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GROUP REF. : D1
PREF. SUBJECT : 2: Materials for Electrotechnical Purposes
QUESTION N : 2.09

Question 2.09:
Is the reduction in the number of contributions on nanocomposites a sign of waning interest, acceptance that bulk processing remains a significant challenge or a reflection that these materials are moving towards real-world deployment? How close is the industry to deployment of nanocomposites?

Answer:

- The insulation materials for large generators (epoxy-mica composite insulation) and small and medium-sized generators (enamel), which we have researched and developed in our project, are being developed on the premise of commercialization.
- Bulk processing, especially the method of controlling the aggregation of nanofillers during manufacturing, was an essential issue. Through trial and error, we are developing a technique to disperse the nanofillers at a certain level.
- Sumitomo Seika Chemical Co., Ltd., a member of this project, has already manufactured enamel wire with improved partial discharge resistance using nanofillers at a factory-scale manufacturing facility, as shown in Figure 1. In addition, they have prototyped a rotating machine using the enamel wire, as shown in Figure 2. Furthermore, they verified the energy-saving effect of increasing the cross-sectional area of the conductor, and it is expected to be commercialized within a few years.
- The progress in the practical application of insulating materials using nanocomposites for large-scale generators is reported separately by Mitsubishi Electric Corporation, which is also a project member.

Figure 1: Enamel wire containing nanofiller (nanoclay) in the insulating layer

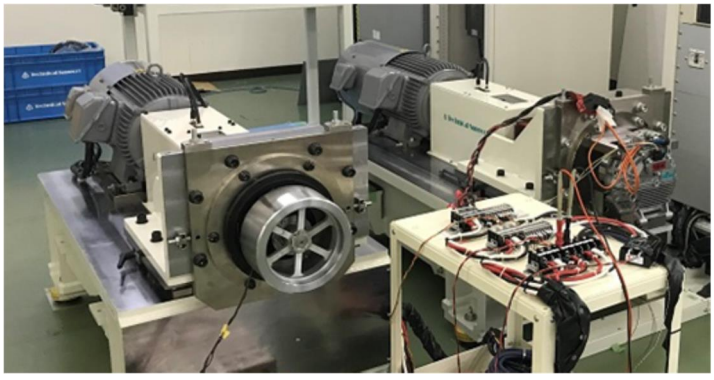

Figure 2: A prototype of a rotating machine using enamel wire containing nanofiller, which was installed at Shizuoka Institute of Science and Technology, a joint research member.

- Figure 3 shows cross-sectional view of enamel wires for small- and medium-sized rotating machines. By using a newly developed insulating material, it is possible to reduce the thickness of the insulating film, and the conductor resistance (copper loss) can be reduced by expanding the conductor cross-sectional area at the same outer diameter.
- Figure 4 shows the results of efficiency experiments using the prototype rotating machine shown in Figure 2. Although the value varies slightly depending on the rotation speed, the loss can be reduced by approximately 10% during steady operation.

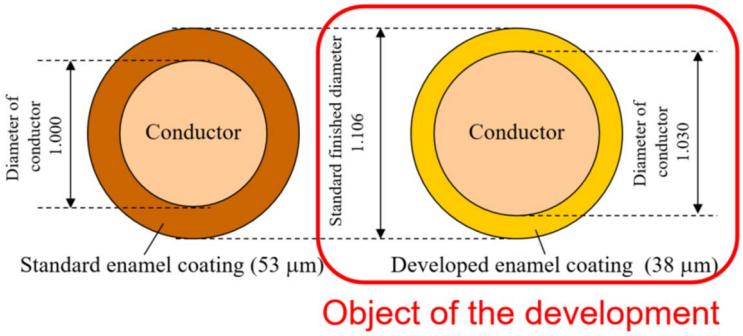

Figure 3: Cross-sectional view of enamel wires for small- and medium-sized rotating machines

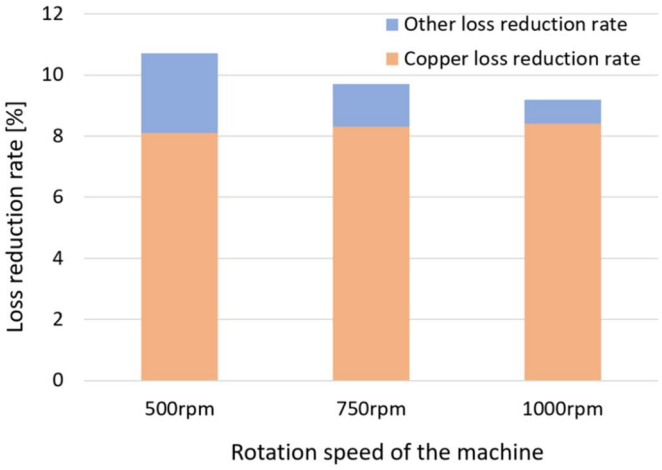

Figure 4: Results of efficiency experiments using prototype rotating machine