

White Paper

Site Load Correction for Load Banks

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Site Load Correction (SLC) is an automatic control feature for SIGMA-equipped ASCO Load Banks that automatically applies load to electrical circuits to maintain the minimum amount of load required by diesel generators. The following describes SLC features, benefits, and operation.

THE NEED FOR SLC

Wet stacking is the accumulation of unburned fuel residue that develop in the exhaust systems of diesel engines when they operate below minimum levels of load, which is commonly 30% of nameplate capacity. Under these conditions, engines may not reach optimal operating temperature. The resulting fuel combustion process is incomplete, resulting in increased emission of particulates as well as carbon monoxide and other green house gasses. Operating under no-load or light loaded conditions for extended periods promotes wet stacking. Maintaining minimum load levels avoids wet stacking and thus promotes reliability and longevity.

Site load correction uses a load bank to proactively increase loading on diesel gen-sets to avoid the effects of wet stacking. It can also be used to ensure that generators are run at higher levels for optimal performance and reduced emissions. When necessary, SLC automatically applies load and ensures that gen-sets reach proper operating temperature for user-selectable time periods.

For example, if the optimal load for a generator is 70% of maximum output, but is running at 50%, the SLC system will add apply 20% load. However, if a generator is running at 70% the SLC will not apply load. The percentage of load can be set to meet the standards of a particular gen-set.

SLC OPERATION

To implement SLC, current transformers are installed on generator-connected busbars or power cables to monitor load levels, a three-phase power transducer detects the site load. When the site loads decrease below a specified threshold, SLC increases the amount of load provided by a load bank. Conversely, when the site load increases beyond the threshold, SLC will deactivate and the gen-set will supply load according to system demand. Required load levels are set prior to load bank installation. Figure 1 shows a typical configuration for a large facility.

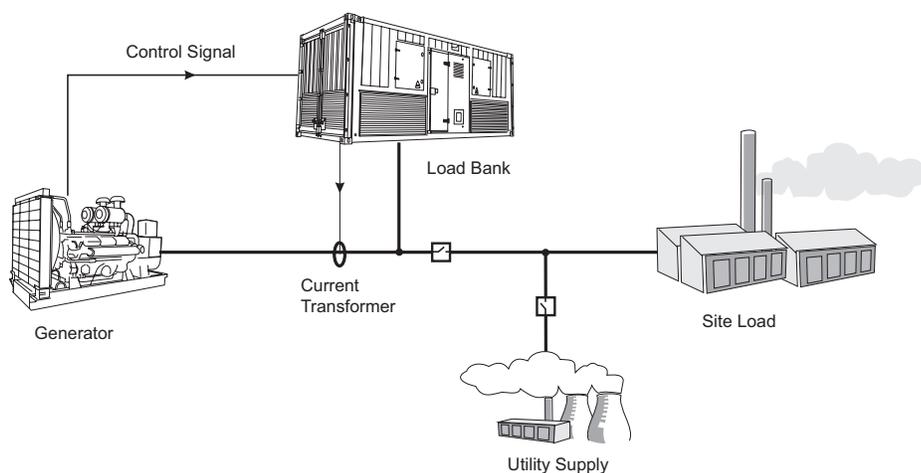


Figure 1: Typical site load correction configuration.



Photo courtesy of ASCO Power Technologies

SLC offers multiple configuration options. These include the following:

- Set Point
- Set Point Dead Band
- Warm Up Times
- Ramp-Down on Finish
- Current Transformer Position and Quantity

Set Point

On ASCO load banks, a 12-position SLC switch sets the minimum amount of load to be maintained on a generator. The amount is indicated as a percentage of the supply rating.

Set Point Dead Band

The Set Point Dead Band setting indicates the sensitivity of the control systems to SLC trigger levels. This setting is set lower than a gen-set's total supply rating. Using this feature, a load bank will cease applying load when load percentage is within the dead band range. The load bank will not apply load again until the total load drops below the dead band range, and the load bank cease operation when the total load exceeds the set point value.

