

Accepted Manuscript

Characterization and computational modeling of electrical wires and wire bundles subject to bending loads

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PII: S0020-7403(17)33632-9
DOI: [10.1016/j.ijmecsci.2018.03.009](https://doi.org/10.1016/j.ijmecsci.2018.03.009)
Reference: MS 4219



To appear in: *International Journal of Mechanical Sciences*

Received date: 24 December 2017
Revised date: 16 February 2018
Accepted date: 9 March 2018

Please cite this article as: Ehsan Taghipour, Sai Siddhartha Vemula, Zhengdi Wang, Yitong Zhou, Hossein Qarib, Kushal Gargesh, Leon M. Headings, Marcelo J. Dapino, Soheil Soghrati, Characterization and computational modeling of electrical wires and wire bundles subject to bending loads, *International Journal of Mechanical Sciences* (2018), doi: [10.1016/j.ijmecsci.2018.03.009](https://doi.org/10.1016/j.ijmecsci.2018.03.009)

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Highlights

- Synergistic computational-experimental approach is presented to characterize the mechanical behavior of electrical wires and taped wire bundles in bending.
- Elucidate the significant role of plasticity on the deformed shape of wires subject to bending moments, as well as the uncertainty caused by residual stresses.
- A customized cantilever bending test is developed to characterize material properties and calibrate/validate finite element (FE) models of single wires and taped wire bundles.
- A high-fidelity 3D FE model is developed to simulate the deformed shapes of taped wire bundles considering material/geometrical nonlinearity and contact-friction between wires.
- The study shows that 1D FE models relying on homogenized elastoplastic properties, evaluated using an optimization algorithm, can accurately predict the deformation response of single wires and taped wire bundles in bending.

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