

Low Vibration Electric Compressor for Air Conditioning System of Hybrid & Electric Vehicles



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Mitsubishi Heavy Industries Thermal Systems, Ltd. (MHITS) has been marketing electric compressors for air conditioning systems for hybrid and electric vehicles since 2007 and has achieved reduced size and weight, as well as high efficiency, through the introduction of its unique scroll technology, inverter control system and optimized internal structure^{*1}. In order to secure a higher level of in-car quietness, MHITS has now developed a new electric compressor that reduces the vibration by about 25% compared with the current model while maintaining the same size and performance, by optimizing the balance through an update of the internal structure.

*1 See Mitsubishi Heavy Industries Technical Review vol. 54 No. 2 (June 2017) "Development of Electric Compressors for Air Conditioning Systems of Hybrid Electric Vehicles"

1. Introduction

In light of reducing CO₂ emissions, the number of hybrid and electric vehicles in the market is expected to grow, as is demand for electric compressors that need to be installed in the air conditioning system in such hybrid and electric vehicles. Generally, vehicles powered by a motor provide a higher level of in-car quietness. With the increased quietness, other on-board components can contribute to the creation of a comfortable environment in the vehicle. According to the knowledge MHITS has accumulated so far, we have learnt that the vibration of electric compressors is the major factor in achieving in-car quietness. Therefore, in some cases, anti-vibration brackets are used to reduce vibration propagation compressors, which would, however, result in increased costs and the need for extra space to accommodate the brackets.

2. Lower vibration

The newly-developed model maintains the same size as the current electric compressor and continues to utilize the updated 3D Scroll Profile^{*2}, where the unbalanced elements have been minimized through an update of the internal structure. Consequently, it has achieved lower vibration while maintaining the same level of performance as the current model. **Figure 1** shows a comparison of vibration between the current and new models. We have confirmed that the new model reduces the vibration level by about 25%^{*2} compared to the current one. **Figure 2** shows a comparison of the handle vibration between the current and new models as one example of a contribution to the enhancement of in-car quietness. As can be seen, the handle vibration is reduced to approximately half in each of the compressor rotation speed levels. The application of this new model has a great chance of increasing in-car quietness, and in cases where the anti-vibration brackets are no longer necessary, cost-cutting and space-saving can also be expected. This technology is also applicable to large-capacity compressors^{*3} and can be tailor-made to suit customer needs.

*2 Comparison of vibration values of compressor bodies in the vehicle's longitudinal direction with a compressor high rotation speed

*3 See Mitsubishi Heavy Industries Technical Review vol. 56 No. 4 (December 2019) "Large Capacity Electric Compressor for Air Conditioning System of Hybrid Electric Vehicles"

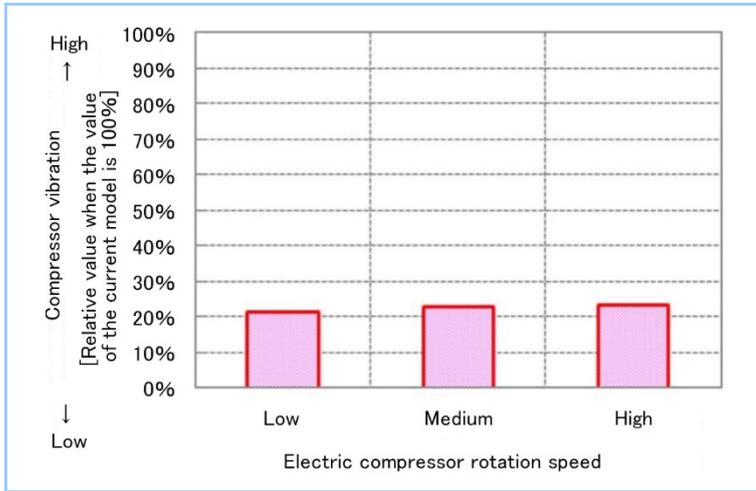


Figure 1 Comparison of compressor vibration between current and new models

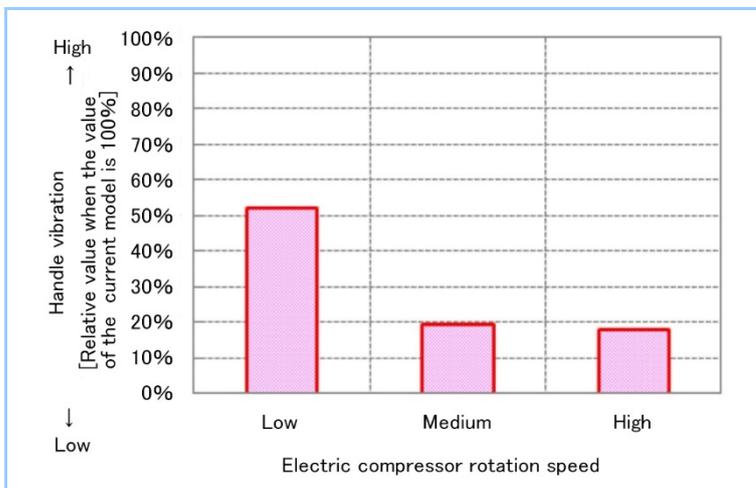


Figure 2 Comparison of handle vibration between current and new models

3. Future development

This new model introduced above is scheduled to be launched in 2021. MHITS will continue to contribute to the widespread use of hybrid and electric vehicles and improving the global environment, through our commitment to product development that meets market needs.

※ Highly-efficient 3D Scroll with reduced leakage during compression process. “3D Scroll” is a registered trademark of Mitsubishi Heavy Industries Thermal Systems, Ltd. in Japan.