Technical note
Transient mitigation services

Electrical transients are temporary excesses of voltage and current on an electrical network. The causes are external (such as lightning) or internal (for example switching devices). Transients can cause irreparable damage to the insulation systems of motors.

Transients are random phenomena - they can either be spikes of very high amplitude and frequency or spread-out, distributed surges.

The electrical power used in industry can be severely affected by transient voltages which occur due to reasons such as load switching, lightning, energizing or de-energizing of transformers, and other.

The motors in industrial applications suffer from problems caused by transients and therefore require protection.

Consequences of transients
- Motors run at higher temperatures and vibration levels
- Insulation systems are degraded, leading to unexpected failures
- Degradation and wear of the motor are accelerated, leading to excessive downtime, increased maintenance expenses and, in some cases, the need to replace the motor
- If a transient-affected motor is rewound, the insulation withstand voltage of the rewound motor may be lower than before the rewind. This can mean further problems in the future
- As a result, the motor operator faces repair or replacement costs, downtime costs, and other
Benefits
- Simulation can be performed without any process intervention
- Early warning of the network related transient failures as determined by the software simulation
- Peace of mind through confirmation that transients are analyzed
- Unplanned downtime and associated costs avoided, resulting into optimized cost of ownership
- Lost production and associated costs avoided
- Mitigating chokes, if required, are easy to fit
- Chokes can be fitted in line with existing maintenance shutdown schedules
- Analysis and solution are low-cost procedures

Vacuum circuit breakers (VCBs)
- The opening and closing of VCBs generates transient voltages of different amplitudes and frequencies.
- These propagate towards the connected motor in the form of very fast transient (VFT) voltage spikes.
- These voltage spikes are of considerable amplitude – sufficient to damage the stator winding insulation over a period of time or even instantaneously.

Variable speed drives (VSDs)
- Transients from VSDs are low in amplitude compared to those from VCB switching. The effects of very frequent switching accumulate over time, however, and can contribute to insulation damage.
- Since VSDs usually operate at kHz frequencies they cause thousands of over-voltages per second, i.e. millions of operations every day. This can result in significant degradation of insulation.

ABB solution for installed base

Software analysis - to determine susceptibility of motor system to transients
Supply of chokes - in accordance with the specifications output by the software analysis

Example of motor system where simulation models show presence of transients
Example of chokes fitted to motor cables at terminal to mitigate transients
Same motor system after protective devices fitted to mitigate transients (using simulation models)

For more information please contact:
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