Application Note

Dead Bus Synchronization

There are certain applications that require generators to start quickly: Black Start and Emergency Start. Black Start is the act of starting up a generator without the use of any external electrical power. In other words, the generators are required to start themselves. In several instances, black start generators range in size from 1 MW up to 300 MW. Black start generators are often used with natural gas (Figure 1), diesel, hydro, or combustion turbines and are used when there is a complete blackout at locations that would likely experience total blackouts. Emergency start generators are used in applications where having some form of power is critical, such as nuclear power plants, hospitals, nursing homes, waste water treatment, and schools.

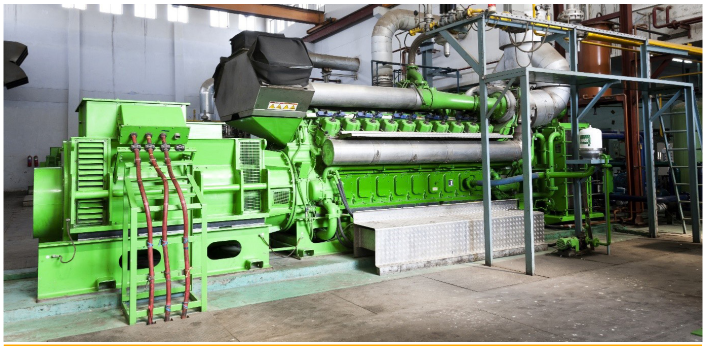

Figure 1. Natural Gas Reciprocating Engine

Black start and emergency start generators share one commonality: both applications need the generators to be started quickly. When just one generator is in operation, getting it started quickly depends on what type of generator it is. When multiple generators need to be started to handle the load demand, they are required to be paralleled and synchronized quickly. Normal synchronization will take time because each generator is started independently, then one generator at a time is synchronized. In this synchronization method, the generator voltage and frequency must be adjusted to match the bus or generator frequency and voltage prior to applying a signal to close the generator breaker. A faster method of paralleling generators and synchronizing them is known as Dead Bus Synchronization. This method can be used in combination with the DECS-150 Digital Excitation Control System (Figure 2).

Figure 2. DECS-150

Dead Bus Synchronization is the act of paralleling all of the generators together before any power has been applied to the generators themselves. See Figure 3. To perform dead bus synchronization, all of the generators' breakers are closed, the generators are started, paralleled together, and begin to spin at the same time. Once the generators have reached the appropriate speed, excitation is applied to every generator at once. See Figure 4. Since the generators were placed in parallel before they started operating, synchronization occurs initially at low excitation and generator voltage levels. No additional synchronization is required because the machines were placed in synchronization initially.

Dead Bus Synchronization has its advantages over Manual Synchronization when being used with the DECS-150. Manual Synchronization requires a synchronization switch and a synchroscope. Each generator is started independently. When the generators are at rated voltage, they are synchronized one at a time. This approach can be much slower than the Dead Bus Synchronization method. In addition, the DECS-150 does not require control power and will come up as the PMGs spin up.

Conclusion

Dead Bus Synchronization is a viable method to bring up multiple generators at once in a short time. Using the DECS-150 makes this method both easy and efficient.

For more information

For further assistance with product orders or questions, contact Basler Electric Technical Support at +1 618.654.2341.

For additional information, including more application notes, product bulletins and instruction manuals, visit www.basler.com, contact your Application Engineer, or contact Technical Support at +1 618.654.2341.

