

DAFTAR PUSTAKA

- [1] R. J. Kennelly, "IEEE standards for physical and data communications.," *Biomed. Instrum. Technol.*, vol. 30, no. 2, pp. 172–5, 2002, [Online]. Available: <http://www.ncbi.nlm.nih.gov/pubmed/21097060>.
- [2] S. Kulkarni and S. A. Khaparde, *Transformer Engineering*, Second. CRC Press, 2017.
- [3] H. D. Mehta and R. M. Patel, "A Review on Transformer Design Optimization and Performance Analysis Using Artificial Intelligence Techniques," *Int. J. Sci. Res.*, vol. 3, no. 9, pp. 726–733, 2014, [Online]. Available: www.ijsr.net.
- [4] M. Kozupa, C. Ploetner, and M. Swiatkowski, "Acoustic radiation efficiency parameter in assessment of transformer noise," in *Proceedings of Euronoise 2018*, May 2018, no. 43, pp. 573–578.
- [5] "Kepmen No: KEP-48/MENLH/11/1996 Tentang BAKU TINGKAT KEBISINGAN," 1996. <https://ditppu.menlhk.go.id/portal/peraturan-nasional> (accessed Sep. 12, 2019).
- [6] V. Rohilla and C. Palani Samy, "A Study of Transformer Noise and Reduction Techniques of Transformer Noise," *Issue*, vol. 2, pp. 1911–1915, [Online]. Available: <http://www.krishisanskriti.org/Publication.html>.
- [7] A. J. Moses, P. I. Anderson, and T. Phophongviwat, "Localized Surface Vibration and Acoustic Noise Emitted From Laboratory-Scale Transformer Cores Assembled From Grain-Oriented Electrical Steel," *IEEE Trans. Magn.*, vol. 52, no. 10, pp. 1–15, Oct. 2016, doi: 10.1109/TMAG.2016.2584004.
- [8] A. Gamil and F. Schatzl, "New Method to Optimize No-Load Noise of Power Transformers Based on Core Design & Transformer Operating Conditions," *J. Energy*, vol. 63, no. Special Issue, pp. 43–51, 2014.
- [9] H. Paghadar and R. A. Kantaria, "Accurate Estimation and mitigation of Audible Sound using Novel Technique of Flux Density Reduction at Design Stage in Transformer," *Int. J. Electr. Electron. Eng.*, vol. 3, no. 10, pp. 12–15, 2016, [Online]. Available: https://www.internationaljournalssrg.org/IJEEE/archive_details?page=Volume3-Issue10-2016.
- [10] D. L. Dahlstrom, "Occupational Noise," in *Hamilton & Hardy's Industrial Toxicology*, no. 9, Hoboken, New Jersey: John Wiley & Sons, Inc., 2015, pp. 1115–1122.
- [11] R. S. Girgis, M. Bernesjö, and J. Anger, "Comprehensive Analysis of Load Noise of Power Transformers," in *2009 IEEE Power and Energy Society General Meeting, PES '09*, 2009, pp. 1–7, doi: 10.1109/PES.2009.5275883.
- [12] C. M. A. Vasques, H. Miguel, and R. Campelo, "Quiet Transformers : Design Issues," in *Advanced Research Workshop on Transformers*, Oct. 2013, pp. 1–17, doi: 10.13140/2.1.2620.0962.
- [13] E. Reiplinger, "Study of Noise Emitted by Power Transformers Based on Today's Viewpoint.pdf," in *International Conference on Large High Voltage Electric Systems*, 1988, pp. 1–7, [Online]. Available: https://e-cigre.org/publication/12-08_1988-study-of-noise-emitted-by-power-transformers-based-on-todays-viewpoint.
- [14] R. Haettel, M. Kavasoglu, A. Daneryd, and C. Ploetner, "Prediction of Transformer Core Noise."



