

TITLE:

Optimization of the dehumidification process in real time based on changing weather conditions

Abstract:

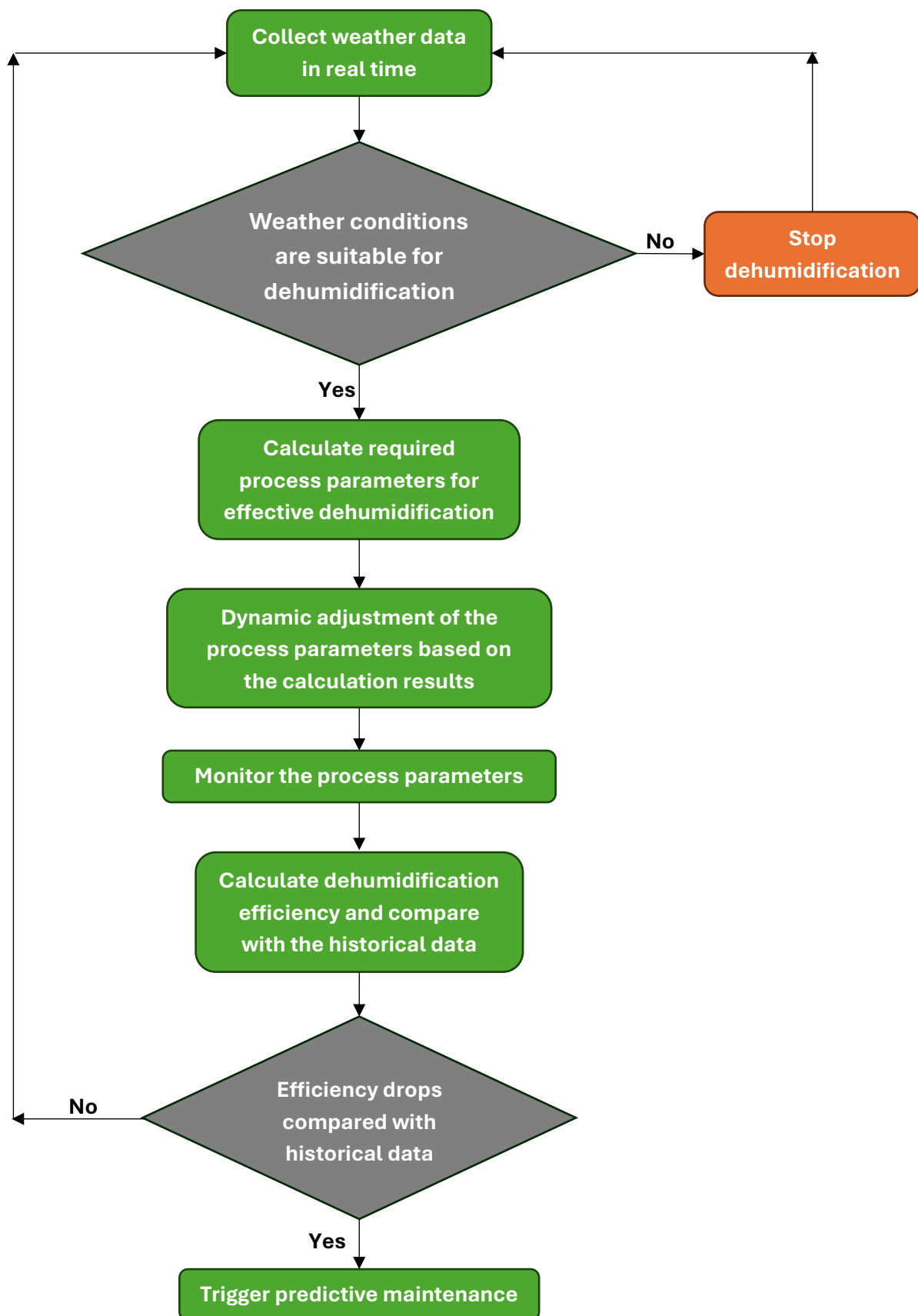
5 This invention relates to a control system for optimizing the dehumidification process in real time based on changing weather conditions. The system collects real-time weather data and processes it through customized algorithms. These algorithms dynamically adjust process parameters to maximize efficiency and ensure safe operation. By adapting to diverse environmental scenarios, this control system achieves energy efficiency, 10 reliability, and optimal dehumidification performance.

