Unyarat Torpol 2009: The Influence of Pipe Roughness to the Performance of Water Spray Fire Control in Electrical Transformer. Master of Engineering (Safety Engineering), Major Field: Safety Engineering, Interdisciplinary Graduate Program. Thesis Advisor: Associate Professor Prakorb Surawattanawan, Ph.D. 147 pages.

The electrical transformer can be seriously damaged by fire because it contains oil within the transformer case to cool its electric coils. Water spray is one of effective ways for fire suppression in the transformer. One crucial parameter in the design of water spray is the pipe roughness coefficient. The coefficient selection influences to the result of system working pressure. In general water spray design, the high value of coefficient representing smooth pipe wall is selected. In consequence, the calculation result tends to have the lowest operating system pressure. However, when the time goes by, the pipe roughness has been changed and deteriorated. The system working pressure is increased until the system does not function properly. As a result of this, the efficiency and reliability of the system are degraded. This research work utilized hydraulic calculation along with Hazen-Williams formula for water piping analysis. The results show that working life or the value of roughness coefficient has a significant effect on the system working pressure. The demand system pressure increases 47% in comparison with the design value for 10-years of working life. In addition, the demand system pressure increases100% in comparison with the design value for 20-years of working life. It implies that if the designer does not prepare safety factor for the design pressure, the system may be at fault in operation after a period of time. The solution of this problem can be performed by two ways. The first one is to increase the pressure or head of the fire pump. Nevertheless, this implementation is costly and not a best choice in term of investment. The second one is to increase the size of water pipeline. This results in the reduction of demand system pressure. The analyses show that the increase of 25% in piping size extends the working life to 20-year and the increase of 50% in piping size extends the working life to 50-year.

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