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Increasing cable drum lengths

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The economic and technical interest of maximising cable drum lengths is mainly to reduce the number of joints. Increasing length can be achieved in reducing the cable outer diameter or improving the winding up capacity of the drum. The paper presents some means to carry it out and the consequences on the design of an underground power link and its operating conditions.

An optimised calculation method of the cable drum length makes possible the illustration of representative configurations. Based on concentric overlapped helical sections and an optional expansion factor to take into account an uncertainty margin, this method is more accurate than a traditional calculation from an integer of layers and turns. It is straightforward to extrapolate the corresponding weight of the drum, and to compare it with the handling and shipping limits.

The cable drum length can be increased in optimising the dimensions and geometry of the drum. Some examples are given in terms of shipping legal constraints (road or railway gauge). The study deals with the limit of the cable minimum bending radius as well as the related constraints of design (especially metallic screen) and installation (drilling layout for example).

The evolution of the cable components (more compact conductors, reduction of the insulation layer, metallic sheath technological change, emergence of outer jacket for direct burying) has a straight influence on the outer diameter.

The final part of the study concerns the consequences of the cable outer diameter reduction on the power link design: impact on the thermal performance during steady-state or emergency operating conditions, impact on short-circuit design (aluminium foil for cables of small cross-section area), impact on induced voltages or electrodynamic strains (distance between axes of touching cables), impact on methods of laying (ducts design, laying in touching trefoil, mechanical laying, retrofitting of oil-filled pipe-type cables, etc.), impact on accessories.