

Product Description and Data Sheet

The Low Load Diesel (LLD) is a pre-packaged electronically injected diesel generator, with integral Reverse Power Protection (RPP) designed to give a long and reliable service life at low load ratings.

The LLD is a “conventional” corner-stone of the high penetration Wind/Diesel system, designed by Powercorp to give your plant the edge in clean, renewable energy augmentation.

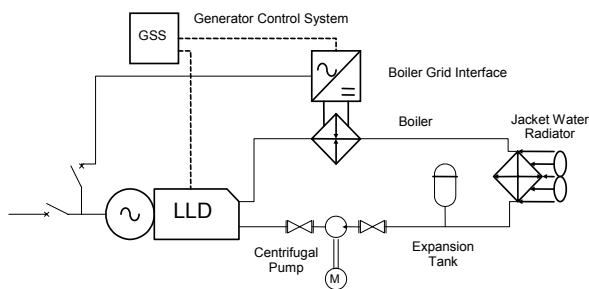


Figure 1 – Low Load Diesel Electrical/Thermal Single Line Diagram

The LLD consists of the following four main components:

- Detroit Series 60 400kVA generator
- Boiler Grid Interface (BGI) and associated plumbing, forming the Reverse Power Protection (RPP) system
- Automatic generator controller and protection system
- All cooling loops, including the charge air inter-cooling system

CONTAINER BUILDING

All of the components are conveniently factory installed into a custom built container, requiring a minimum of installation on-site. The components requiring installation after delivery include parts easily damaged in transportation (including ventilation covers) and other easy to remove and install parts that significantly reduce the package dimensions for shipping (including externally mounted fans).



Figure 2 - Flywheel Installed within the containerised building



Figure 3 – Inside Low Load Diesel unit

Figure 3 shows the internals of the container, with the Detroit Series 60 prime mover and Stamford alternator, intake air pick-up and filtration on the top of the prime mover and the white cabinet to the left housing the DDEC electronic engine protection controller. The in-line heater (part of the Reverse Power Protection system) can be seen in the bottom-right of the photograph.

The LLD also includes fluorescent lighting within the engine compartment, allowing maintenance to occur without additional lighting at night.



Figure 4 - Control Cabinet

Figure 4 shows the control and machine protection cabinet on the right and Reverse Power Protection (RPP) BGI cabinets to the left. The outer doors also come fitted with a Perspex window to allow an operator to easily view the metering on the control cabinet, so that they can see the status of the machine without opening the doors, for example, during inclement weather.

Control and SCADA System

A number of variables are recorded in the SCADA system relating to each individual LLD:

- Generator Active Power and Reactive Power output

- Spinning Reserve
- Machine Frequency, Voltages and Currents
- Machine Speed (RPM), Temperatures and RRP operation
- Machine Status and Alarms
- Machine Hours Run and Hours to Next Service

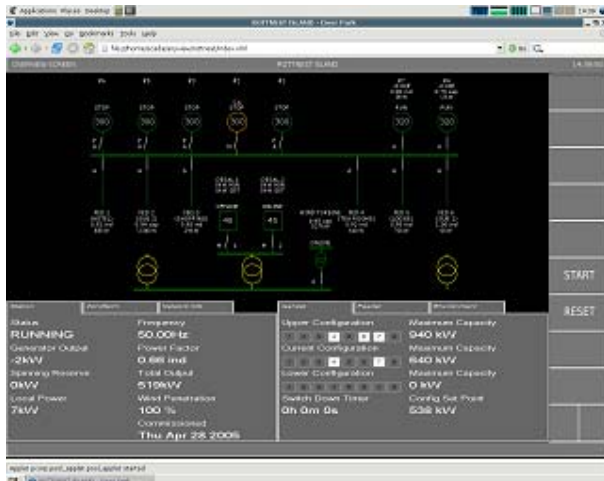


Figure 5 - Powercorp Wind Diesel SCADA Screen

In addition, this data can be exported into a wide range of software, including Microsoft Excel for further analysis.

The LLD can be remotely controlled by an operator via the AnyView interface, including starting, stopping, close main generator contactor, open main generator contactor and alarm reset. Most alarms on the system can be reset remotely.