Technical Notes

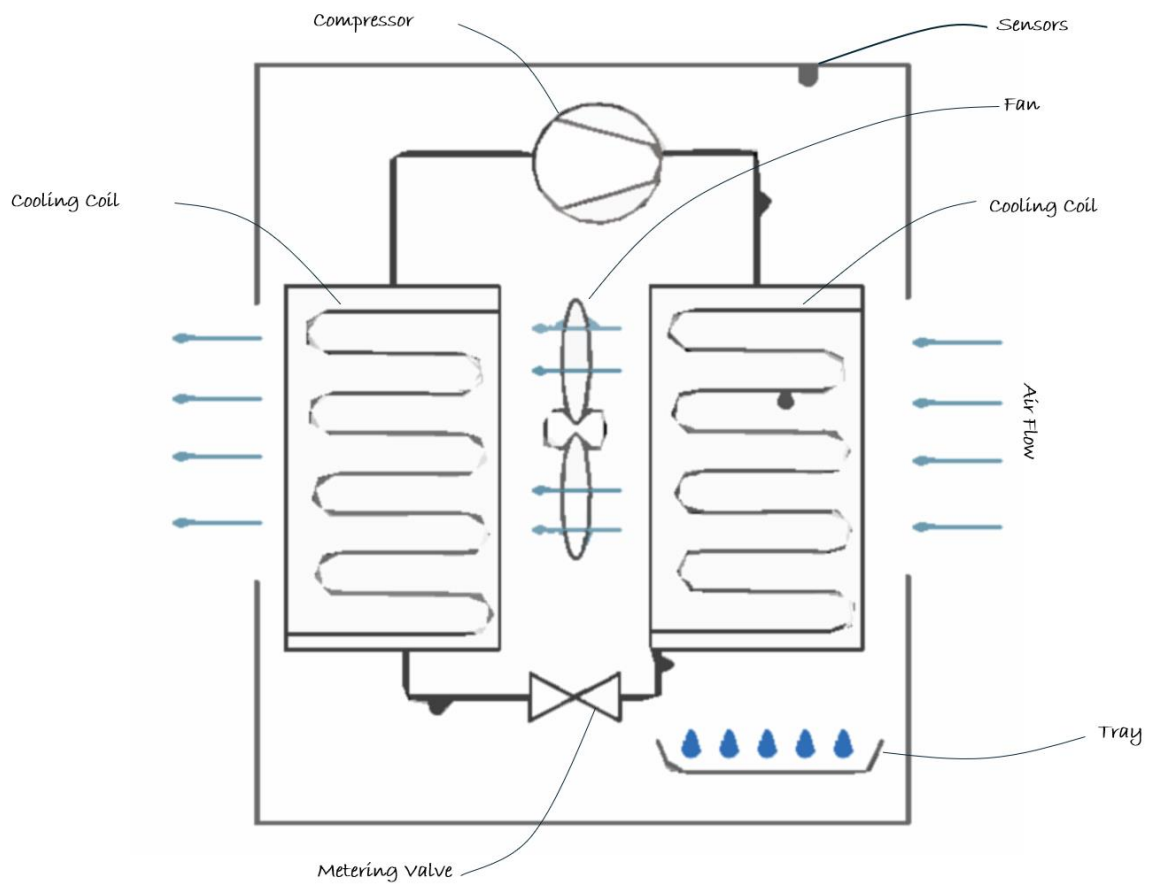
The patented control system is based on the following approaches:

