

## Using Different Relay Manufacturers

In this article, we consider the application of two different manufacturers' relays in primary/backup positions on a given line terminal. Note that it is not our intention to convince you that two different manufacturers should or should not be used. Instead, we intend to take a closer look at the problems we are trying to solve or avoid by making certain decisions.

Some of the earliest discrete electromechanical relays were known to perform better for some fault types and worse for others. Since different manufacturers built relays for specific functions using different operating principles, the strengths and weaknesses of individual relays from different manufacturers could be generally complimentary. In that environment it was not unreasonable to require that different manufacturers' relays be applied in primary and backup transmission applications.

One of the first responses that established relay companies had to the introduction of multi-function, microprocessor-based relays was the 'all your eggs in one basket' defense. This played on the rational assertion that if a single, multi-function relay is installed by itself, nothing is left protecting the equipment if that relay fails. It is interesting to note that no utility that we are aware of was using single, multi-function relays by themselves in typical transmission applications because we are all more conservative than that. Typical distribution applications utilize single relays due to the depth of backup inherent in most designs.

The latest concern is 'common mode failure:' that a common weakness of the hardware, algorithms, or the engineer's implementation of two relays built by the same manufacturer could result in an uncleared fault or undesirable trip.

What is frequently neglected in this discussion is that, when we use two different manufacturers' relays for primary and backup protection we get:

- Two different pieces of hardware
- Two different schematic approaches
- Two different setting schemes to develop
- Two different commissioning procedures to define and execute
- Two different sets of operational data to collect and interpret
- Two different routine maintenance procedures to define and execute

We suggest that doubling the number of manufacturer idiosyncrasies that the engineers and technicians have to deal with roughly doubles the chance that some sort of error will be made at some point. Further, if there is a weakness in a relay or implementation, then doubling the types of relays assures that those weaknesses will be compounded by human error opportunities. If the weakness is a likelihood not to trip for a given condition, then installing two different schemes pays off: one scheme trips correctly for the fault. If the weakness is a likelihood to trip undesirably, then installing two different schemes is a loser: we experience multiple misoperations rather than just one. In our experience, relay setting errors seem to congregate under the latter heading, the tendency to trip when it's not necessary. Problems introduced by the manufacturers seem to fall roughly evenly into both categories. In any case, we will have the opportunities to discover these different weaknesses over the course of time, usually at the worst possible moment during the life of the protection scheme and apparatus. We must each judge for ourselves what design will result in the least amount of net problems.

There are valid arguments for and against using two different protection methods in dual primary or primary/backup protection schemes. A good example in favor is the short transmission line protected by line current differential and a distance/directional overcurrent transfer tripping scheme. Most manufacturers' product lines are diverse enough at this point to allow the two different methods to be selected from within a single manufacturer's offering. This approach at least halves the number of relay command sets the field staff has to learn.

One last point to make. Many of the philosophies related to this topic were generated either during the electro-mechanical era or during the introduction of microprocessor-based relays. When installing relaying systems using the most modern technologies and best practices, we are using the most reliable devices in the history of power system protection. With no moving parts, substantial design margin and mature software development methods, failures are rare. Some manufacturers have mean time between failures that are expressed in centuries. When failures do occur, more often than not, the relay tells you that it is failed. The context of the argument is significantly different now, than it was 30 years ago.

At the end of the day, this decision falls back to our values and experience with the manufacturers in question. Do we believe that the likelihood of a common mode failure is high enough, or that the potential results of such failure are severe enough, that we will bear the technical burden imposed by the use of significantly different devices. Remember that, due to the longevity of protective relays, the choice you make is one that will likely be praised or cursed for a good many years into the future.