- [15] Z. Xian, Z. Pengcheng, Y. Qingxin, Z. Lihua, and Z. Xin, “Numerical estimation and optimization of vibration noise due to magnetostriction and magnetic forces for laminated core structure,” in *2014 17th International Conference on Electrical Machines and Systems (ICEMS)*, Oct. 2014, no. 51307120, pp. 1548–1551, doi: 10.1109/ICEMS.2014.7013722.
- [16] M. V. F. Da Luz, P. Dular, J. V. Leite, and P. Kuo-Peng, “Modeling of transformer core joints via a subproblem FEM and a homogenization technique,” *IEEE Trans. Magn.*, vol. 50, no. 2, pp. 1009–1012, 2014, doi: 10.1109/TMAG.2013.2284917.
- [17] Y. Yang, L. Qingfen, L. Dichen, L. Shanshan, and H. Jingzhu, “Electromagnetic Vibration Noise Analysis of Transformer Windings and Core,” *IET Electr. Power Appl.*, vol. 10, no. 4, pp. 251–257, 2016, doi: 10.1049/iet-epa.2015.0309.
- [18] B. Zhang, N. Yan, J. Du, F. Han, and H. Wang, “A novel approach to investigate the core vibration in power transformers,” *IEEE Trans. Magn.*, vol. 54, no. 11, Nov. 2018, doi: 10.1109/TMAG.2018.2839722.
- [19] S. Yürekten, Y. Sert, M. Trnan, and E. Ceylan, “The Parameters of Generated Sound Level of Transformer Cores,” *Procedia Eng.*, vol. 202, pp. 273–279, 2017, doi: 10.1016/j.proeng.2017.09.714.
- [20] S. J. Cheng *et al.*, “Correlation of magnetostriction variation on magnetic loss and noise for power transformer,” *J. Appl. Phys.*, vol. 117, no. 17, May 2015, doi: 10.1063/1.4919122.
- [21] M. Liu, O. Hubert, X. Mininger, F. Bouillault, and L. Bernard, “Homogenized Magnetoelastic Behavior Model for the Computation of Strain Due to Magnetostriction in Transformers,” in *IEEE Transactions on Magnetism*, Feb. 2016, vol. 52, no. 2, doi: 10.1109/TMAG.2015.2493062.
- [22] M. Liu, O. Hubert, X. Mininger, F. Bouillault, L. Bernard, and T. Waeckerle, “Reduction of Power Transformer Core Noise Generation Due to Magnetostriction-Induced Deformations Using Fully Coupled Finite-Element Modeling Optimization Procedures,” *IEEE Trans. Magn.*, vol. 53, no. 8, pp. 1–11, Aug. 2017, doi: 10.1109/TMAG.2017.2687409.
- [23] J. Rens, S. Jacobs, M. Van Poucke, and E. Attrazic, “Numerical and experimental evaluation of magnetostriction and magnetic forces on transformer stacks and joints for the assessment of core vibrations,” in *2017 IEEE Energy Conversion Congress and Exposition (ECCE)*, Oct. 2017, vol. 2017-Janua, pp. 3111–3118, doi: 10.1109/ECCE.2017.8096567.
- [24] D. Azuma and R. Hasegawa, “Audible noise from amorphous metal and silicon steel-based transformer core,” in *IEEE Transactions on Magnetism*, Nov. 2008, vol. 44, no. 11 PART 2, pp. 4104–4106, doi: 10.1109/TMAG.2008.2003174.
- [25] B. Weiser, H. Pfützner, and J. Anger, “Relevance of Magnetostriction and Forces for the Generation of Audible Noise of Transformer Cores,” 2000.
- [26] M. Kavasoglu, R. Haettel, and C. Ploetner, “Prediction of Transformer Load Noise,” in *Proceedings of the COMSOL Conference*, 2010, pp. 1–5, [Online]. Available: https://www.comsol.it/paper/download/63432/kavasoglu_paper.pdf.
- [27] T. Nagata, K. Hirai, S. Iwasaki, and Y. Ebisawa, “Estimation on on-load vibration of transformer windings,” in *2002 IEEE Power Engineering Society Winter Meeting. Conference Proceedings (Cat. No.02CH37309)*, 2003, vol. 2, no. c, pp. 1378–1382, doi: 10.1109/PESW.2002.985241.
