Contribution ID: **247** Contribution code: **WED-PO2-706-05** Type: **Poster**

Lifetime Studies of Electrolytic Capacitors Installed in the Protection Systems of the Superconducting Magnets in the Large Hadron Collider at CERN

Wednesday, 17 November 2021 10:30 (20 minutes)

A long-term scientific project such as the Large Hadron Collider (LHC) at CERN must undergo periodic, preventive and corrective maintenance of electronic components along their lifetime. Components that typically require replacement are the aluminium electrolytic capacitors. More than 36'000 units, rated 500 V and 4.7 mF are installed in the protection systems of the high field LHC superconducting magnets, and are in operation in the LHC tunnel since the start up phases of the collider in 2007.
Capacitor banks are integrated in the quench-heater discharge power supplies (HDS) that upon a quench detection, discharge their energy into the stainless-steel strip heaters installed inside each magnet. The quench protection electronics are in place to quickly detect a quench onset and then dissipate the magnet energy homogeneously inside the coils, such that the local peak temperature remains below damaging level. The quench heater strips heat up a large fraction of the magnet coils surface in order to quench them and spread up the coils internal resistive volume. A distributed internal resistance is causing an evenly energy dissipation over a large volume preventing local overheating and magnet damage. The HDS are thus safety-critical protection elements and so do the capacitors they integrate.
This paper describes the studies carried out with representative samples of the global population of capacitors. To this end, test beds have been assembled and ovens put in operation. Their main features are explained. Conclusive results obtained through the analysis carried out with several groups of capacitors effectively aged during more than one year at 85 ℃ and 70 ℃ are presented and discussed. Parameter values, such as capacitance, equivalent series resistance, leakage current and weight, have been measured regularly to evaluate the aging process.

Primary authors: BJORKHAUG, Erik Hildre (CERN); Dr CARRILLO, David (CERN); NOWAK, Edward (CERN); RODRIGUEZ MATEOS, Felix (CERN); GUASCH MARTINEZ, Josep (Centro de Investigaciones Energéticas Medioambientales y Tecnológicas (ES))

Presenter: Dr CARRILLO, David (CERN)

Session Classification: WED-PO2-706 Quench Detection II