

## EPR insulated cables for modern offshore systems

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EPR insulated cables are covered by the IEC standards and by many National Standards around the world and are currently used in several countries in power distribution networks at voltages up to 150 kV.

The EPR insulated cables started to be used in the early sixties just few years after the development of the Ziegler-Natta catalyst process (Nobel prize award in 1963 for this invention) and the ad hoc EPR insulation compound implementation. During this more than 40 years period of experience an excellent track record in terms of reliability and service operability has been observed.

The use of EPR insulated cables found its maximum application during the seventies and eighties following the relevant problems arisen from the failures in service caused by the water treeing phenomenon in polyethylene insulated cables. Because of the complex and costly compounding process, today the EPR insulated cables are less common but are still being used for specific applications where they maintain some advantages versus other kinds of cables.

EPR insulated cables are used up to 170 kV; at higher voltages the quadratic dielectric loss increase with voltage makes their use not convenient, while at MV dielectric losses can usually be neglected.

On the other hand most of the premoulded type accessories for AC cable systems up to 550 kV are based on specific EPR compounds and the same is for the accessories of the increasingly installed HVDC extruded cable systems.

In recent years the large development of renewable energy generation systems required the adoption of new cables designs having particular characteristics. For instance the medium voltage cables inside a wind turbine have to meet very demanding mechanical performances in terms of bending and torque flexibility. Cables connecting the individual wind turbines (often called "inter-array cables") are pure submarine cables in which resistance to water and mechanical strength are among the most important characteristics. The same is for submarine and umbilical cables for dynamic applications that are used to connect floating offshore units where superior fatigue resistance and mechanical performances are required.

Thanks to its outstanding electrical performance in wet environment and superior mechanical characteristics EPR insulated cables are particularly suitable for modern offshore systems. Some significant applications are described in the paper.