- [28] P. Hamberger *et al.*, “3D-FEM simulation for investigation of load noise of power

- transformers verified by measurements,” in *2008 18th International Conference on Electrical Machines*, Sep. 2008, pp. 1–4, doi: 10.1109/ICELMACH.2008.4800062.
- [29] X. Duan, T. Zhao, J. Liu, L. Zhang, and L. Zou, “Analysis of Winding Vibration Characteristics of Power Transformers Based on the Finite-Element Method,” *Energies*, vol. 11, no. 9, p. 2404, Sep. 2018, doi: 10.3390/en11092404.
 - [30] Z. Yu, D. Li, and L. Chen, “Statistical analysis of vibration characteristics of power transformers with different voltage levels,” in *Proceedings of the IEEE International Conference on Properties and Applications of Dielectric Materials*, 2018, vol. 2018-May, no. 1, pp. 694–699, doi: 10.1109/ICPADM.2018.8401146.
 - [31] M. Jin and J. Pan, “Effects of insulation paper ageing on the vibration characteristics of a transformer winding disk,” *IEEE Trans. Dielectr. Electr. Insul.*, vol. 22, no. 6, pp. 3560–3566, Dec. 2015, doi: 10.1109/TDEI.2015.004885.
 - [32] A. Al-Abadi, A. Gamil, F. Schatzl, B. Van Der AA, E. De Groot, and J. Declercq, “Investigating the Effect of Winding Design and Clamping Pressure on the Load-Noise Generation of Power Transformers,” in *CIGRE Study Committee A2 COLLOQUIUM*, 2017, no. July.
 - [33] Z. Zhang *et al.*, “Study on Vibration Noise Signal Characteristics of 10kv Distribution Transformer under Different Load Conditions,” in *Asia Conference on Power and Electrical Engineering, ACPEE 2019*, Jul. 2019, vol. 486, p. 012033, doi: 10.1088/1757-899X/486/1/012033.
 - [34] A. J. Moses, P. I. Anderson, T. Phophongviwat, and S. Tabrizi, “Contribution of magnetostriction to transformer noise,” in *Universities Power Engineering Conference (UPEC), 2010 45th International*, 2010, pp. 1–5, [Online]. Available: <https://ieeexplore.ieee.org/document/5649285>.
 - [35] C. Chen, Y. Gao, and S. Liu, “Study on noise prediction model and control schemes for substation,” *Sci. World J.*, vol. 2014, 2014, doi: 10.1155/2014/696429.
 - [36] Y. Ma, J. Mo, J. Xu, and B. Fan, “Research on Vibration Test in Urban Indoor Substation,” *IOP Conf. Ser. Earth Environ. Sci.*, vol. 108, no. 5, p. 052110, Jan. 2018, doi: 10.1088/1755-1315/108/5/052110.
 - [37] C. Hernandez, M. A. Arjona, and S. H. Dong, “Object-oriented knowledge-based system for distribution transformer design,” *IEEE Trans. Magn.*, vol. 44, no. 10, pp. 2332–2337, Oct. 2008, doi: 10.1109/TMAG.2008.2001483.
 - [38] O. W. Andersen, “Optimized design of electric power equipment,” *IEEE Comput. Appl. Power*, vol. 4, no. 1, pp. 11–15, Jan. 1991, doi: 10.1109/67.65030.
 - [39] E. I. Amoiralis, M. A. Tsili, D. G. Paparigas, and A. G. Kladas, “Global transformer design optimization using deterministic and nondeterministic algorithms,” *IEEE Trans. Ind. Appl.*, vol. 50, no. 1, pp. 383–394, 2014, doi: 10.1109/TIA.2013.2288417.
 - [40] P. S. Georgilakis, M. A. Tsili, and A. T. Souflaris, “A heuristic solution to the transformer manufacturing cost optimization problem,” *J. Mater. Process. Technol.*, vol. 181, no. 1–3, pp. 260–266, Jan. 2007, doi: 10.1016/j.jmatprotec.2006.03.034.