Warm Up Times

Diesel gen-sets work at higher rates of efficiency with a lower load 'warm-up' period before higher loads are applied. A warm-up time can be specified within the SLC setup to determine the time from the engine starting and the load being applied. Using a warm-up time prevents the SLC from immediately applying high load to cold engine that can effect performance and reliability.

Ramp-Down on Finish

The option slowly steps-down generator loading over a 12-second interval. This reduces the engine and alternator stresses that would otherwise occur by dropping the entire load in a single instant.

Current Transformer Position and Quantity

Measurement current transformers (CT's) can be located to monitor only site load (Figure 2), or to measure loads applied by both the site loads and load banks (Figure 3). The latter arrangement allows simple monitoring of the complete system. It also allows site loads to be isolated so that load banks can be used to test generators directly. The other configurations are still effective; however they do not provide full monitoring of the entire three phases of the site load and generator.

Note that three-phase load monitoring provides the most complete assessment of load conditions. Monitoring load on only a single phase can reduce installation costs; however, users will not be able to evaluate whether loads are uniform on each phase. Single-phase monitoring is shown in Figures 4 and 5.

SLC APPLICATIONS

Site load correction is used on a single, permanently installed, resistive load bank. The load bank capacity can either be specified to match the amount of supplemental load needed to support proper diesel generator operation, or to provide the total site load need during utility outages and generator tests. The two most common applications for SLC are (1) commercial and critical facilities and (2) microgrids. Each is further described below.

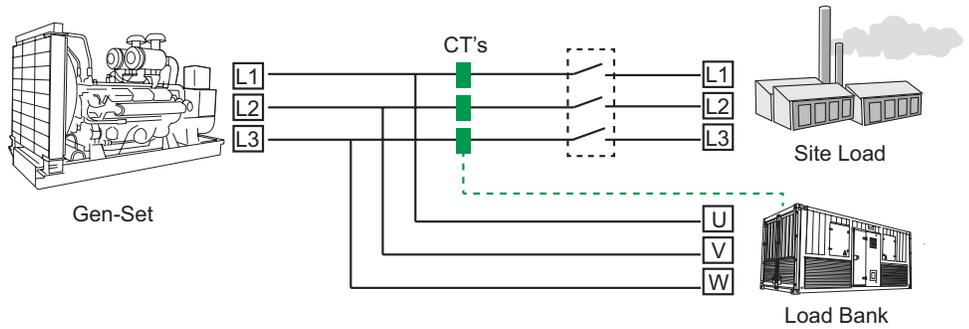


Figure 2: Three-phase monitoring of site loads only.

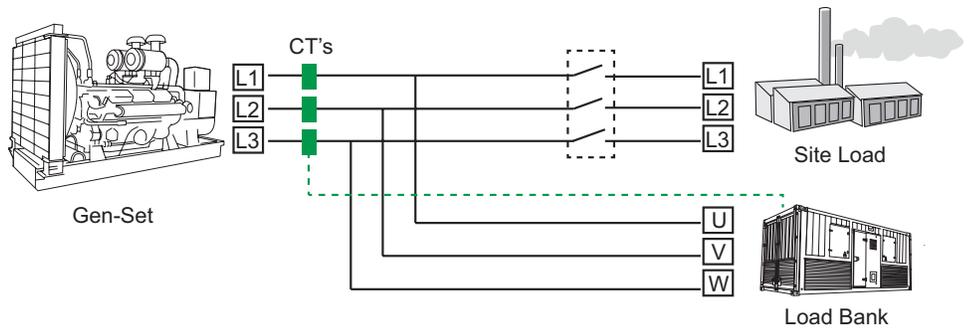


Figure 3: Three-phase monitoring of site loads and load banks.