1. **Real-Time Weather Monitoring:** The system utilizes sensors to gather real-time weather data, including but are not limited to temperature, pressure, and humidity.
- 15 2. **Algorithm-Driven Optimization:** The collected weather data is input into customized algorithms which calculate optimal process parameters. By analysing weather data fluctuations, the algorithm adjusts the process parameters including but not limited to air intake speed, coolant temperature and compressor power to balance effective dehumidification performance and energy efficiency.
- 20 3. **Safety Assurance:** Critical system parameters, such as compressor suction line conditions, are continuously monitored to maintain superheat states. This prevents component failure and ensures the long-term integrity of the system.
4. **Predictive Maintenance:** The system monitors and analyses process parameters including but not limited to power consumption and pressure to detect system 25 leakage, trigger predictive maintenance like system cleaning and coolant top up. These proactive measures minimize downtime and extend system lifespan.
5. **Weather-Condition-Based Operations:** When weather conditions are unsuitable for dehumidification, including but not limited to low humidity or freezing temperatures, the system automatically shuts down dehumidification 30 process to save energy. It restarts when weather conditions meet predefined parameters, ensuring consistent and efficient operation.

A flow chart for the optimization of the dehumidification process in real time:



35 A sketch of the apparatus is shown below.



INVENTION STATEMENTS

1. A method for optimization of the dehumidification process in real time based on changing weather conditions, the method comprising:

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 - collecting real-time weather conditions from data monitoring apparatus which include but are not limited to temperature, pressure and humidity;
 - inputting this collected data into customized algorithms in a real time environment;
 - calculating the process parameters, including but not limited to air intake
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 - speed, coolant temperature and compressor power;
 - real-time monitoring of process parameters, including but not limited to coolant temperature and pressure to maintain superheat conditions;
 - dynamic adjustments of the process parameters to optimize process efficiency of the dehumidification process while safeguarding system
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 - integrity;
 - Implementing predictive maintenance by monitoring and analysing process parameters, including but not limited to power consumption and pressure to detect system leakage, trigger system cleaning and coolant top up;
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 - determining if weather conditions are deemed unsuitable for dehumidification, including but not limited to low humidity or temperatures and take the necessary actions including but not limited to stopping the dehumidification process to save energy;
 - automatic restart of the dehumidification process when weather
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 - conditions meet predefined parameters;

2. The method of claim 1, wherein the weather data is collected continuously or at predefined intervals to enable dynamic system adjustment.

3. The method of any of claims 1 to 2, further comprising monitoring system performance metrics, such as energy consumption and water output, to refine the

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4. An apparatus for optimization of the dehumidification process in real time based on changing weather conditions, the apparatus comprising:

- sensors for collecting real-time weather data, including but not limited to temperature, pressure and humidity;
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 - a control system incorporating customized algorithms configured to:

- receive the weather data from sensors in real time;
 - transmit data to a central processing unit in real time;
 - calculate process parameters;
 - monitor process parameters;
 - 75 ▪ dynamically adjust the process parameters of the apparatus;
 - trigger predictive maintenance;
 - determine conditions deemed unsuitable for dehumidification and stop the dehumidification process;
 - restart the dehumidification process when weather conditions are deemed suitable;
- 80 5. The apparatus of claim 4, wherein the control system is capable of remote monitoring and autonomous adjustment.

Key Features

6. The method or apparatus of any of claims 1 to 5, wherein the customized algorithms ensure optimal energy efficiency by dynamically adjusting process settings based on real-time weather conditions.
- 85 7. The method or apparatus of any of claims 1 to 6, wherein the system is capable of functioning efficiently across diverse environmental conditions, including areas with significant fluctuations in temperature and humidity.
8. The method or apparatus of any of claims 1 to 7, wherein the control system is configured to ensure system integrity and safety is maintained
- 90 9. The method or apparatus of any of claims 1 to 8, wherein the system is designed to stop the dehumidification process when weather conditions are deemed unsuitable based on predefined parameters and restart when conditions are deemed suitable for dehumidification.