Summary of the work

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Academic year 2018-2019

1. General informations about the work

Work title: Mitigation of voltage sags by a voltage conditioner

Section: Electrical engineering, orientation “Electric power and energy systems”

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2. Work overview

The first goal of this thesis is to analyse the dips, also called sags. In fact, these are more complex than a simple step decrease of the voltage and other characteristics have to be taken into account. These are: magnitude (remaining or depth of the dip), duration, phase angle jump (PAJ) and point-on-wave.

The studied device is based on the actual Euro-Diesel No-Break KS®. Then, it is composed of two elements: a high impedance three-point choke and a low impedance synchronous machine. Compared to the equipment actually used, the studied device does not contain any accumulator or diesel engine. Then, the equipment could not handle the severest dip but it is more compact and less expensive than the basic one. The modelled load is composed of induction motors (20%) and constant admittances (80%). All the system is modelled in the software called ERACS.

Two fault types are simulated: the three-phase and the single-phase faults. These are assumed to happen somewhere in the power system and are seen by the load. Before this one, a distribution transformer is assumed to be present (in addition to the voltage conditioner). At first, the “equal-area criterion” is applied to the case of concern here. Then, for the first type, the impact of the dip parameters on the machine stability is assessed. As a result, “power acceptability curves” shows the performance for three-phase faults for two PAJ. These are curves representing, on the axes duration-magnitude, all the dips that do not destabilise the machine and do not yield to an undervoltage too deep at the load terminal. For the single-phase fault, the equipment is able to deal with all possible dips. The effect of adding additional inertia to the machine is also assessed and it is shown that it improves the performances. At the end, the effect of two other types of loads is analysed. These are the cases with all motors and with constant power loads. It is shown that they both yield to worst results.

3. Meaningful work illustrations

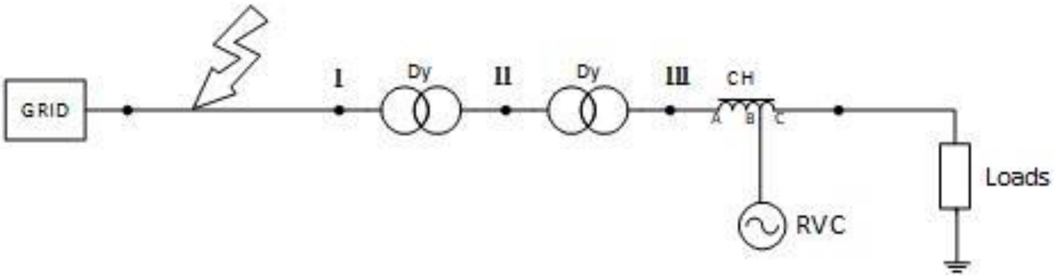

Figure 1: Schematic of the studied network

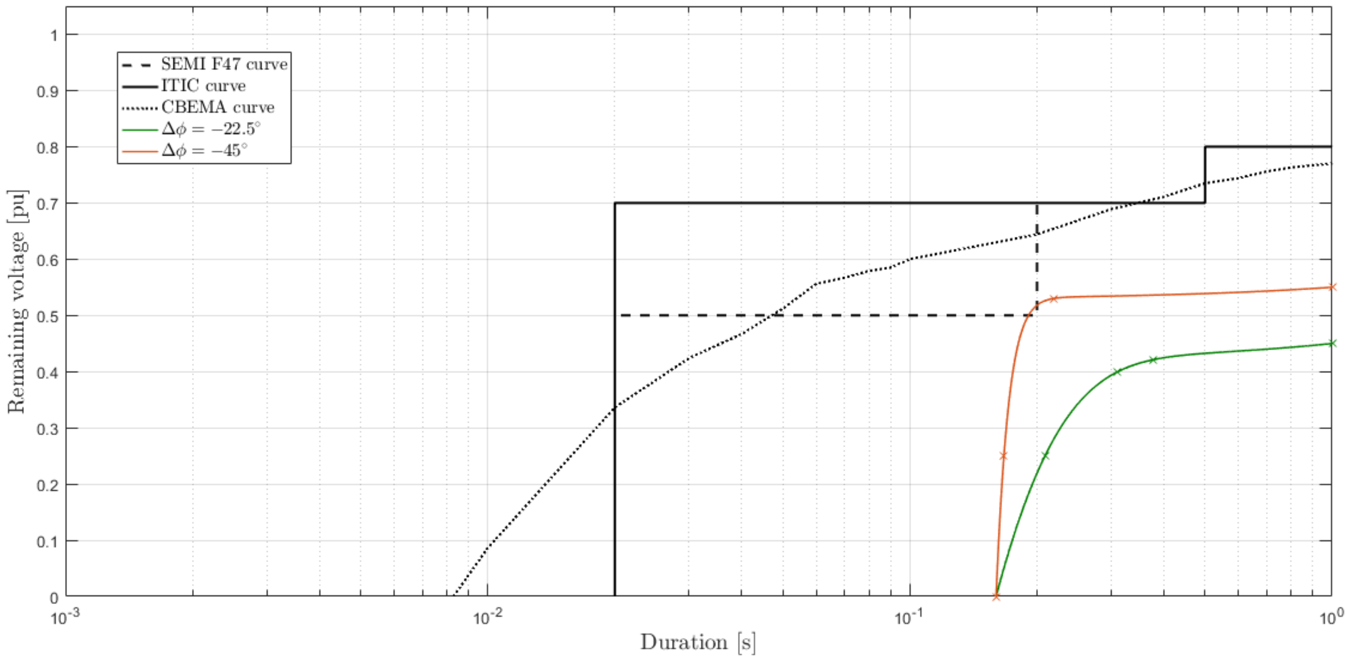

Figure 2: Power acceptability curve (existing standard curves and results)