

Evolution of MV Extruded Cable Designs Used in the US from 1996 to 2014

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ABSTRACT

Developments in cable designs have always been of great interest to utilities and manufacturers alike. In 2003, Joe Dudas, with support from utility bodies (AEIC & NRECA), performed several surveys to establish the industry trends in medium voltage (MV) extruded cable usage. The results of these surveys proved to be very useful to utilities and manufacturers in understanding current. In 2016, the authors undertook a utility survey on cable, materials, and accessories to all interested parties. This study covered the experiences of >50 different utilities. The analyses within the 2016 study enabled the authors to follow the methodologies of the previous studies of Dudas et al, to provide perspectives on present day cable and accessory usage in the US.

KEYWORDS

Design, MV, Extruded Cable Systems

INTRODUCTION

Developments in cable designs have always been of great interest to utilities and manufacturers alike ([1] - [6]). However, when there are many potential design choices available, it can be difficult to determine underlying trends and developments. In 2003, Joe Dudas, with support from utility bodies (AEIC & NRECA), performed several surveys to establish the industry trends in medium voltage (MV) extruded cable usage. The results of these surveys proved to be very useful to utilities and manufacturers in understanding current trends in the use of different insulation types, cable designs, and installation practices of particular use is the fact that the 2003 survey was the last of a series starting back in 1992. However, due to the development of new cable standards and designs and the evolution of replacement / maintenance strategies, these survey results are likely no longer accurate. The authors estimate that there are approximately 9 different generations of designs currently installed on utility systems.

In 2016, the authors undertook a utility survey into the cable, materials, and accessories used by all interested parties. This study covered the experiences of >50 different utilities. The analyses within the 2016 study enabled the authors to follow the methodologies of the previous studies of Dudas et al, to provide perspectives on present day cable and accessory usage in the US, including:

- metal used for the conductor,
- conductor shield type (conventional or supersmooth),
- conductor size,
- insulation type (WTRXLPE or EPR),
- insulation wall thickness, and
- accessory types (premoulded, heat shrink, or cold shrink)
- etc

As this work follows very closely the methodology used by

Dudas and his colleagues, in some cases it is possible to extend the trends developed by these earlier studies.

This study also collected information on the important factors considered by utilities when selecting a cable for use within the distribution system.

APPROACH

Previous Studies

Prior work in this area was performed by Joe Dudas and supported by AEIC and NRECA to establish industry trends in medium voltage cable usage (15 kV to 35 kV). His work started in 1993 and updated approximately every 5 years until 2003. Interestingly, essentially identical questions were asked in each of the surveys allowing trends to be derived. The results were reported separately for investor owned utilities (IOU) and cooperatives (co-ops). The information collated was useful to utilities and manufacturers in understanding technical specification trends and installation practices. The last survey was conducted in 2003. With technology evolution and changes in utility operations, the results from the 2003 survey are likely outdated.

This Study

This study seeks to review and analyze the published data from the previous surveys and re-establish the survey to determine today's usage trends. Previous surveys focused on cables. A number of issues with accessories are also worth exploring. This study covers cable designs, accessory designs, and installation practices. Investor owned utilities and co-op data are reported together in this study. The results from this study provides a 2014-2015 benchmark on utility cable and accessory specifications and extends the 10-year technical specification trend developed by Dudas to a 20-year trend. It also provides updates on current practice/trends in cable replacement and rejuvenation and helps collate experiences/new issues with our aging cable system population. The findings from this work will be shared with interested parties and help guide necessary changes/updates to industry standards.

METHODOLOGY

This project continued the same methodology used by Dudas; namely collating utility specifications and surveying to establish purchasing data and impressions. The authors asked for the last version of Dudas' survey provided to utilities, but was unsuccessful in obtaining it.

Data Collection

Cable specifications, typically issued by utility standards groups, were requested. These documents usually specify permissible cable constructions, proper cable identification,