 - [41] N. D. Doulamis, A. D. Doulamis, P. S. Georgilakis, S. D. Kollias, and N. D. Hatziargyriou, “A synergetic neural network-genetic scheme for optimal transformer construction,” *Integr. Comput. Aided. Eng.*, vol. 9, no. 1, pp. 37–56, 2002, doi: 10.3233/ica-2002-9103.
 - [42] C. Wu, F. Lee, and R. Davis, “Minimum weight EI core and pot core inductor and transformer designs,” *IEEE Trans. Magn.*, vol. 16, no. 5, pp. 755–757, Sep. 1980, doi: 10.1109/TMAG.1980.1060756.



- [43] Li Hui, Han Li, He Bei, and Yang Shunchang, "Application research based on improved genetic algorithm for optimum design of power transformers," in *Proceedings of the Fifth International Conference on Electrical Machines and Systems*, 2001, vol. 1, pp. 242–245, doi: 10.1109/ICEMS.2001.970657.
- [44] S. Elia, G. Fabbri, E. Nistico, and E. Santini, "Design of cast-resin distribution transformers by means of genetic algorithms," in *International Symposium on Power Electronics, Electrical Drives, Automation and Motion*, 2006, pp. 1473–1477, doi: 10.1109/SPEEDAM.2006.1650000.
- [45] N. Tutkun and A. J. Moses, "Design optimisation of a typical strip-wound toroidal core using genetic algorithms," *J. Magn. Magn. Mater.*, 2004, doi: 10.1016/j.jmmm.2003.11.002.
- [46] E. I. Amoiralis, P. S. Georgilakis, T. D. Kefalas, M. A. Tsili, and A. G. Kladas, "Artificial intelligence combined with hybrid FEM-BE techniques for global transformer optimization," in *IEEE Transactions on Magnetics*, Apr. 2007, vol. 43, no. 4, pp. 1633–1636, doi: 10.1109/TMAG.2006.892258.
- [47] J. Takehara, M. Horii, T. Kitamura, and N. Takahashi, "Optimal design of tank shield model of transformer," *IEEE Trans. Magn.*, vol. 36, no. 4, pp. 1089–1093, Jul. 2000, doi: 10.1109/20.877630.
- [48] M. A. Tsili, A. G. Kladas, P. S. Georgilakis, A. T. Souflaris, and D. G. Paparigas, "Geometry optimization of magnetic shunts in power transformers based on a particular hybrid finite-element boundary-element model and sensitivity analysis," *IEEE Trans. Magn.*, vol. 41, no. 5, pp. 1776–1779, 2005, doi: 10.1109/TMAG.2005.846075.
- [49] J. C. Olivares, R. Escarela-Pérez, Y. Liu, J. Driesen, J. M. Cañedo, and P. Moreno, "Reducing losses in distribution transformers," *IEEE Trans. Power Deliv.*, vol. 18, no. 3, pp. 821–826, 2003, doi: 10.1109/TPWRD.2003.813851.
- [50] M. Rizzo, A. Savini, and J. Turowski, "Dependence of forces, eddy current and stray losses on screening in power transformers," *ICEMS 2001 - Proc. 5th Int. Conf. Electr. Mach. Syst.*, vol. 1, pp. 182–185, 2001, doi: 10.1109/ICEMS.2001.970639.
- [51] P. S. Georgilakis, "Decision support system for evaluating transformer investments in the industrial sector," *J. Mater. Process. Technol.*, 2007, doi: 10.1016/j.jmatprotec.2006.03.040.
- [52] S. Y. Merritt and S. D. Chaitkin, "Making transformer losses part of the purchasing decision," *IEEE Conf. Rec. Annu. Pulp Pap. Ind. Tech. Conf.*, pp. 175–180, 2002, doi: 10.1109/PAPCON.2002.1015149.
