Switching Small Currents with Vacuum Circuit Breakers

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We occasionally see a specification which requires that the medium voltage circuit breakers that are supplied should be capable of switching very small currents, in the range of a few percent of the breaker's continuous current rating. Generally speaking, switching of low currents is not a problem for vacuum circuit breakers.

Air-magnetic circuit breakers, which have been successfully used for many years in medium voltage switchgear, do have some problems with switching low currents. These breakers depend on a magnetic field generated by the current flowing through auxiliary coils in the interrupter circuit to drive the arc into the arc chute for successful interruption. When the current is very low, only a small field is generated, and the necessary arc movement may not be obtained. Almost all varieties of air-magnetic circuit breakers are equipped with a “puffer” device, a small air piston driven by the opening of the breaker. This piston is equipped with a nozzle that is directed at the area where the arc is truck by the opening of the breaker, so that the arc is literally blown into the arc chute. This device is needed on air-magnetic circuit breakers to insure interruption of small currents.

At least in part because of this problem with the interruption of small currents, the ANSI standard for circuit breaker rating allows the interrupting time for the interrupting of current below 25% of the required asymmetrical interrupting capability to exceed the rated interrupting time by as much at 50%.

Vacuum breakers, on the other hand, handle small currents with ease. We have tested one model of PowlVac® circuit breaker at inductive currents as low as 25-30 A, and some other models at capacitive currents as low as half an amp. Load current switching tests have been made on all of our present production models of PowlVac® circuit breaker at inductive current levels in the 250-260 A range. All of these tests were successful, and the interruptions took no longer than high current interruptions. The oscillograms indicated no distress in the interruptions. As far as we are concerned, interruption of low currents is a non-problem for PowlVac® circuit breakers.

Baldwin Bridger, P.E.
Technical Director