The control and protection cabinet also houses a local interface, giving rapid feedback for important operation values, including power, power factor and voltage via the use of analogue meters. Other values (including engine temperature and oil pressure) are available via an LCD display.

Typical Wind/Diesel Application

High renewable energy penetration in an isolated power system is only possible if the restrictions placed on system operation by conventional diesel generators are removed to allow the renewable energy sources to output as much energy as possible.

In a conventional system this brings about two problems:

- Frequency regulation due to fluctuation energy sources
- Firm capacity to back up “un-reliable” renewable energy sources

Normally diesel generators are run, but are forced to operate at no less than 40% of their prime power rating in order to ensure acceptable maintenance costs and reasonable life spans. In the case of a 320kW diesel generator, this would mean a minimum loading of 128kW, leaving a maximum of 192kW of possible renewable penetration under best-case conditions.

In more normal conditions (approximately 75% load, or 240kW) the amount of renewable power would drop to just 112kW.

Utilisation of the LLD, with its long-term minimum loading of 7% (23kW) would allow up to 217kW of renewable power, an increase of nearly 100%.

For the case of a power system demand of 350kW, the advantage of using a LLD becomes even larger.

The two conventional diesels required for reliable operation would be operating at a minimum of 128kW each, for a total of 256kW of the station load, leaving a total of 94kW that can be supplied by the renewable energy sources.

In the LLD case, the two LLD generators would be running at 23kW each for a total of 46kW of diesel generation, leaving 304kW that can be supplied by renewable energy sources.

Step Load Response - Covering fluctuations in the Wind

The LLD has also been engineered with the fluctuation nature of renewable energy devices in mind, as well as the possible failure of such devices at high power levels.

The LLD has been tested to comply with strict standards from Western Australia's Verve energy for single step-load response and has been found to be able to deliver a single step of at least 190kW, whilst maintaining frequency and voltage within acceptable tolerances.

Reverse Power Protection - Protecting the LLD from wind gusts

One problem that is created by the use of a generator that is running very close to 0% load in a renewable system, is that gusting renewable energy sources, such as wind turbine generators, can momentarily push diesel generators into reverse power until the control system has enough time to respond and cause the wind turbine generator to back off and return the diesel generator to the positive generation region.

Normal generator protection systems in fact monitor for such situations and will shut down a generator quite quickly if this situation occurs.

In the case of a LLD, Powercorp has incorporated its Boiler Grid Interface (BGI) technology to provide Reverse Power Protection (RPP) for the short periods of time that these gusts occur for.

When the unit detects that the LLD is going into reverse power, the RPP unit triggers, absorbing up to 100kW of power from the network and thereby keeping the alternator in its positive generation area. Once the condition has been resolved, the RPP unit makes a gentle transition back to 0kW, ready for operation again.



Figure 6 – 4 LLD's at Bremer Bay

Specifications

- Design Life 16 years
- Nominal Supply Voltage 3 ph, 415 Vac
- Supply Frequency 50Hz
- Output short circuit protectionYes
- Fault current available..... Yes
- Paralleling of unitsYes

Technical Data

- Prime Power Rating 320kW at 0.8pf
- Long-term Minimum Power Rating 7% (~23kW)
- Fuel Consumption at 7% approx. 8 litres/hour
- Maximum Reverse Power Acceptance 100kW
- Reverse Power Shutdown Mechanism Separate Relay

Dimensions and Weights

Custom Made Shipping Package

- Shipping Dimensions (L x W x H) 6,010 x 2,500 x 2,600 mm
- Installed Dimensions (L x W x H) 6,710 x 3,900 x 3,600 mm
- Weight..... 10,500 kg

Environmental

- Operating Temperature -5degC to +46degC
- Humidity 95% non-condensing
- Wind Loading Category IV (3sec gust >65m/s)
- Sound Power Level less than 75dB(A)

Optional: The container can be prepared for a severe marine environment close to seaside installations. This includes salt-reducing filtration and additional corrosion resistant treatment of the alternators.

Communication

- Supported Protocols:
 - CANOpen / Powercorp Commander
- Interfaces:
 - CAN
 - Volt-Free Contacts

More Information

To discuss your application further, please contact us by phone or email. We look forward to hearing from you!

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