

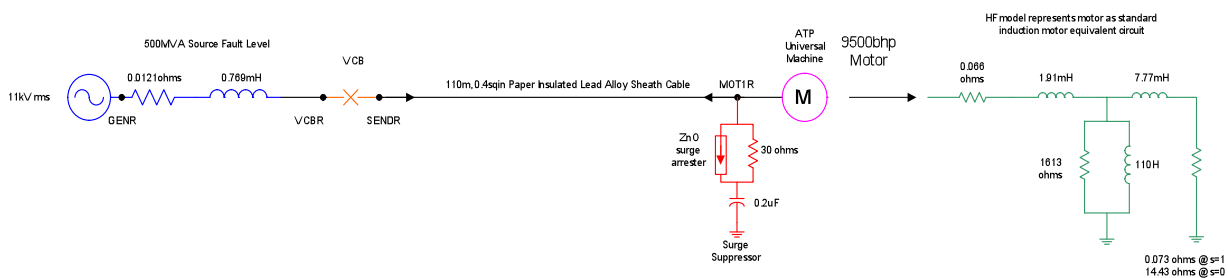
Case Study 2

Transient studies for two 11kV induction motor feeders

Project Scope

To investigate the magnitude and frequency of overvoltages and currents generated on two 11kV motor circuits. The studies investigate various switching operations by vacuum circuit breakers to ascertain as to whether motor surge suppressors are required.

Motor circuit single line diagram



Modelling

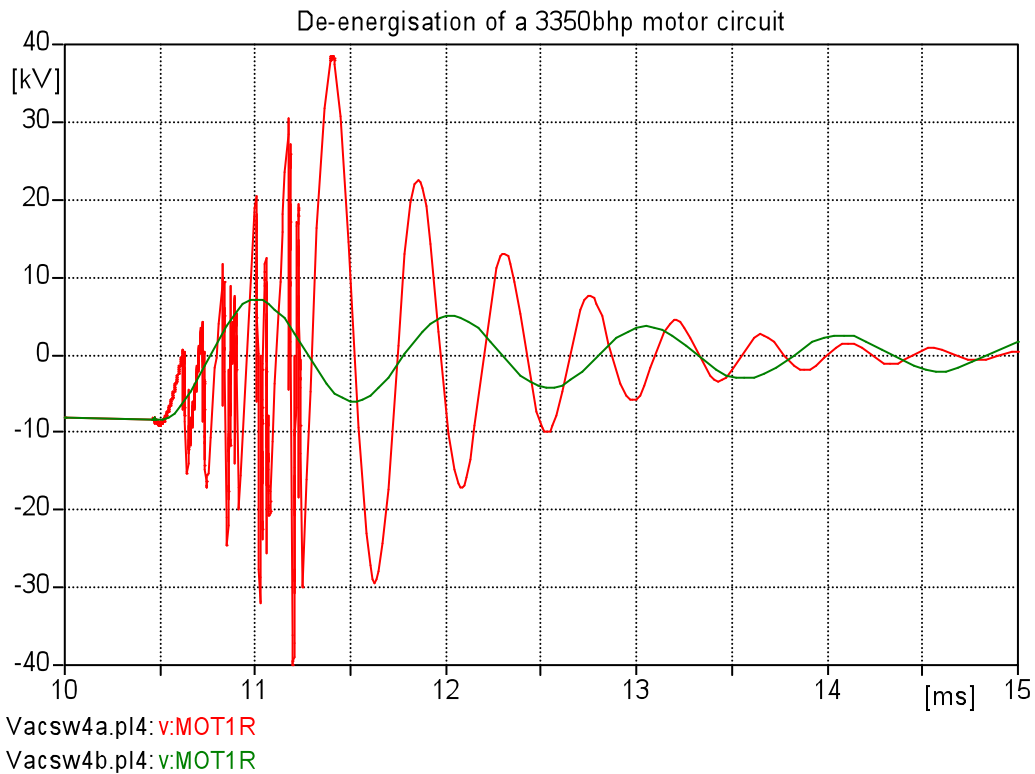
The following network equipment was modelled using the Electro Magnetic Transient Program.

Vacuum Circuit Breaker	(3-phase representation : Dynamic model representing circuit breaker pre-strikes & re-strikes)
11kV Underground Cable	(Modelling mutual effects between phases)
Surge Suppressor	(RC filter with resistor short circuited at 2.1 p.u. voltage)
9500bhp & 3350bhp Motor	(3-phase representation)

The studies examined both starting and running conditions, monitoring the transients occurring at the motor terminals due to circuit breaker switching. The vacuum circuit breaker model represented pre-striking and re-striking for closing and opening operations, respectively. A statistical analysis of switching was also performed.

Results

Graph showing the voltage at motor terminals with (green trace) and without (red trace) surge suppressors connected.



Narec Power System Analysis Section demonstrated to the client that very fast transients can exist when switching motors using vacuum circuit breakers and recommended that all motor surge suppressors remain in circuit.