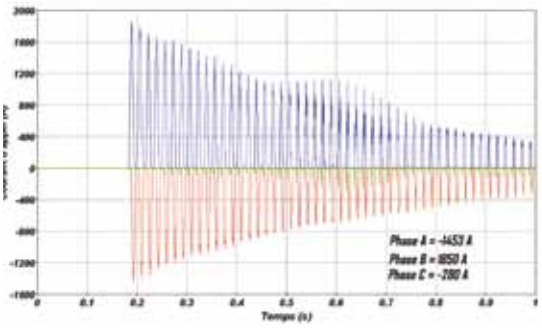

# SMCT

## Transformer Switching Control System

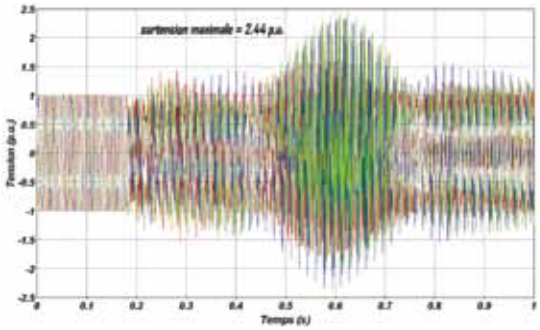
Uncontrolled energizing of a power transformer may produce high inrush currents, resulting in significant stress in its windings and temporary overvoltages of considerable magnitude on the grid.

To avoid such problems, a new solution was developed and successfully tested, the transformer switching control system SMCT (système de manoeuvre contrôlée des transformateurs), which determines the appropriate instant to energize the transformer based on remanent flux and other parameters. Hydro-Québec has mandated Snemo to manufacture the prototype developed by its research institute IREQ and to market it under licence.

*Phenomena produced by energizing an unloaded transformer with no damping mechanism*




*Inrush current*




*Overvoltage on the grid*

### *Benefits of controlled transformer energizing*

SMCT minimizes the risk of saturation of a power transformer being energized, thus avoiding excessive inrush currents, grid disturbances and premature deterioration of equipment.

Inrush currents are usually dampened by equipping the circuit breaker with insertion resistors, a solution that entails high purchase and maintenance costs (especially for metal-clad substations).

Controlled energizing of power transformers is innovative and less costly compared to existing techniques. In-service test results have shown that the system is effective both in eliminating temporary overvoltages and in reducing transformer stress.

### *Operating principle*

The remanent flux in the transformer core is calculated and the phase-by-phase closing of the circuit breaker is delayed. Coordinating energizing with the static flux makes it possible to minimize or eliminate inrush currents and voltage surges. Precise calculation is crucial since the optimum instant for energizing the transformer differs from one switching operation to the next.

### *SMCT comprises four subsystems:*

- The flux calculator, the main component, determines the optimum instant for energizing the unloaded transformer and relays adjustments for the next closing command to the SynchroTeq unit.
- The SynchroTeq unit, also marketed by Snemo, determines the time to switch on the circuit breaker and controls its closing coils.
- The command override unit monitors the entire system and blocks commands to the circuit breaker if there is a need to prevent the transformer from being energized.
- Voltage sensors measure the precise voltage at the transformer's terminals.

### *Applications*

SMCT is now being used to energize unloaded transformers in hydroelectric generating stations. It could also be used to energize substation transformers.

### *For information:*

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