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Core Loss Analysis in Laminated Core of Electric Motor according to Welding Conditions

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To reduce the core loss of the electric motor, a laminated core made by stacking thin electric steel plates is used. Usually welding, riveting, or interlocking are used in laminated core to prevent each plate from falling off. Among these methods, when the welding is used, the welding bead can make a closed-loop in the laminated core. By Faraday's law, current is induced in the closed-loop making additional core loss. In this paper, the core loss of the electric motor is analyzed according to the position and the number of welding on laminated stator core.

To analyze the effect of welding condition on core loss, wires are used to make the closed-loop at each position of the stator instead of welding. The closed-loop made by the welding bead is replaced by the closed-loop made by the wire. When the wires are wound on the stator, the time-varying magnetic flux induce a current in the wires making additional copper loss. By analyzing this copper loss, the additional core loss caused by the welding can be predicted.

The wires are wound on stator teeth and yoke, respectively, as shown in Fig. 1, to analyze the effect of welding position on the core loss. As can be seen in Fig. 2, the additional loss is greater when the wires are wound on the teeth than on the yoke. Also, it can be confirmed that the additional loss is proportional to the number of welding.

As a result, the additional copper loss is larger when the wires are wound on the teeth than on the yoke. The additional core loss caused by the welding in laminated core may have same tendency. This is because the time-varying magnetic flux flowing through the closed-loop becomes smaller in that order.

The result of FEA will be added in the future to verify the test result. Also, additional analysis which cannot be obtained in the test like welding from teeth to yoke will be added by using FEA.

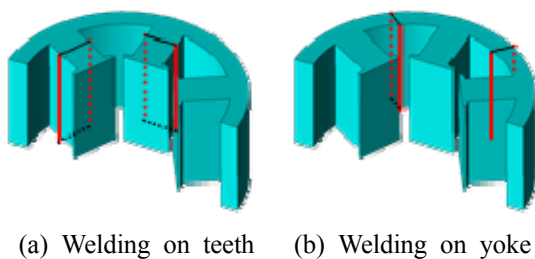


Fig. 1. Welding Position

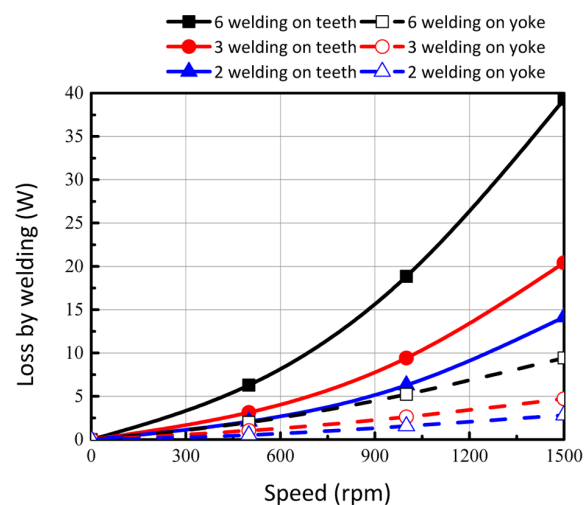


Fig. 2. Loss by welding on the teeth and yoke