Voltage Dip Immunity of Equipment and Installations

TUTORIAL

Global Voltage Dip Statistics (Part 6)
Global Voltage Dip Statistics

GOALS

- To obtain statistical information for making decisions concerning immunity requirements

- By means of:
  - Wide range of sites at several voltage levels and different geographical regions
  - Integration of measurements in a consistent database for statistic analysis
Global Voltage Dip Statistics
Data Sources (1)

- 1175 monitoring sites
- Sites from Canada, Portugal, UK, South Africa, USA, Australia, Spain...
- All data within the same database
- Presentation as Contour Charts by:
  - voltage level,
  - dip type and
  - percentile value
LV, MV and HV sites.

Phase-to-neutral, phase-to-earth or phase-to-phase.

RMS values, no waveforms.

Three channels or just worst channel recordings.
Global Voltage Dip Statistics
Algorithms

- Conversion from phase-to-earth into phase-to-phase.
- Type I, II or III.
- Characterisation according to IEC 61000-4-34 (3A, 3B or 3C).
Global Voltage Dip Statistics
How Dips Should be Measured?

- **Between active conductors:**
  - At LV $\rightarrow$ phase-to-neutral.
  - At MV and HV $\rightarrow$ phase-to-phase.

- **At MV and HV some phase-to-earth records are converted into phase-to-phase measurements.**
Global Voltage Dip Statistics
Type I, II and III Dips

Type III

Type II

Type I
Global Voltage Dip Statistics
Contour Charts (1)

Example: LV and CP 75%.
Global Voltage Dip Statistics
Contour Charts (2)

- For each point \((V-t)\): number of dips per year and site, deeper than \(V\) and longer than \(t\), not exceeded by 75% of sites.

- Allows easy calculation of the amount of dips outside a specific \(V-t\) curve.
Global Voltage Dip Statistics
Worst and Typical Sites

- CP 95% excludes the “very bad” sites.
- CP 50% corresponds to the median or “average” site.
- CP 25% corresponds to the “quite good” sites.
Global Voltage Dip Statistics
Some results

- Type III are around 20% of all dips.
- Type II at MV+HV (51÷63%) are equivalent to type I at LV (54÷69%).
Survey Results: Type I Dips

![Graph showing percentile curves for Type I Dips]

- Percentile 95%
- Percentile 90%
- Percentile 75%
- Percentile 50%
- Percentile 25%
Survey Results: Type II Dips

Percentile 25%
Survey Results: Type III Dips
The report can be obtained in electronic format for free from: www.uiie.org;

a hardcopy can be purchased from www.e-cigre.org