- [53] A.K. Sawhney, *A Course of Electrical Machine Design*, 1st ed. Delhi: J.C. Kapur, 1984.
- [54] S. V Kulkarni and S. A. Khaparde, "Transformer Engineering: Design, Technology, and Diagnostics, Second Edition."
- [55] I. E. Commission, *INTERNATIONAL STANDARD IEC 60076-10*. IEC, 2002.
- [56] T. Tanzer *et al.*, "Magnetostriction of Electrical Steel and Its Relation to the No-Load Noise of Power Transformers," *IEEE Trans. Ind. Appl.*, vol. 54, no. 5, pp. 4306–4314, 2018, doi: 10.1109/TIA.2018.2840977.
- [57] R. Penin, J. Lecointe, G. Parent, J. Brudny, and T. Belgrand, "Estimation of relative magnetostriction and Maxwell's forces in stacked Grain Oriented steel structures," in *2012 XXth International Conference on Electrical Machines*, Sep. 2012, pp. 1971–1976, doi: 10.1109/ICEIMach.2012.6350151.



- [58] C. H. Hsu, C. H. Liu, Y. C. Hsiao, W. M. Chu, C. Y. Lu, and S. J. Cheng, "High frequency characteristics of magnetostriction on vibration and noise for single-phase transformer dependence of magnetic circuit method," in *Proceedings - 2014 International Symposium on Computer, Consumer and Control, IS3C 2014*, 2014, pp. 399–402, doi: 10.1109/IS3C.2014.110.
- [59] R. Negi, P. Singh, and G. K. Shah, "Causes of Noise Generation & its Mitigation in Transformer," *Int. J. Adv. Res. Electr. , Electron. Instrum. Eng.*, vol. 2, no. 5, pp. 1732–1736, 2013.
- [60] P. Shuai and J. Biela, "Impact of core shape and material on the acoustic noise emission of medium frequency, medium voltage transformers," in *2015 17th European Conference on Power Electronics and Applications (EPE'15 ECCE-Europe)*, Sep. 2015, pp. 1–11, doi: 10.1109/EPE.2015.7309376.
- [61] N. Hihat, E. Napieralska-Juszczak, J. P. Lecoite, J. K. Sykulski, and K. Komeza, "Equivalent permeability of step-lap joints of transformer cores: Computational and experimental considerations," *IEEE Trans. Magn.*, vol. 47, no. 1 PART 2, pp. 244–251, Jan. 2011, doi: 10.1109/TMAG.2010.2089800.
- [62] R. S. Girgis, M. S. Bernesjö, S. Thomas, J. Anger, D. Chu, and H. R. Moore, "Development of ultra-low-noise transformer technology," *IEEE Trans. Power Deliv.*, vol. 26, no. 1, pp. 228–234, Jan. 2011, doi: 10.1109/TPWRD.2010.2070812.
- [63] M. Arul Sathya and U. Savadamuthu, "Electromagnetic force and deformation in transformer winding," *Int. J. Appl. Eng. Res.*, vol. 14, no. 3, pp. 790–796, 2019, [Online]. Available: https://www.ripublication.com/ijaer19/ijaerv14n3_25.pdf.
- [64] Wenqi Ge, Youhua Wang, Zhenghan Zhao, Xiaoguang Yang, and Yongjian Li, "Residual Flux in the Closed Magnetic Core of a Power Transformer," *IEEE Trans. Appl. Supercond.*, vol. 24, no. 3, pp. 1–4, Jun. 2014, doi: 10.1109/TASC.2013.2291437.
- [65] X. Zhao, Y. Du, Y. Liu, Z. Du, D. Yuan, and L. Liu, "Magnetostrictive properties of the grain-oriented silicon steel sheet under DC-biased and multisinusoidal magnetizations," *Materials (Basel)*, vol. 12, no. 13, Jul. 2019, doi: 10.3390/ma12132156.
- [66] M. Bagheri, A. Zollanvari, and S. Nezhivenko, "Transformer Fault Condition Prognosis Using Vibration Signals Over Cloud Environment," *IEEE Access*, vol. 6, no. d, pp. 9862–9874, 2018, doi: 10.1109/ACCESS.2018.2809436.
