

BREAKDOWN TIMES

2. Study Design

The 76 batches of the same insulating fluid constitute the experimental units in the experiment. Let us assume that the batches were randomly assigned to the seven voltage levels of 26, 28, 30, 32, 34, 36, 38 kV. The numbers of batches assigned to the different voltage levels are 3, 5, 11, 15, 19, 15, and 8, respectively. The measured responses were the times, in minutes, until breakdown.

The fact that the batches of insulating fluid were randomly assigned to the different voltage levels is very important for the validity of inferences drawn from the data. If, for example, batches are spooned from a large container that has density stratification, then assigning consecutive batches to the lowest voltage, then the next lowest, and so on, will confound fluid density with voltage. Some wrong conclusions might be made under these circumstances.

Under the assumption that the fluid batches were randomly assigned randomly to the seven voltage levels, the experiment is an example of a randomized experiment. Thus, causal inferences can be drawn from the data.

Indeed, the laboratory setting for this experiment allowed the experimenter to hold all factors constant except the voltage level. Therefore, if any significant differences among the mean breakdown times can be detected, it seems reasonable to infer that they have been caused by different voltage levels.

Observe that the data were obtained under laboratory conditions and for a particular range of voltage levels. Therefore, we cannot make any inferences to voltage levels outside the range and to performance under non-laboratory conditions.