

## Propagation of voltage sags in industrial power networks

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**Abstract.** The paper analyzes the propagation of voltage sags through the distribution network of an industrial company. For this, power quality is monitoring in high voltage, 44kV, and low voltage, 400V. The theory of M. Bollen is used for the study of the sags recorded by the meters at different points of the installation. It is necessary to know the connection of transformers in order to determine the transmission of the sags.

### Key words

Voltage sag, Transformer connection, Industrial loads

### 1. Introduction

One of the typical problems in electrical distribution systems are voltage sags. These have a great incidence on the electrical equipment connected to the network in the same area. The sags cause more damages than the rest of disturbances because these have a greater frequency of occurrence.

### 2. Classification of voltage sags

In this work the Bollen's classification is used [1]. Seven types of sags are defined which correspond to the possible shortcircuits in the three-phase network and to the sag propagation through transformers. The most common types are A, B, C and D.

### 3. Propagation of voltage sags across transformers

The windings of transformers can be connected in different ways, however, only three types summarize the transfer of three-phase unbalanced sags from one voltage level to another.

### 4. Sags propagation in industrial plants

The industrial plant under study is fed by three transformers ratio 44/13,8kV, 6 MVA and Dyn11 connection. The voltage of 13.8 kV undergoes a second reduction ratio through two transformers 13.8 kV/400 V, 1600 kVA and Dyn5 connection. Measuring equipment at two points are two QNA 412 Circutor brand, able to record supply quality parameters according to IEC 61000-4-30 Class A.

### Conclusion

This work studies the actual case of a company, which suffers frequently power quality problems; the transmission of the most common electrical disturbance, voltage sags, which causes major economic losses in the industrial sector. By monitoring two measurement points, the propagation of the sags through the electrical installation will be analyzed, taking into account the theory presented in this subject by M. Bollen.

### References

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