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Analysis Technology Used in Development of High-Efficiency Electrical Steels and Their Optimized Application to Electrical Apparatuses

I r U N (Sadahiro, K.) wÆ S \ (Shiga, N.) ° a † » (Ishida, M.)

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Synopsis :

In order to make full use of electrical steel sheets, Kawasaki Steel has developed various analysis methods, including model-based theoretical analyses, computerized numerical analyses, as well as experimental evaluation. Model analysis over the domain refining effect on grain-oriented electrical steel sheets and the local distribution of iron loss due to the influence of finite crystal grain size have brought about useful insights for the improvements of electrical steel sheets. Furthermore, for the prediction of motor energy loss a model has been established, wherein material properties and motor-driving conditions are taken into consideration. For transformer cores, the rotating magnetic flux and the waveform distortion were reproduced for the prediction of building factor, based on a magnetic field analysis called integral element method. These analytical techniques will lead to further advancements of electrical steel sheets and their optimized applications.

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電磁鋼板の磁気特性改善と電気機器への
最適適用における解析技術の応用*

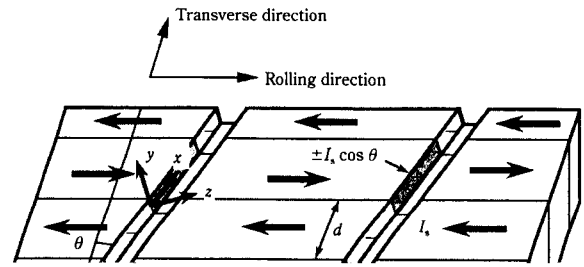
川崎製鉄技報
33 (2001) 3, 103-111

**Analysis Technology Used in Development
of High-Efficiency Electrical Steels
and Their Optimized Application to Electrical Apparatuses**

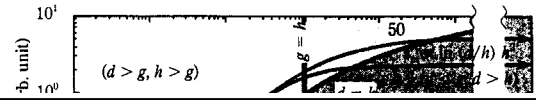
因する非常に大きい形状異方性を呈する。

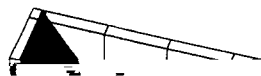
- (2) 結晶粒の方位が等方的でなく一方向性あるいは面内無方向性など特定の集合組織を形成する。
- (3) 結晶粒のサイズが鉄心の大きさに比べても無視できない。
- (4) 強磁性体であるため大きなヒステリシスを示し、それに起因するヒステリシス損の計算が容易でない。

また、鉄心が励磁される際の磁界強度あるいは磁束密度の時間波

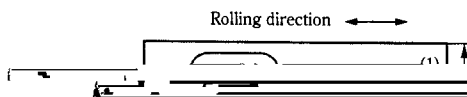


$$\phi(x) = \frac{4I_s}{\pi^2 \mu_0} \sum_{\substack{n=1 \\ \text{(odd)}}}^{\infty} \frac{1}{n} \int_0^x d\xi \frac{\sin(\xi h/2)}{\xi \sqrt{(n\pi/d)^2 + \xi^2}}$$





$\lambda(0/m)$



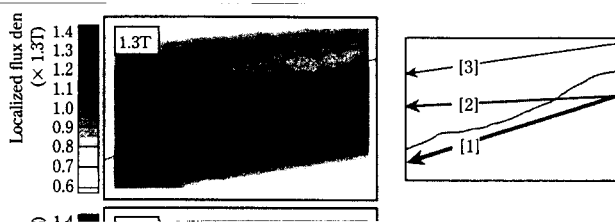
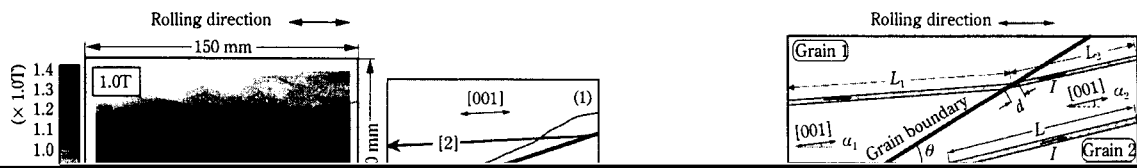
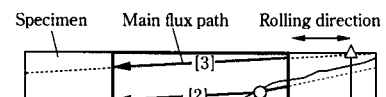


Fig. 9 Model for calculation of magnetic energy



ーダーの解析に対応している。

3 電磁鋼板応用機器における材料最適適用研究



