Abridged version

KAWASAKI STEEL TECHNICAL REPORT
No.39 (October 1998)
Electrical Steel

Analysis of Noise Emitted from Three-Phase Stacked Transformer Model Core

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Synopsis :
The influence of core structure and material on the noise level of a three-phase stacked transformer core is studied using model cores composed of high flux-density grain-oriented magnetic steels. The noise level at 1.7 T and 50 Hz decreases by slightly less than 2 dB with an increase of 0.01 T in B8 of the core material and is lower by 2 dB with step-lap joints than with alternate-lap joints. The amount of higher harmonics in magnetostrictive oscillation and magnetizing force of the core material show a strong correlation with the noise level. The vibration around the joints governs the noise level when the core is free of clamping pressure. The noise level decreases with increasing clamping pressure before reaching a minimum at a stress of about 0.05 MPa and then turns upward with further increase. The increasing rate of noise level is more moderate with step-lap joints than with alternate-lap joints.

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The body can be viewed from the next page.

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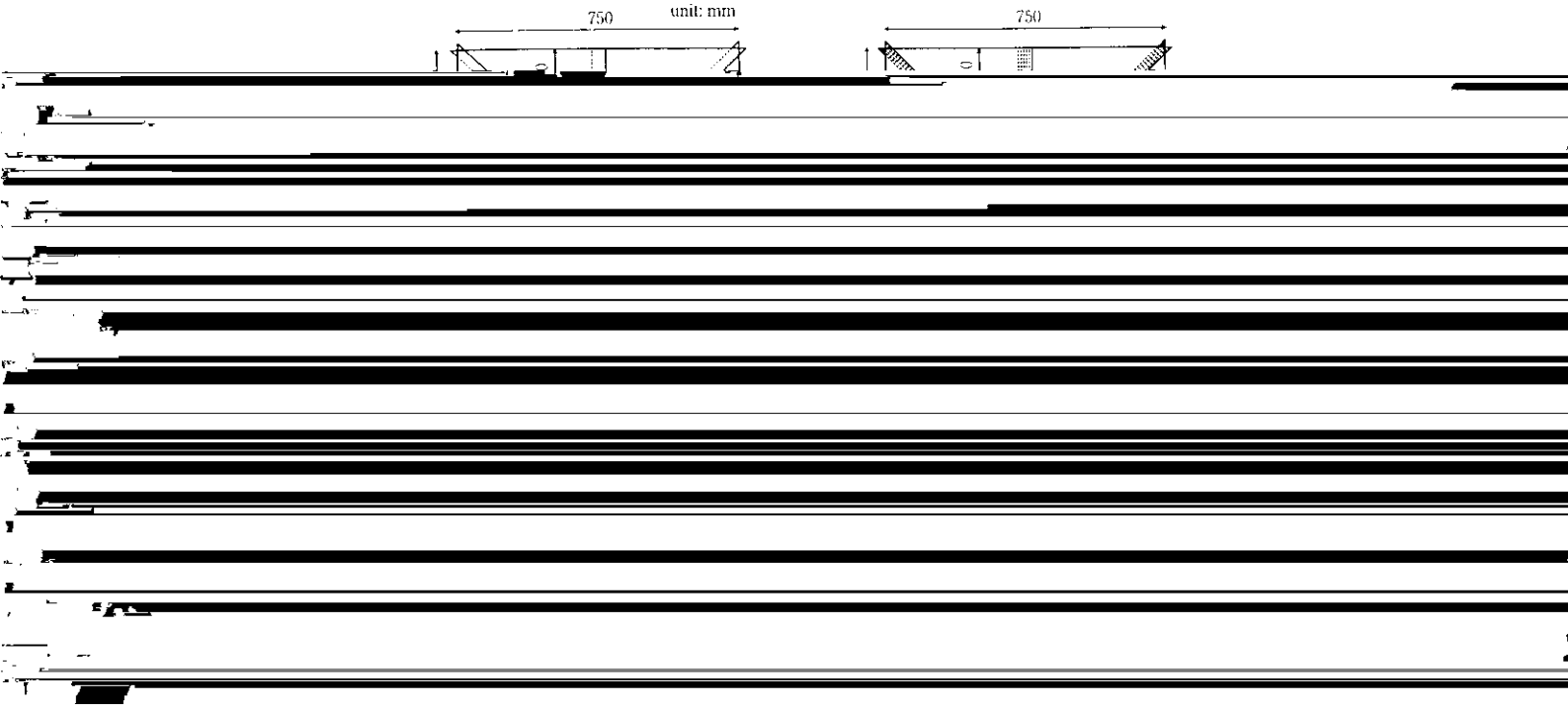
Synopsis:

