

**Fault Diagnosis Model Development  
for Air Source Heat Pump Water Heater/Chillers**

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**Abstract:** As an emerging source for cooling and heating, air source heat pump water chiller/heaters are getting increasingly popular in recent decades. However, problems such as unfavorable operating environment, unstable operating conditions, the poor reliability of defrosting and the gradual change of operational faults, often make an air source heat pump unit operate in an unhealthy condition. This prevented further extensive application of air source heat pump water heater/chillers.

Therefore, the objective of the investigation is to develop a fault detection and diagnosis model, which can predict and diagnose faults before the shutdown of a unit. This can help promote intelligent mechatronics, prolong equipment life, increase the reliability of the unit, and decrease the energy consumption and maintenance costs.

Both theoretical analysis and practical investigation were employed in developing the fault diagnosis model. The model included a fault reasoning sub-model based on BP neural network, and a validated dynamic, equal dimension, grey recursion performance predicting sub-model based on Grey Theory for change rate of unit's COP founded, and faults diagnosis system model based on Expert System and Neutral Network for air source heat pump water heater/chiller founded.

All these not only have an important practical significance, but a brand-new method for faults diagnosis in HVACR field.

**Keywords:** air source heat pump, fault diagnosis, model development