CO-SIMULATIONS PREVENT COSTLY FAILURES

CASE STUDY 3: FORCES UNDER DOUBLE INRUSH CONDITION

Through co-simulation (FEM and circuit system simulator), forces under inrush condition in complex configurations are computed; correcting measures can be put in action to prevent failures.

SUMMARY

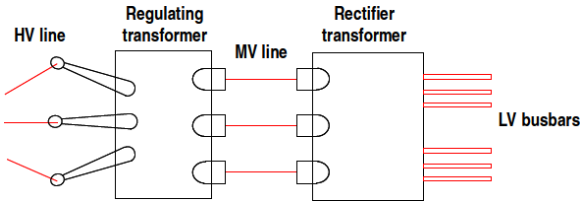
Axial forces on HV winding under inrush condition need to be evaluated taking into account residual core magnetisa- tion and the presence of a rectifier transformer connected to the MV. The regulating transformer has to face double inrush currents (its own and the one of the rectifier transformer).

The currents obtained by circuit transient computation matched the values measured on site during switch-on transients. Axial forces distribution calculated allows to prevent the failure on the HV winding, defining proper corrective actions.

DESCRIPTION

A rectifier transformer is connected to the MV winding of a regulating transformer.

- The lumped parameters of the transformers are deter- mined by Finite Element Analysis.
- The switch-on transient current evolution is computed.
- The flux density plot related to the peak current instants is calculated.
- The local and integral electromagnetic forces on the HV winding are computed.

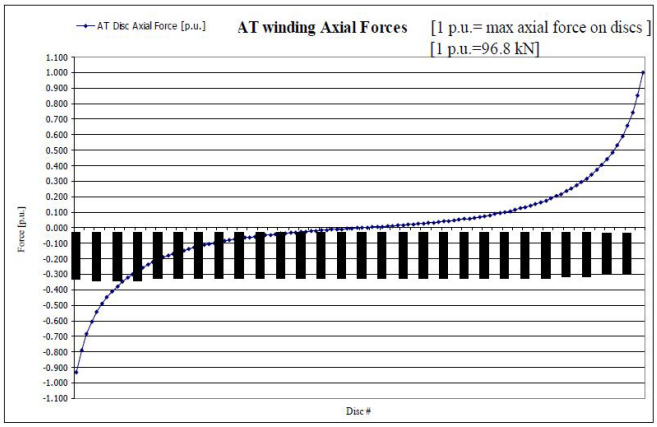


Scheme

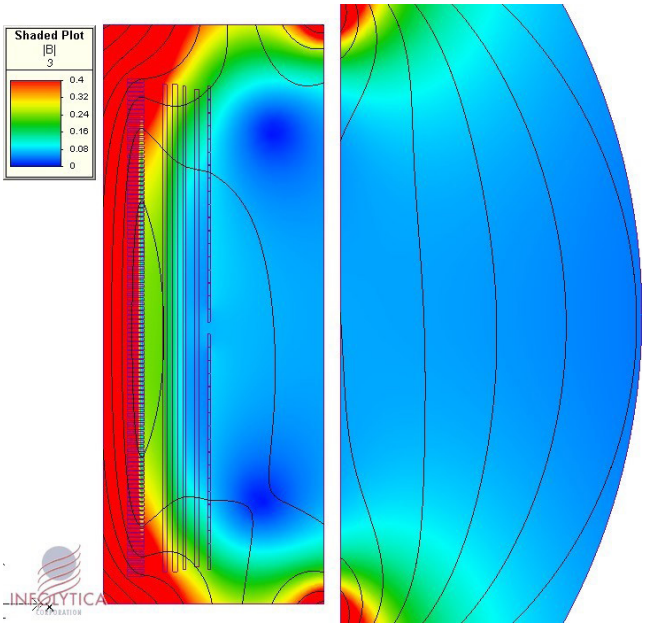
TECHNICAL CHALLENGE

It was necessary to take into account in the circuit all the three phases, the neutral connection, tertiary winding , the non linear core reactance due to saturation, the residual in- duction on regulating and rectifier cores and zero sequence impedance.

RESULTS



Distribution of axial forces on each HV disc [p.u.] at first peak current



Electromagnetic field at inrush peak

CONCLUSIONS

By means of co-simulation Weidmann reproduced the axial forces distribution in a complex circuit configuration, allowing the search for a proper corrective action.

WEIDMANN

Weidmann Electrical Technology AG
Neue Jonastrasse 60, 8640 Rapperswil, Switzerland
www.weidmann-electrical.com