



Project 16-8: Distribution Series Capacitor Application Considerations and Recommendations

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Project Summary:

Before series capacitors were installed in transmission systems, they were first applied in distribution circuits in the first half of the 20th century. The typical distribution series capacitor application focused on solving voltage flicker and/or voltage regulation issues associated with variable loads usually combined with either weak systems and/or long distribution circuits.

Both the early distribution series capacitors as well as more modern installations have successfully mitigated voltage flicker issues. In some early applications, ferroresonance and subsynchronous resonance issues were encountered along with bypass gap issues. It is possible to mitigate these issues with proper application engineering and new gap technology. With this as background, the DSTAR membership proposes to re-visit this product as part of Project 16-Y starting with the history of this device, lessons learned from previous applications, identify the benefits/advantages of new equipment, provide some guidance on bank sizing and location, document previous motor experiences, and to the maximum extent possible, provide equipment prices.

This project report can serve as a reference for DTAR members considering this application.

Key findings include:

- 1) DSCs should be considered as one of many solutions to improve the performance of both distribution feeders and connected loads. Normally distribution series capacitors (DSCs) are applied in the following applications: a. Long radial distribution circuits. b. Large motors with frequent starting. c. Large motors with frequent load switching.
- 2) Although DSCs have had known application issues such as bypass gap performance issues and motor subsynchronous operation, these issues have been solved by: a. Elimination of bypass gaps and replacing them with solid-state metal-oxide varistors. (MOVs) b. MOVs increase the overall reliability of DSCs. c. DSCs are now self-monitoring and can detect subsynchronous motor operation and automatically insert a parallel resistor to provide circuit damping.
- 3) Ferroresonance issues can be prevented by performing operational switching and fault clearing only with 3-phase switching devices. Fuses should be avoided.
- 4) All prior known DSC application issues are known and have solutions.
- 5) The only known commercially available DSC is the “MiniCap” offered by ABB.

Who Should Use:

Distribution/Transmission Planners, Standards Engineers, PQ/Reliability Engineers

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For the complete report for DSTAR Project 16.8: Distribution Series Capacitor Application Considerations and Recommendations, visit www.dstar.org.



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