Comparison of Quickfield^{TM} simulation of three single core XLPE cables, in flat formation, with complex loading, between not taking drying out and taking drying out of soil into account.

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Current rating calculations for power cables require a solution of the heat transfer equations which define a functional relationship between the conductor current and the temperature within the cable and its surroundings. The challenge in solving these equations analytically often stems from the difficulty of computing the temperature distribution in the soil surrounding the cable. An assumption is made to simplify thee computations, namely that the earth surface is an isotherm. The ambient temperature in summer will be taken as 25º C. The burial depth of the cables is in the order of 10 times their external diameter and for the usual temperature range reached by such cables this is a reasonable assumption, but for large cable diameters and cables located close to the ground surface a correction to the solution has to be used or numerical methods should be applied. Normally in such calculations the drying out of soil is not considered. This however, may have a very negative effect on the emergency rating of the cable. This paper will show the difference between taking drying out into account and when this is not taken into account. QuickfieldTM handles these types of computations with the greatest of ease. The main feature of this is to accurately model the cable and the surface. Each section of the cable must be drawn to scale and all the parameters of the constituent parts must be added. Once this is done all the boundaries and edge labels must be given the specific values. The next important part is the soil. The thermal conductivity changes with moisture content. The edges of the soil sample must be such that the temperature change due to the cable doesn't affect the final boundary. The load curve is the next part that must be handled. Here a 24 hour load curve must be programmed. Once this has been done the simulation can start. The first part of the simulation was with a constant soil thermal conductivity. The second part was where the soil's thermal conductivity changes as the soil is dried out. From the simulations it is quite obvious that when doing computations on cable ampacity and emergency ratings that drying out of soil is a very important factor that must be taken into account.