

Topic for a
Master Thesis/Project Work

**Autonomous wear monitoring of high-voltage crimp connectors
using artificial neural networks.**

Power cables in the high-voltage electricity grid are connected using so-called crimp connectors (Figure 1). Over the course of their life cycle, corrosion, vibrations or material fatigue lead to an increase in electrical resistance at the contact surface and, consequently, a reduced temperature difference between the coupling point and the reference conductor cable (Figure 2). To prevent more serious damage, these thermal hotspots must be replaced at an early stage by grid operators (e.g. Amprion); however, this has so far only been possible through tedious helicopter surveys using thermal imaging cameras.

As part of a collaboration with the IEEH and Amprion, the aim of this work is to investigate the applicability of neural networks in the context of assessing the condition of a crimp connector based on data of the temporal temperature progression at between the connector and the conductor (Figure 3) – under various weather conditions.

The following sub-tasks are to be carried out:

- Literature review on damage detection using neural networks
- Development of a model for assessing the condition of the connection, taking environmental data (e.g. ambient temperature) into account
- Comparison of the model's performance in terms of generalisation to other types of cable
- Preparation of a written project report

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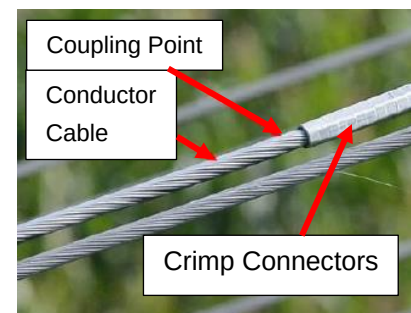


Figure 1: Example of a junction.

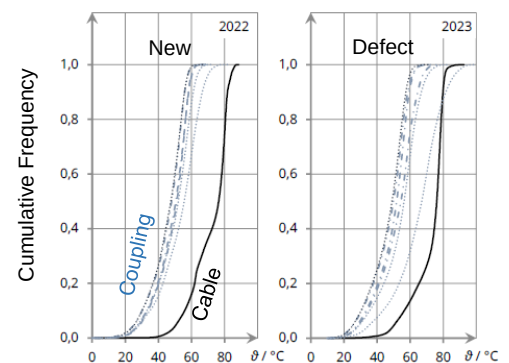


Figure 2: Cumulative frequency of temperatures in a crimp connector (blue) compared with those in the conductor cable (black) for a new, intact system (left) and an aged system (right).

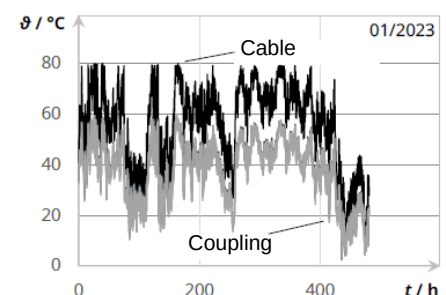


Figure 3: Temperature curve over time for a crimp connector compared with the reference (solid cable) for a worn crimp connector.