The influence of core structure and material on the


750
unit: mm
750

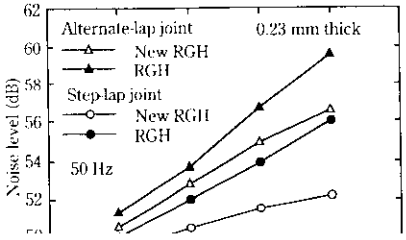


Fig. 2 Noise level of model transformer cores using 0.23 mm thick NewRGH and RGH sheets

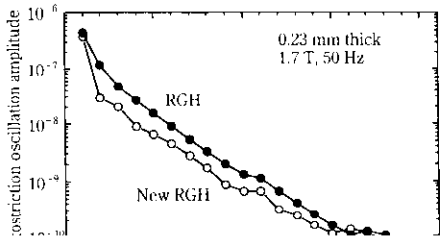
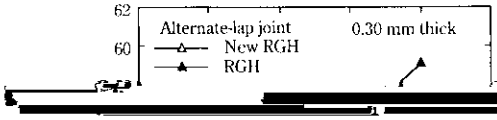
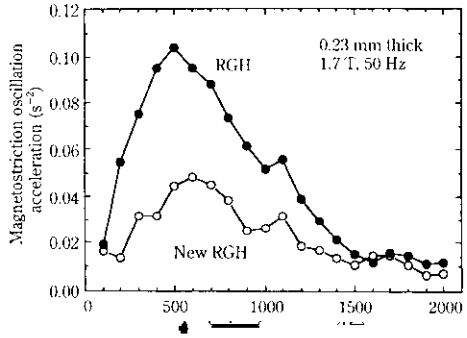
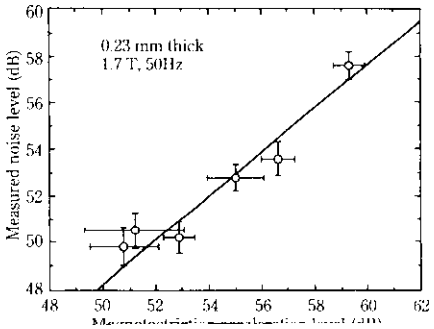


Fig. 5 Spectral intensity of magnetostriction oscillation amplitude in 0.23 mm thick NewRGH and RGH sheets




0.23 mm thick
1.7 T, 50 Hz
RGH
New RGH
Magnetostriction oscillation acceleration (s⁻²)
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0
500
1000
1500
2000


0.23 mm thick
1.7 T, 50Hz
Measured noise level (dB)
60
58
56
54
52
50
48
48
50
52
54
56
58
60
62

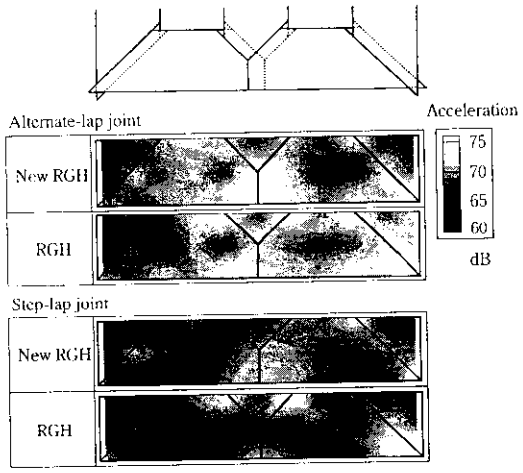


Fig. 12 Distribution of vibration acceleration level

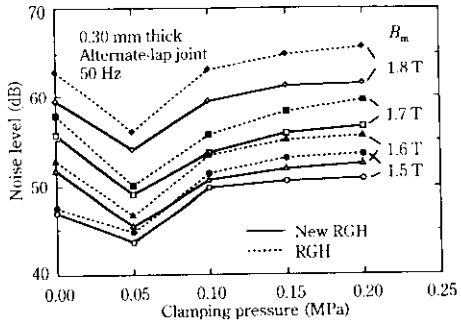
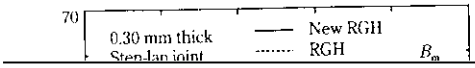
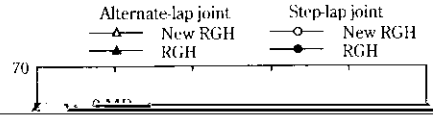


Fig. 14 Influence of clamping pressure on noise level of alternate-lap core





range, reaches a minimun at a certain clamping pressure, and begins to increase when clamping force is applied to the yoke, as shown in Figs. 14 and 15. This change in