

## ABSTRACT

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The technical and financial management of power substations involves the evaluation of the operational condition of power transformers. Evaluation is an essential stage for maintaining electricity supply and resource efficiency by guiding the process of maintaining or upgrading a transformers park. This process aims at identifying assets with critical operational condition in a substation that may pose risks to operators, installed equipments and customers. The use of computational intelligence techniques aims at assisting the evaluation process, which is not simple because it requires composing measurements, that evaluate different systems of a power transformer. A deep technical knowledge of chemical, electrical and physical measurements is necessary to infer a diagnosis. Thus, computational intelligence techniques reduce the need for the human factor, since they are able to extract patterns of known information or optimize processes for identifying critical assets. In this dissertation, computational intelligence techniques are applied aiming at composing a numerical index, designated Health Index, for asset prioritization. Prioritization can present the operating state of one asset through the classification based on criticality levels or through an ordination in a set of assets. Information regarding the measurements used to compose the index is available in periodicals, based on measurements in real transformers. In this dissertation, techniques of swarm intelligence are specially explored for the composition of the health index, since, until the beginning of this dissertation, there were no publications with the application of these techniques to solve the prioritization problem. With the development of this dissertation, we seek the most appropriate set of methods to support decision making in prioritizing assets. The effectiveness of the proposed methods is evaluated, seeking strategies that add greater flexibility, simplicity and high accuracy rate in the prioritization of assets.

Keywords: Power transformers; diagnosis; operational condition; computational intelligence; swarm intelligence; measurements; health index; criticality levels; ordination.