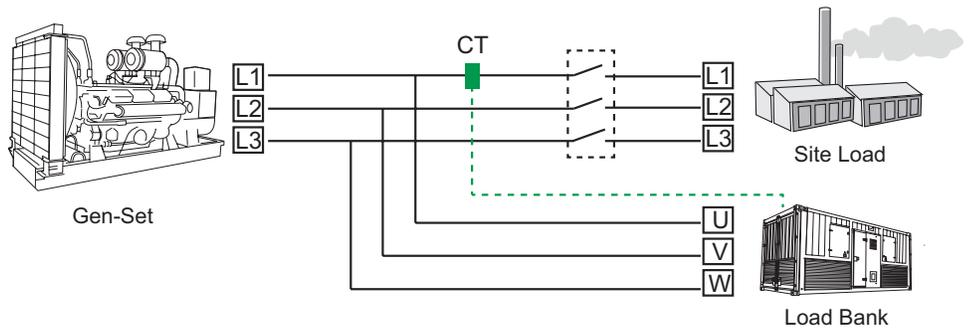


Figure 4: Single-phase monitoring of site loads only.

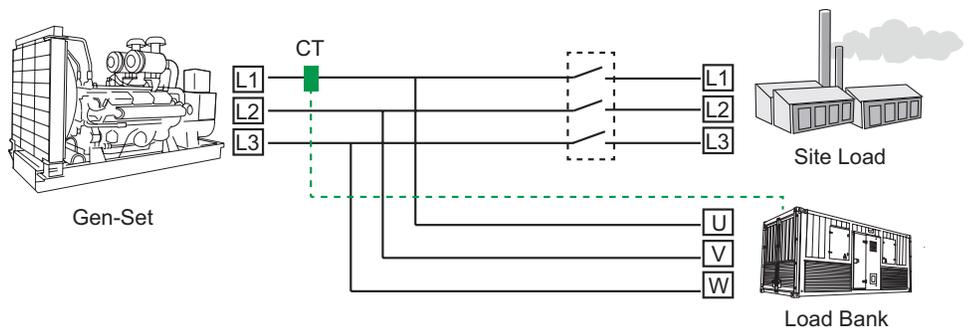


Figure 5: Single-phase monitoring of site loads and load banks.



Photo courtesy of ASCO Power Technologies

Critical Facilities and Commercial Buildings

Site load correction is often used for permanently installed load test applications in critical facilities or commercial buildings. Critical facilities have more stringent needs for consistent and reliable power. Consequently, they place the highest priority on ensuring reliable and efficient performance when backup power is required.

Using permanently installed load banks, facilities can meet both minimum operating load and periodic load testing and generator maintenance objectives, (while avoiding recurrent annual load bank rental costs). Permanent load banks can also provide a readily available method of meeting stringent test criteria that is enforced at mission critical facilities such as [ISO8528 part 6](#).

Microgrids

For microgrid or “off-grid” applications, a diesel gen-set may be the only source of power. Because many microgrid systems are expected to grow over time, their gen-sets may be oversized to accommodate anticipated temporal increases in total load. In this case, a load bank with SLC is often installed to prevent light loading and wet stacking. Until initial loads increase, SLC may be required. After loads become sufficient to avoid light loading of the generator, load banks can continue to provide load for generator maintenance and testing, avoiding long-term load bank rental costs.

For microgrids that use gen-sets sized to supply initial supplemental load, SLC may still be necessary. For instance, if the backup power system is used during off-peak hours when lighting, machinery and equipment are off-line, supplemental load may still be needed to meet gen-set operating requirements. In addition, SLC will automatically apply load for optimal generator operation during periods of low demand.

SUMMARY

Site load correction optimizes diesel generator performance and avoids wet stacking by automatically supplementing load to run diesel generators at or above their minimum output specification. When loads decrease below a specified threshold, SLC increases the amount of load provided by a load bank. Conversely, when the site load increases beyond the threshold, SLC will de-activate and the gen-set will supply load according to system demand.

Key SLC features include settings for set point, dead band, warm-up times and ramp-down on finish. In addition, the placement of current transformers in the power distribution systems affect whether SLC can support the testing of isolated standby generators for service and compliance purposes. While these functions are commonly seen in commercial and critical applications requiring high reliability, SLC can also be used in microgrid systems to provide supplemental loads in systems with intentionally oversized gen-sets.

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