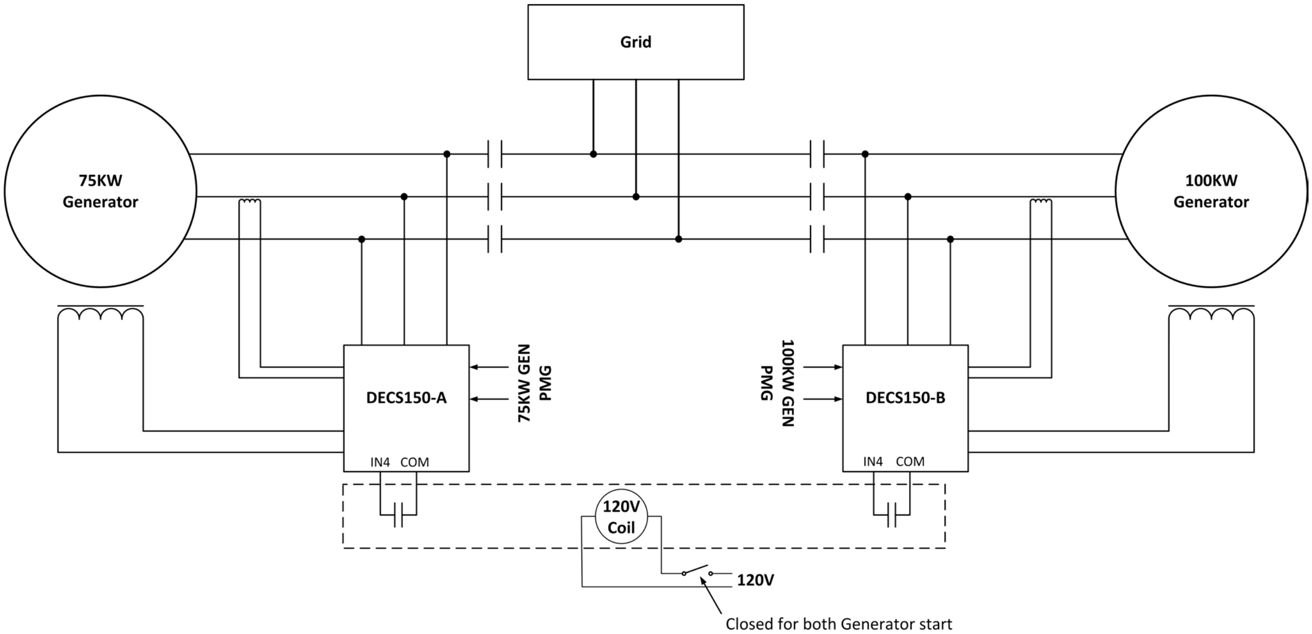

Figure 3. Dead Bus Synchronization Layout

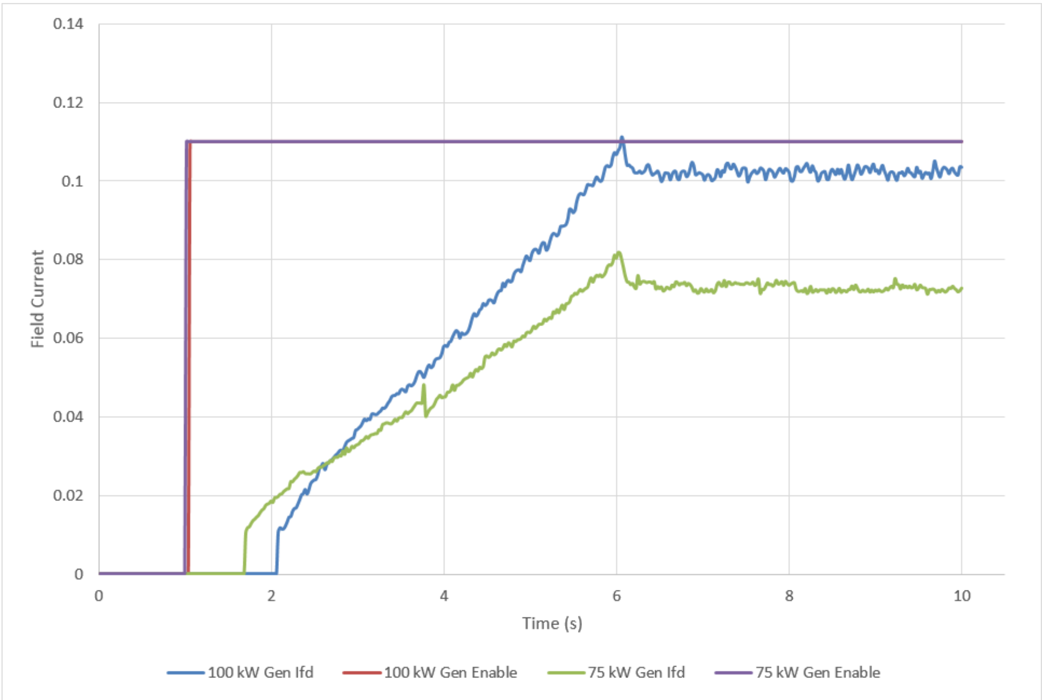

Figure 4. Dead Bus Synchronization Response

Basler Electric

Highland, Illinois USA
Tel +1 618.654.2341
Fax +1 618.654.2351
email: info@basler.com

Suzhou, P.R. China
Tel +86 512.8227.2888
Fax +86 512.8227.2887
email: chinainfo@basler.com