TECHNICAL NOTE

Preventive Maintenance

Electrolytic Capacitors



Scope of this document

Electrolytic capacitors commonly operate in the DC link of a converter module. The DC capacitors are used as an energy source and smoothing the DC voltage after rectification and inversion of the motor voltage.

The lifetime of an electrolytic capacitor is highly dependent on the application conditions and is affected by both electrical and environmental factors. Environmental factors involve temperature, humidity, atmospheric pressure and vibrations, whereas operation voltage, ripple current and charging/discharging can be categorized as electrical factors. If operating environment changes rapidly, the duration of individual conditions should be regarded in lifetime calculation. In many applications, the lifetime of the device is directly linked to the lifetime of the electrolytic capacitors inside. In frequency converter DC-link, capacitor aging involves a lack of power in high-demand dynamic changes and higher ripple in DC-link voltage.

Reasons for the preventive maintenance

An electrolytic capacitor is an ageing component. There is a risk that an aged capacitor starts to leak. In time, the impregnated electrolyte is gradually evaporating and diffusing out of the capacitor through the capacitor sealing. The loss of electrolyte increases ESR (equivalent serial resistance) value and causes decrease in capacitance. The rate of evaporation is increased significantly with temperature. The capacitor is considered failed when one or more of its electrical characteristics exceeds the allowable range of specifications. Allowable tolerances are specified by the capacitor manufacturer.

Following effects are caused by capacitor aging:

- Decrease in capacitance and increase in tanδ/ESR
- Poor charge/discharge capacity
- Leakage current increase

Preventive maintenance is an undeniably critical part of any maintenance strategy. By taking necessary maintenance actions, failures can be prevented before they occur. Preventive maintenance is not only predictable, but also cheaper, than repairing already failed drive. It's key for **avoiding unfunctional drive**, **decreases unexpected downtime, reduces costly repairs**, **improves reliability**, **enhances drive life expectancy**, **increases safety** and reduces risk of injury. If preventive maintenance action are not carried out, it can result in **total breakdown of the drive**.

ABB recommends changing wearing components to avoid risk of failures in frequency converter. Check maintenance schedule for recommended maintenance intervals and component replacements for a specific drive.

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