- [67] A. Al-Abadi, "Developing an Accurate Load Noise Formula for Power Transformers," in *2019 6th International Advanced Research Workshop on Transformers (ARWtr)*, Oct. 2019, pp. 19–24, doi: 10.23919/ARWtr.2019.8930195.
- [68] N. Rinanto and C. H. Kuo, "PCA-ANN Contactless Multimodality Sensors for Body Temperature Estimation," *IEEE Trans. Instrum. Meas.*, vol. 70, no. M1, 2021, doi: 10.1109/TIM.2021.3112778.
- [69] X. Chen, M. Yi, and J. Huang, "Application of a PCA-ANN Based Cost Prediction Model for General Aviation Aircraft," *IEEE Access*, vol. 8, pp. 130124–130135, 2020, doi: 10.1109/ACCESS.2020.3008442.
- [70] K. Irshad, A. I. Khan, S. A. Irfan, M. M. Alam, A. Almalawi, and M. H. Zahir, "Utilizing Artificial Neural Network for Prediction of Occupants Thermal Comfort: A Case Study of a Test Room Fitted with a Thermoelectric Air-Conditioning System," *IEEE Access*, vol. 8, pp. 99709–99728, 2020, doi: 10.1109/ACCESS.2020.2985036.
- [71] A. M. Najemalden, S. W. Ibrahim, and M. D. Ahmed, "Prediction of collapse potential



- for gypseous sandy soil using ANN technique,” *J. Eng. Sci. Technol.*, vol. 15, no. 2, pp. 1236–1253, 2020.
- [72] S. Haykin, *Neural Networks and Learning Machines*, 3rd ed. Canada: Pearson Prentice Hall, 2008.
- [73] Z. Wang, W. Wei, R. Langari, Q. Zhang, and Q. Yan, “A Prediction Model Based on Artificial Neural Network for the Temperature Performance of a Hydrodynamic Retarder in Constant-Torque Braking Process,” *IEEE Access*, vol. 9, pp. 24872–24883, 2021, doi: 10.1109/ACCESS.2021.3057494.
- [74] T. Munakata, Ed., *Fundamentals of the New Artificial Intelligence*. London: Springer London, 2007.
- [75] F. Gorashi and A. Abdullah, “Prediction of water quality index using back propagation network algorithm. case study: Gombak river,” *J. Eng. Sci. Technol.*, vol. 7, no. 4, pp. 447–461, 2012.
- [76] D. T. Pham and D. Karaboga, *Intelligent Optimisation Techniques*. London: Springer London, 2000.
- [77] S. Yadav and R. K. Mehta, “Modelling of magnetostrictive vibration and acoustics in converter transformer,” *IET Electr. Power Appl.*, vol. 15, no. 3, pp. 332–347, 2021, doi: 10.1049/elp2.12025.
- [78] I.-D. Deaconu, R.-C. Dragomir, A.-I. Chirila, A.-S. Deaconu, C. G. Saracin, and V. Navrapescu, “Noise analysis for no load operating power transformers,” in *2017 10th International Symposium on Advanced Topics in Electrical Engineering (ATEE)*, 2017, pp. 128–131, doi: 10.1109/ATEE.2017.7905122.
- [79] M. R. Karafi and R. S. Nejabat, “An introduction to a bulk magnetostrictive bending actuator using a permendur rod,” *SN Appl. Sci.*, vol. 2, no. 2, pp. 1–10, 2020, doi: 10.1007/s42452-020-2090-z.
- [80] E. Doğan and B. Kekezoğlu, “Power Transformer Noise , Noise Tests , and Example Test Results,” *World Acad. Sci. Eng. Technol. Int. J. Electr. Comput. Energ. Electron. Commun. Eng.*, vol. 10, no. 1, pp. 57–61, 2016, [Online]. Available: <https://www.waset.org/publications/10003432>.