Gravitational cooling of cable installations

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New possibilities are shown to eliminate hot-spot-regions in cable routes by means of a sectionalized gravitational water cooling. This type of cooling is characterized by low complexity as well as autarkical and reliable low-maintenance operation, without active elements like pumps, coolers etc.

Principle and effectiveness are demonstrated for a powertubes-cable installation, comp. fig. 1. Two heat absorbing pipes, which are closely neighboured to the cables, are connected with two heat dissipating pipes which are installed parallel, as near as possible to the soil surface. The two lower and the two upper pipes are connected with each other by means of vertical pipes at both ends of the cooling section, thus building two closed cooling circuits, filled with water.

As it is shown, with growing warm cables and pipes a water circulation will set in with only some cm/s but with surprisingly good cooling effects. In principle,, a sensible part of the cables losses are extracted by the cooling pipes and dislocated and dissipated into a more favorable region of the cable trench. Especially impressive is the effectiveness even for very long cooling sections up to e.g. 1000 m.

The shown examples elucidate, that even severe thermal impacts by steam pipes, other cables etc. can be controlled by means of such arrangements.

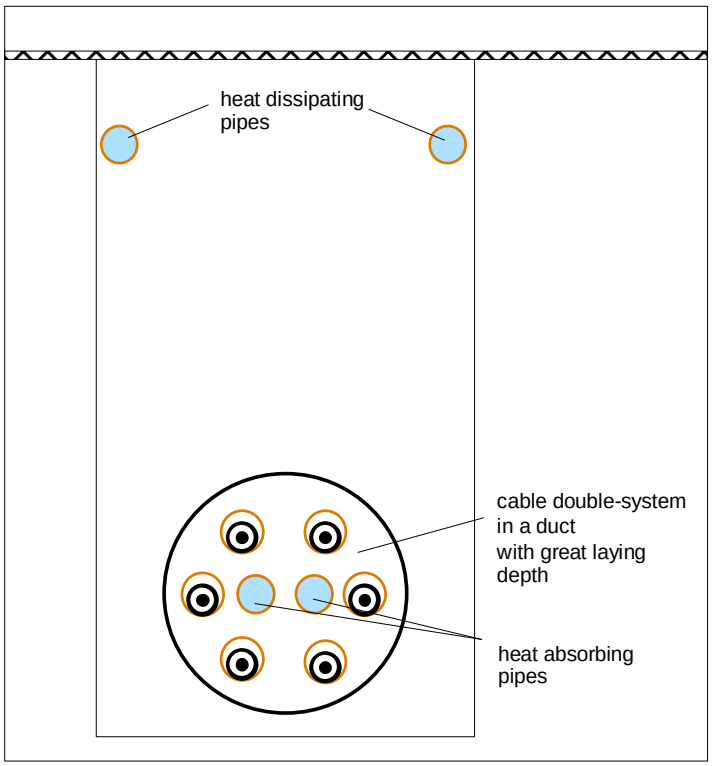

Fig. 1:

Thermal bottleneck over 50 m with steam pipe in a depth of 2.0 m and a cable double-system

380-kV-VPE-cables
2500 mm^2 RMS;
I = 3467 A; m = 0,80

below: cooling facilities (schematic)