

NOVEL TECHNOLOGY DC CIRCUIT BREAKER

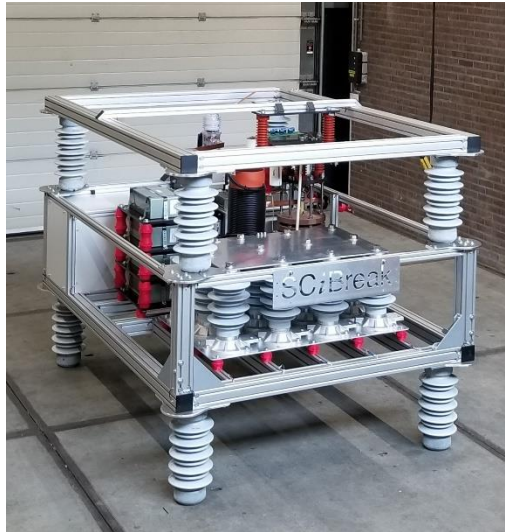
CIGRE SC A3 - PROMOTioN Technical Panel on
HVDC circuit breakers

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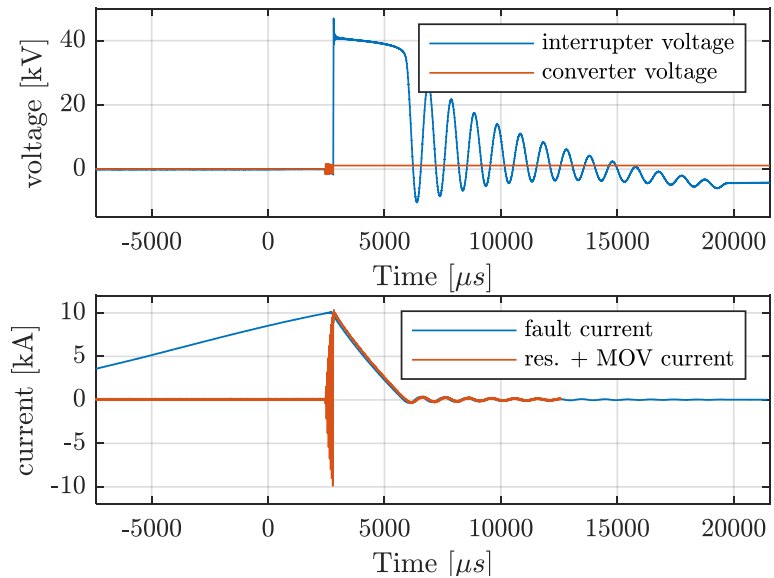
SCiBreak

VSC Assisted Resonant Current DCCB

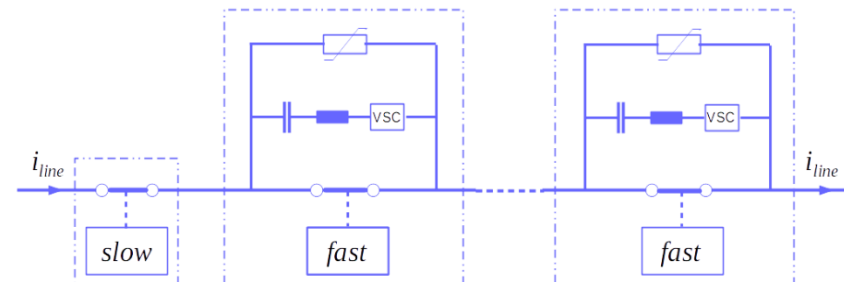
module



- 40 kV TIV
- 10 kA interruption capability
- fault neutralisation time < 3 ms
- size 2.2 x 1.7 x 1.6 m
- weight: 800 kg
- possible to stack vertically



