PRESS RELEASE

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The NOJA Power Outdoor Circuit Breaker

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Electrical engineering switchgear classification is a challenging topic. With the varied terminology for electrical equipment around the world, clarity on what an Outdoor Circuit Breaker can become clouded. Questions abound, such as,

"Is a dead tank breaker the same thing as metal clad switchgear?",

or a personal favourite:

"What is the difference between a GIS and a GIS?"

Given the complexity of electrical engineering, these questions are common and valid. In this article, let's attack the former question, and we'll address the latter at the conclusion. For the sake of clarity, let's consider figure 1.

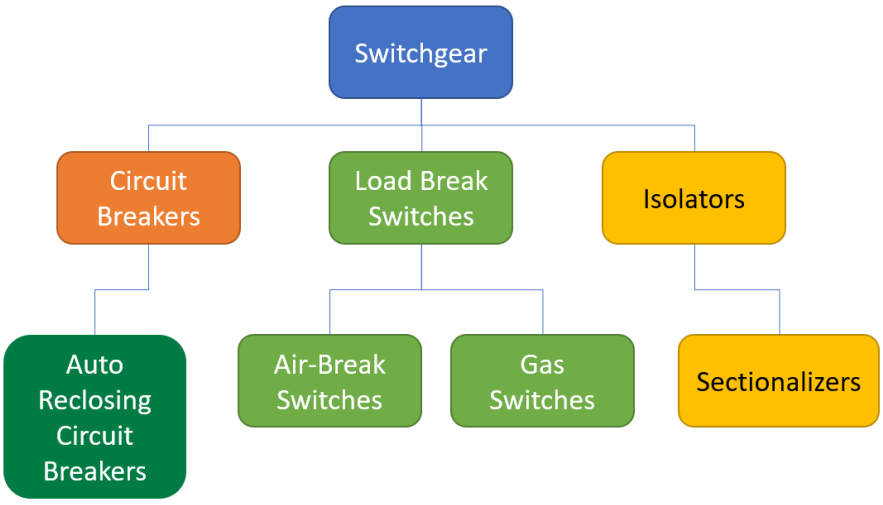

Figure 1: Simplified Switchgear Classification

Classifying Switchgear

While it isn't an exhaustive list, figure 1 shows where the clear classification delineations are. Generally, when classifying switchgear, we consider it firstly on its ability to handle electrical current.

> Fault break equipment, circuit breakers, can interrupt fault current to a type tested limit.
>
> Load break equipment, switches, can interrupt load current to a type tested limit before failure.
>
> Isolators and disconnectors cannot interrupt current at all. They will, however, provide a type tested level of insulation across the contacts when in the open position.

This basic headline of classification helps allocate the equipment in the correct grouping. Regional informal names applied to equipment usually add an additional layer of specification, or description, around how the above functionality is achieved.

For example, a "Gas Switch", is literally a load break switch which achieves its load breaking and insulation capacity through use of a gas. That gas is usually the highly polluting SF6 gas, 1 kg of which has the equivalent greenhouse gas performance as approximately 23,000 kg of CO2.

On the circuit breaker front, an example is NOJA Power's OSM Recloser system, which is actually a kind of Outdoor Circuit Breaker. "Recloser" itself is shorthand for "Auto Reclosing Circuit Breaker", or alternatively, sometimes known as an "Automatic Circuit Recloser".

However, not all circuit breakers are reclosers.

Reclosers are a specially designed class of circuit breaker that is designed to operate with rapid open and closing operations in a sequence, known technically as a “duty-cycle”.

In the distribution world, equipment that claims the “recloser” title needs to be compliant to both the general Circuit breaker standard (IEC 62271), and the Recloser Standard (IEC 62271-111/IEEE C37.60).

What is a Vacuum Circuit Breaker?

This is another example where a word is added to describe the way that the circuit breaker function is achieved.

In this case, using a vacuum interrupter. Other types include Air Blast Circuit Breakers, SSF6 Puffer Circuit Breakers, and so on.

When something is marketed as a “Vacuum Circuit Breaker”, generally it is a class of circuit breaker that cannot meet the “Recloser” duty cycle but uses a vacuum interrupter to interrupt current.

Ironically, a NOJA Power OSM Recloser is also a Vacuum Circuit Breaker, although not all vacuum circuit breakers are reclosers!

What does Live Tank mean? What’s a Dead Tank?

Live tank and Dead Tank are the two main design types of circuit breakers. Essentially, the difference is whether the interrupter is at earth/ground potential, or whether it is at a high voltage potential.

Live tank designs can be cheaper individually, but you forfeit the ability for arc fault containment and for voltage measurement. When live tank devices fail, the term “detonation” would be an appropriate description of the failure mode.

Dead tank designs enclose the interrupter in material at ground potential. This provides a few advantages:

1. Arc Fault containment and venting is possible.
2. You can do voltage measurement, because you have a ground plane reference and the ability to read the voltage capacitively on the bushings on both sides.
3. You provide added protection for the materials and instrumentation, making the installation more reliable.

Designing dead tank equipment is more challenging, because bringing a ground plane so close to the insulation demands excellent insulation engineering. If you can get it right, and type test to prove that it is right, it will be more reliable because the insulating material is not exposed to the outdoor elements.

Can I Use Reclosers for Circuit Breaker Applications?

Like most electrical engineering questions, it depends. If it is a NOJA Power OSM Recloser, then yes.

For a recloser to be used as a circuit breaker, it should have a type test certificate stating performance and compliance to the circuit breaker standard, IEC 62271. The OSM Recloser has this, and accordingly can be used as a circuit breaker. Most NOJA Power GMK installations, which are essentially an OSM Recloser in a ground mount enclosure, spend their entire lives operating as a circuit breaker without reclosing enabled.

When using reclosers as circuit breakers, the key limiting factor is the interrupting capacity.

Some circuit breakers trade their speed of sequence operation for a large interrupting current. The OSM Recloser's maximum interrupting current is 16 kA at 38 kV. This is ample for most applications away from primary substations, and is ideal for connecting renewable energy or asynchronous generation where the fault currents are under 16kA.

If you're dealing with a primary substation, or a 110 kV to 11 kV transmission/distribution connection, it's fairly likely you'll need specialist high current interrupting breakers. For most rural, renewable or remote connection sites, a recloser is an ideal circuit breaker.

The added bonus is most reclosers ship with a control system built in – you can save a fortune on project costs through reduced instrumentation and commissioning. This is the core reason why reclosers get selected in circuit breaker applications.

What is a Sectionaliser?

This one we've already answered, you can read about it here. Traditionally they're a kind of isolator/offload disconnector, but today they are more sectionalisers by action, rather than specification.

GIS vs GIS?

Gas Insulated Switchgear vs Geographic Information Systems. After reading this article, you should be able to work out the first one, and a Geographic Information System in the electrical engineering context is usually used to map network assets with SCADA.

Conclusion

"Our auto reclosing circuit breakers can be used as a pole mount auto recloser, substation circuit breakers, pole mount sectionalisers and load break switches," says NOJA Power Group Managing Director Neil O'Sullivan. "Our one product can be applied in almost every example provided in this article. Add a set of disconnect links on the line side of the device and it can provide the isolation required to work on the line as well."

Hopefully this article provides some clarity with the different classes of equipment in power engineers arsenal. If you'd like to learn more about Reclosing, you can do so here, or if you have a switchgear project, we'd be

glad to help. Contact us at www.nojapower.com.au or through your local NOJA Power Distributor.