

Efficient cable fault location in power distribution networks.

Ageing cables – more disturbances

The cost and inconvenience involved when replacing cables in busy cities is often considered unacceptable because of intense traffic or extensive infrastructure that block the access to the cable paths. An increasing number of faults should be expected in many cities where cables are approaching the end of their technical lifetime.

Complicated to locate faults

The most dominant fault types in urban cable systems are earth faults. They are initially tripped by the feeding circuit breaker, but it may be very time consuming and complicated to further locate a fault between many Ring main units (RMU's) along a cable circuit. Fault repair teams will usually try to open selected RMU breakers in order to isolate suspected cable sections. Then the feeding circuit breaker is closed, hoping that the faulted section is disconnected. The process is repeated until the faulted section is found. This trial-and-error process is laborious, slow and less acceptable to the consumer. In city rush hours the delays before re-energising may be extremely long due to heavy traffic that delays the maintenance crews when moving between the different RMU locations.

Some advantages :

- Reduced consumer outage time.
- Immediate earth fault location indication at outgoing feeder or in dispatch centre
- No test switching needed – less consumer disturbance (closing breaker onto fault)
- No test switching reduces the stress on cables, breakers and other equipment
- Maintenance crews are more efficient by going directly to the faulted section
- Switchgear refurbishment plans may be extended (less investment)
- Cable replacement plans may be extended (less investment)
- Quick installation without significant service interruption
- No costly or complicated communication systems needed. No operational cost
- Self-testing/automatic reporting of faulty units eliminates periodical maintenance

Reduce outage time

The logic solution to these problems is to install systems that automatically display the fault location. Then a maintenance crew can be quickly sent to the faulted cable section and isolate the fault. This will substantially reduce the outage time and increase the efficiency of the maintenance crews. It also reduces the number of test re-connections, and therefore protects the cable and the breakers against further strain or damage.

Fault locator

Introducing new measuring modules and communication equipment in distribution cable systems used to be very expensive and was usually not worth the effort, but a new efficient fault location system is now available.

HV power cable communication and add-on measuring modules enables uncomplicated and fast installation of a fault location system without replacing power cables or introducing new and complicated communication systems in all RMU's.

For further details please study the article "Cable automation for urban distribution systems" by A Newbould and K Chapman.