MODELING AND SIMULATION OF INELASTIC EFFECTS IN COMPOSITE CABLES

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The present work aims at describing hysteresis behaviour arising from cyclic bending experiments on cables by means of the Preisach operator. Pure bending experiments on cables conducted in [1] show that slender structures such as electric cables behave inelastically and open hysteresis loops arise, with noticeable difference between the first load cycle and the following ones.
As shown in [2] and [3], the Preisach operator plays an important role in describing the input-output relation in hysteresis behaviours and it can be expressed as a superposition of Relay operators. The definition of the Preisach plane occurs naturally from the definition of Preisach operator and can be defined recursively. Thus, hysteresis loops can be computed by integrating a suitable weight function over a domain included in the Preisach plane.
Here, data collected from pure bending experiments [1] are utilised for a first approach. A mathematical formulation of the problem is introduced, and a first attempt is made to mathematically determine the hysteresis behaviour that describes the relation between curvature and bending moment of specific electric cables.
In this contribution, starting from the input function, i.e. the curvature of the cable specimen, the Preisach plane is recursively defined for this specific case. Therefore, the derivation of a suitable weight function is attempted by means of polynomial approximation, in a way that the integration of such a weight function over the Preisach plane results in the output function, i.e. the bending moment of the specimen.

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References

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