To reduce maintenance expenses, many utilities are departing traditional maintenance practices based on in-service time or number of operations, in favor of reliability-centered maintenance and condition-based approaches. Reliability studies have proven that most failures occur in a breaker’s main insulation path to ground, followed by faults in its compressors or pumps, control elements, and interrupting units. Condition monitoring of those areas can effectively improve reliability while reducing expenses.

The CBS Lite combines on-line monitoring of statistically failure prone components with breaker timing functionality, to provide true universal applicability on any manufacturers’ single-pressure SF₆ circuit breakers.

**Breaker timing through simulated travel**

Obtaining timing information from various make breakers through custom installation of travel sensors poses a formidable host of technologic and economic challenges. The CBS Lite addresses those concerns by applying patent-pending simulated travel functionality.

Operation of the breaker’s auxiliary switches provides the essential intelligence upon which the CBS Lite re-constructs a travel curve, making it unnecessary to exactly replicate a measured curve. By combining the simulated curve with phase current information, the CBS Lite quantitatively reports accumulated interrupter wear. Moreover, the simulated travel curve provides an illustration of the breaker’s timing, as well as a tool to deduce information about changes in breaker timing.

**Interrupter wear**

On-line monitoring of accumulated interrupter wear enables service to be performed on a proactive basis, eliminating costly unplanned interrupter overhauls, which are known to introduce particles and often lead to catastrophic failures shortly thereafter.

Because of pre-strikes, breaker closing duty is as much a contributor to interrupter wear as is current breaking. The CBS Lite monitors the wear associated with both close and open operations by calculating the “it” value (current-time product) as well as “i²t”. Wear is thereby measured from the time of current inception until contact touch, as well as from the time of contact separation until current interruption. Contact touch and separation times are obtained from the simulated travel curve, as well as user-defined settings. Interrupter wear data collected in this manner is far more accurate than relying solely upon operation of the breaker’s “a” auxiliary contacts.

While this approach is applicable to any single-pressure SF₆ circuit breaker, whenever the CBS Lite is installed on an ABB breaker, the more accurate ABB-proprietary interrupter wear algorithm is automatically invoked.

**Close and trip coils**

The CBS Lite monitors the breaker’s close and trip coils, whose failure may not otherwise become evident until called upon to operate. Open as well as shorted coil conditions are monitored, as failure in either mode can result in unplanned outages. Affording such early detection of control coil problems enables scheduling of repairs during off-peak times.

**Mechanism charging system**

Critical to successful fault current interruption is the breaker’s mechanism, which relies on a charging motor to maintain readiness to operate. The CBS Lite monitors the number of motor starts per day as well as motor run time. It differentiates between motor starts that follow breaker operation from those without operation. Conditions such as worn motor brushes, inefficient pumps or hydraulic leaks can be detected before they result in loss of stored energy.

**Heaters**

All high voltage circuit breakers require anti-condensation heaters in the control cabinet. Additionally, the interrupting tanks and/or mechanism may also require auxiliary heating to assure proper breaker operation at low temperatures. The CBS Lite monitors both thermostatically controlled as well as continuously energized heaters. Users may define acceptable bandwidths for thermostatic operation. Deviations from expected behavior are logged and counted, and if they occur too often or last too long, an alarm is generated.