The Occurrence of Faults in LCI Drive Systems and its Effects on the Power Supply Quality

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1. Introduction

This paper presents a study about the Load Commutated Inverter (LCI) drive, under faulty operating conditions. It is shown that an open-switch fault introduces great changes in the normal harmonic content of the supply currents.

Key words

LCI Drives, Thyristor Faults, Harmonics, Power Quality.

2. Description

The LCI is an adjustable speed drive used in applications requiring high power ratings. It comprises a wound-field synchronous motor, associated with a current source inverter [1]. The power converters of the LCI drive system are the traditional thyristors bridges.

Like other drives, the LCI produce current harmonics, which are injected both in the machine and in the supply network. The last ones contribute to the degradation of the power supply, which have to comply with standards, regarding to the quality of electrical power systems [2]. To minimize the production of harmonics in the LCI, the structure adopted uses an asymmetrical six-phase machine, and the connection to the supply network is made through a transformer with two secondary windings constituting a twelve-pulse LCI drive system (Fig. 1).

The availability and reliability of electrical drives is always crucial and increases with the powers involved. But the drives can be subjected to faults, which can change the normal harmonic content and therefore introducing adverse effects both on the motor and in the supply network.

This paper focuses on the study of open-circuit faults in the power switches. A simulation study and experimental https://doi.org/10.24084/repqj01.311 results are presented regarding the effects of one openswitch fault in the supply-side converter and machine side converter.



Fig. 1. Structure of a twelve-pulse LCI drive system.

2. Conclusion

The results obtained experimentally and by simulation, show that the effects of open-switches faults in the power converters of the LCI drive system, introduce low order harmonics normally inexistent or disregarded. In the case of faults in the supply-side converter some supply currents will even present a DC offset, violating the recommendations of the standards.

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References

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