

附件 3

IAQ QUALITY SUSTAINABILITY AWARD 2023 - ONE-PAGE SUMMARY

Project and contact details

The name of the quality sustainability project (max. 100 characters)

Research and Industrial Application of Efficient Cooling and Heating Technology for Air Conditioning Based on Variable Frequency Drive Technology

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Organisation(s), country, where the project-members are working, including Web-page links

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Project description

Almost all variable frequency air conditioners use high back electromotive force compressor with high Kinetic energy constant of the motor. Due to cost reasons, over 80% of them use rare earth compressors with low-cost single rotor and small inertia. In the industry of small inertia rare earth compressors, there are still three major challenges such as limited frequency rise rate when the compressor is started, easy shutdown under high loads, and unstable state of high-frequency operation. These challenges of these problems in air conditioner are as follows: slow speed of cooling and heating, unstable state under high temperature conditions, high noise, high power consumption leading to high greenhouse gas emissions and exacerbating climate warming.

Starting from user experience, experiment with QFD and DOE, Haier air conditioner electronic control R&D team has carried out special quality and technology innovation since January 2019. First of all, according to the development status of the air conditioning industry, they determined the goal of quality improvement by investigating the situation and bottleneck problems of air conditioning cooling and heating capacity and the root cause of the problem. Then determine the design scheme and DOE verification scheme in a targeted manner and constantly check whether the verification scheme meets the expected requirements during the process. Finally this team has been researched and developed successful three technologies named PKC full frequency pulsation suppression, Kick-start step start-up, and P3/C3 high-speed current stabilization by special work on quality technology innovation and put into mass production in December 2022.

Based on the above technology, 168 models of variable frequency air conditioners have been developed to achieve large-scale production and global promotion. According to the cumulative sales of 2.3 million units in the past year, it is expected to increase sales by over 6 billion yuan, with significant energy-saving effects. Within the life cycle of a single unit, 470.3 kilowatt hours of electricity can be saved. Based on sales, 1.86 billion kilowatt hours of electricity can be saved throughout the year, and 1.464 million tons of CO2 and 55000 tons of SO2 can be reduced annually, resulting in significant social benefits. It has important practical value and promotion significance for improving people's living comfort level and sustainable development.

This project has saved electricity, reduced CO2 and SO2 emissions, achieved sustainable development and energy conservation, responded to policies of resource conservation and environmental protection, followed the development concept of green, circular, and low-carbon, and supported Goal 13: Climate Action.

Project leverage potential

This technical system has strong universality and is easy to promote, and can be promoted and applied in all variable frequency household appliance industries. Currently, it has been applied to Haier's entire series of variable frequency air conditioners, especially in relatively harsh high-temperature environments such as the Middle East, Africa, and Southeast Asia, which can operate stably and reliably, making it suitable for global promotion.

Based on this technology, 168 models of variable frequency air conditioners have been developed, with a total sales of 2.3 million units and an additional sales revenue of over 6 billion yuan. This plan breaks through the bottleneck of variable frequency air conditioning development technology and can be promoted and used throughout the industry. It plays a crucial role in promoting the progress of air conditioner greenhouse gas emissions, reducing the rate of temperature rise, and protecting ecosystems and socio-economic systems from the threat of climate change.

Picture/Image describing the project

Insert picture/and visual graphic here