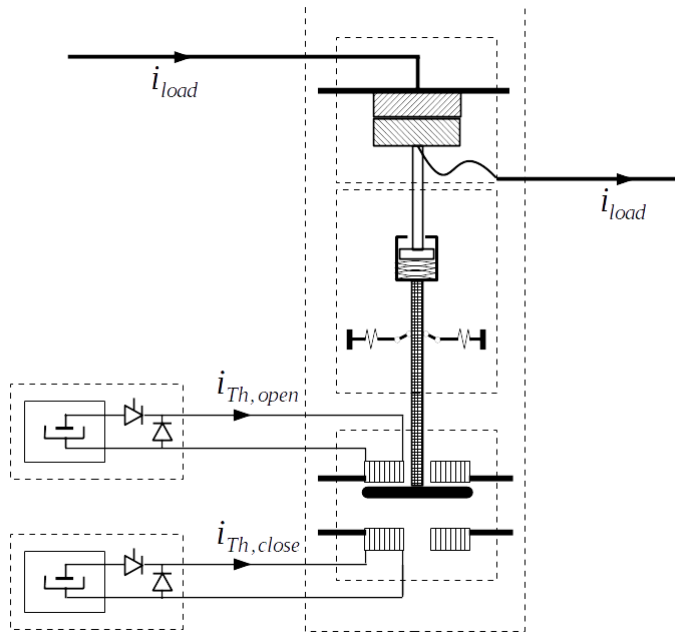
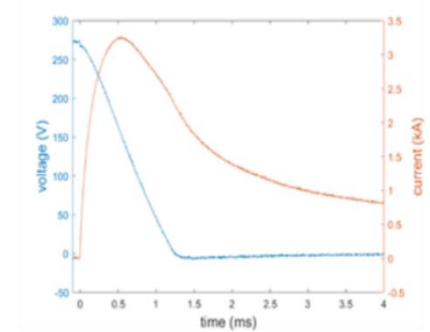
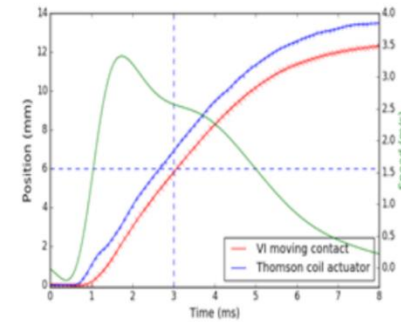
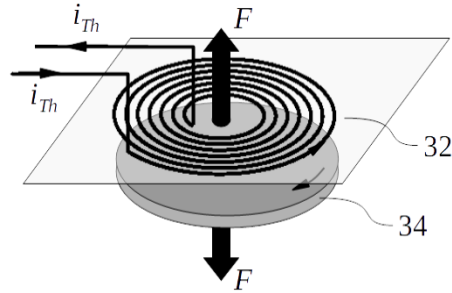
HVDC CB



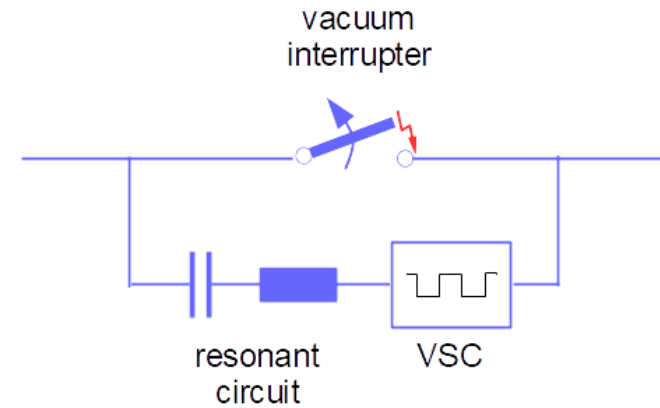
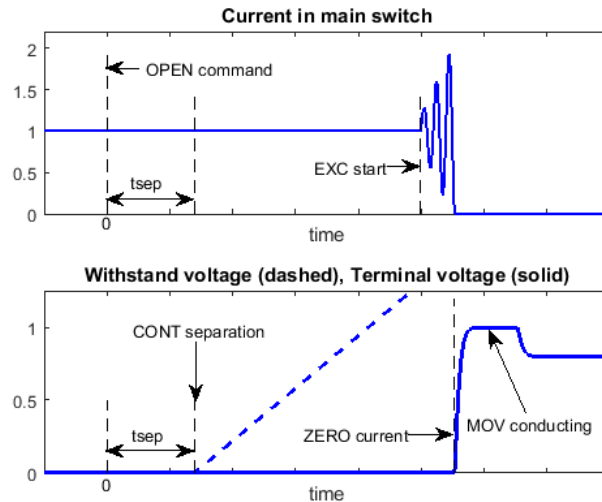
Basic Principles for VARC DCCB

- Vacuum Interrupter conducts continuous current
- Vacuum Interrupter interrupts the current at an artificial current zero-crossing
- Fast mechanical actuator using Thomson coil principle separates contacts in few milliseconds
- Metal Oxide Varistors absorb the magnetic energy in line inductances and limits the voltage between interrupter terminals
- Low-voltage power electronic voltage source converter used to create artificial current zero cross-over; total semiconductor voltage rating for its devices 10% or less of that for a bidirectional switch that withstands the voltage between interrupter terminals
- Residual breaker provides isolation

