Application of knowledge engineering approach to mitigate the infant mortalityrisk of HV cable system in MEA Thailand

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Metropolitan Electricity Authority (MEA), the distribution utility supplying electricity to the customers in Bangkok Metropolis, Thailand, has implemented the underground cable system for several decades. The main purpose is to enhance the distribution system reliability and beatify the Bangkok metropolitan cityscape. Recently, MEA has launched the roadmap to support the government policy in turning Bangkok Metropolis into the capital of ASEAN through the modernization its distribution network. Hence the number of undergrounding projects has been established for the near future. The projects include the conversion of overhead to underground system along the main streets in Bangkok totaling 260 km of street length as well as the strengthening of sub-transmission system totaling 270 circuit- km. This passes on the huge burden to the project execution team.

MEA installation team although possesses very high skill through lifelong experience in cable jointing works, working under the adverse environment and stressful condition somehow deteriorates the quality of jointing work. It was evidenced by the number of accessories breakdowns during the commissioning soak test on the cable line, particularly the cable joints which installed in the manhole buried underneath the road surface. It sometimes even occurred right after the voltage switching-on. This event can be considered as “infant mortality” of bathtub failure pattern that seriously required particular attention from the project execution team. The knowledge engineering approach together with the analytical tool has then been employed to digest the problems, analyze causes and effects and seek for the appropriate solutions.

Knowledge engineering provides the methods to obtain a thorough understanding of the structures and processes used by knowledge workers (or cable jointers), even where much of their knowledge is tacit, leading to a better integration of information technology in support of knowledge work. On the other hand, knowledge engineering is a process of eliciting, structuring, formalizing, and operationalizing information and knowledge involved in a knowledge-intensive problem domain (or cable jointing works), in order to construct a program that can perform a difficult task adequately.

By employing the knowledge engineering methodology, it is found that several factors could contribute the joint failures. The problems include: the cable joint that may not be designed to fit the installation environment, the jointers, although possessing high skill in usual jointing works, that may not be well trained for particular installation, the uncontrollable site installation conditions, the times duration allowed to carry out the jointing job too short, the inappropriateness of cable testing methods, the switching procedure to energize the cables, etc. As a consequence, the countermeasures have then been developed to overcome the problems of joint failure including the system design review, the acquisition of proper installation and testing tools, and especially the adequate training for the jointers.

This paper aims to share the experiences of applying knowledge engineering approach to mitigate the infant mortality risk of HV cable system in MEA.

Key words

Cable joint failure; Cause effect analysis; HV cables; Infant mortality; Knowledge engineering