump in our testing lab

Demo case in the Llevant Innovation District in Palma de Mallorca

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