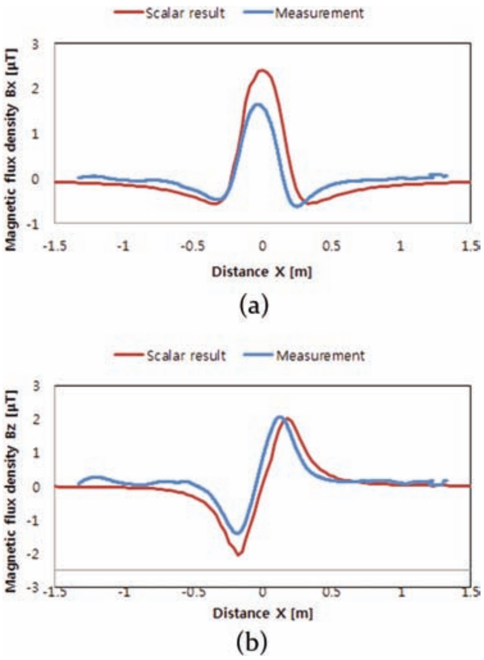

Fig. 1 Comparison scalar results with measurement. (a) Bx component. (b) Bz component.

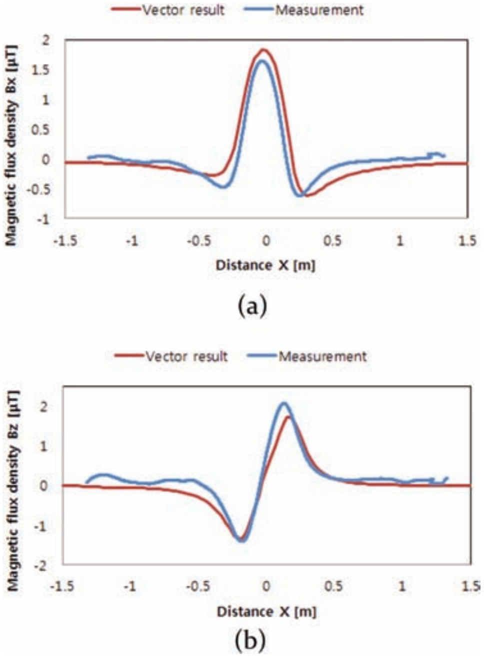

Fig. 2 Comparison vector results with measurement. (a) Bx component. (b) Bz component.

CU-06. Dynamic Preisach hystersis model for magnetostrictive materials for energy application.

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Recently Magnetostrictive materials have been proposed as active materials to be used in several energy harvesting technology [1]. In this kind of application, the working condition of the material is highly dynamic and non linear. As a result static models of magnetostrictive materials are usually not very accurate and can be not reliable to develop a sufficiently accurate design of the energy harvesting devices. The presence of hysteresis requires accurate mathematical modeling in order to correctly foresee the behavior of real materials (ferromagnetic or magnetostrictive) used in control systems or in electrical machines and thus simplifying the design of such controllers or predicting with acceptable accuracy electromagnetic fields in such devices[2]. In order to overcome this problem, this paper addresses the development of Dynamic Preisach hysteresis model (DPM) for magnetostrictive materials for energy application operating in hysteretic and time varying nonlinear regimes. DPM is a development of classical Preisach Model which is able to include dynamical features in the mathematical model of hysteresis. In this paper the magnetostrictive material considered is Terfenol-D. Its hysteresis is modeled by applying the DPM whose identification procedure is performed by using a neural network procedure previously publised [3]. The neural network used is a multiplayer perceptron trained with the Levenberg-Marquadt training algorithm. This allows to obtain both Everett integrals and the Preisach distribution function, without any special conditioning of the measured data, owing to the filtering capabilities of the neural network interpolators. The model is able to reconstruct both the magnetization relation and the Field-strain relation. The model is validated through comparison and prediction of data collected from a typical Terfenol-D transducer

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CU-07. An efficient inverted vector hysteresis model based on Preisach model with rotational operator.

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To solve rotational electromagnetic field numerical problems, it is necessary to implement vector hysteresis models, especially when anisotropic magnetic materials are involved [1,2]. Since magnetic vector potential is introduced as unknown in finite element method (FEM) formulations [3,4], magnetic flux B can be directly obtained. It is more efficient to apply inverted (B-based) hysteresis models than forward (H-based) models in numerical analysis. In this paper we propose an inverted vector hysteresis model. In order to circumvent tedious iterative procedure, a derivative Preisach weight (DPW) function is introduced in the inverted model. To construct the DPW function, analysis was made in the first derivatives of Everett function. According to the DPW function of a H-based model [5,6] (Fig. 1a), the DPW function of the B-based model was designed and shown in Fig. 1b. The inverted model also accounts for forced magnetization effect by applying a tangent function as a basis of the final output. With an additional rotational operator in Preisach integral, the inverted scalar Preisach model can be defined efficiently in different space directions [7]. The identification of the model was done by the measurement data obtained by means of a vector vibrating sample magnetometer. Limited amount of parameters are determined by Newton method algorithm to obtain the mean squared error (MSE) between the measured and simulated data. As it is shown in Fig. 1c, the simulation result produced by the inverted hysteresis model shows a good agreement with measurements.

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