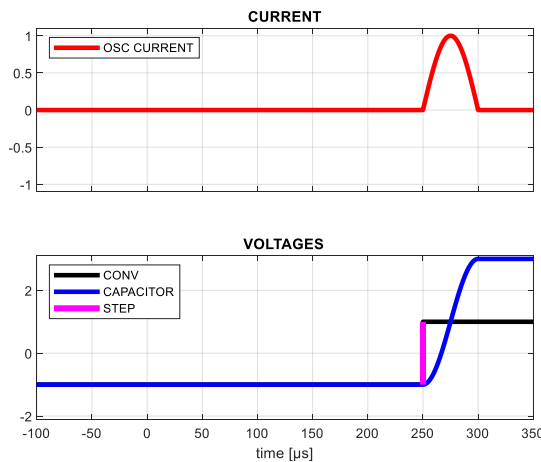
Thomson Coil Actuator



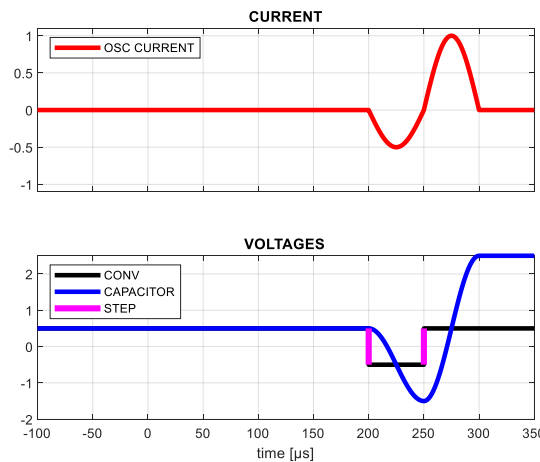
Resonant Current Excitation



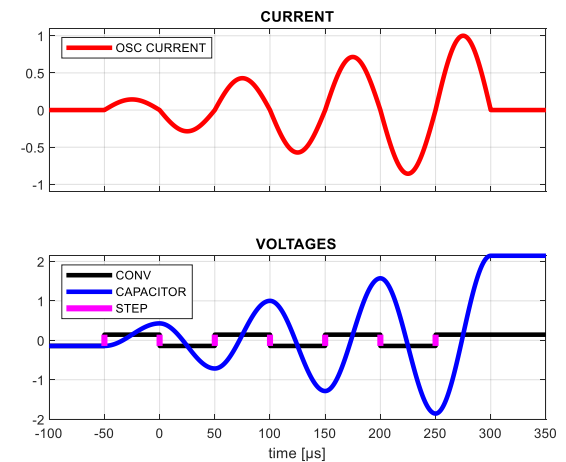
single reversal



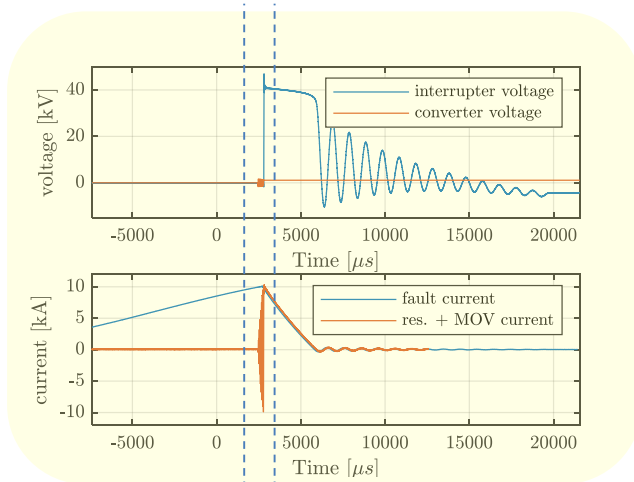
two reversals



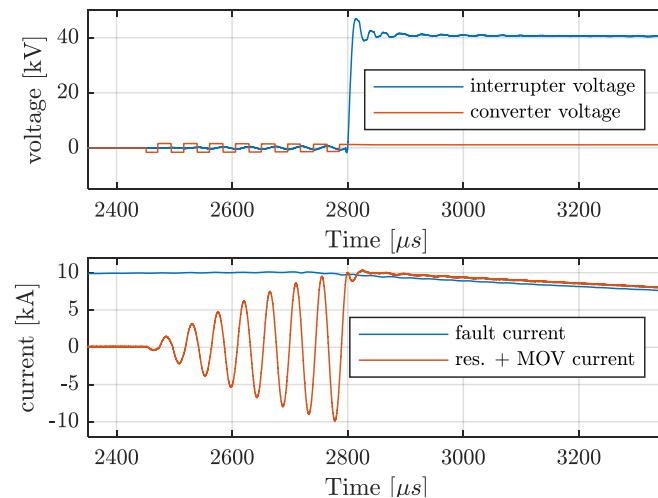
seven reversals



Current Interruption



- low number of required semiconductors
- short opening time
- current pulse adapted to current to be interrupted



- power electronic VSC assists existing mechanical switchgear to use its very high interruption capability
- likely that we will see more of this in the future