

Agricultural Applications for Generator Sets

Information Sheet # 41

1.0 Introduction:

Off-utility stand-alone generator systems have been used in agricultural production for many years. Common applications include powering pivot irrigation systems, modern dairy refrigeration systems, farm pumps and lighting. The growth of intensive high volume confined production farms, particularly for poultry and hogs, has made standby generator systems critical. Even a brief power loss can cause catastrophic consequences for confined livestock.

This Information Sheet discusses the importance of maintaining a reliable generator set system for various agricultural applications and specifics of agricultural uses that must be taken into account when applying a generator system.

Agri-Market Application Specifications	
Ratings	Prime power ratings to manage continuous loads
Fuel	Natural gas or diesel, in some cases LPG
Generator End	Close voltage and frequency stability for equipment load, and PMG for high motor loads.
Enclosure	Weather protected canopy for installing adjacent to facility
Alternators	In many cases sized to specific high starting kVA requirements
Air Cleaners	Heavy duty for operating in a dust laden environment
Controls	Remote annunciation, auto start controls, stainless steel



Codes & Standards Specific to Agricultural Generator Applications (see details over)

NFPA Codes National Fire Protection Association	Code 99 for facilities not supplying life-support
	Code 110 Levels 1 and Level 2 also for planned maintenance of systems requirements
	Transfer switches are covered under NFPA 70 National Electrical Code Article 517
IBC International Building Codes	For areas of seismic activity IBC code ICC-ES-AC-156
UL Codes Underwriters Laboratories	2200 This covers entire generator set as a manufacturing standard
	142 Applicable to above ground storage tanks to specify leak containment and spillage
	891 Safety criteria applicable to electrical switchgear up to 600 volt systems
	1008 Standard transfer switches are tested and manufactured to
	1558 For low voltage power circuit breakers

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The installation information provided in this information sheet is informational in nature only, and should not be considered the advice of a properly licensed and qualified electrician or used in place of a detailed review of the applicable National Electric Codes and local codes. Specific questions about how this information may affect any particular situation should be addressed to a licensed and qualified electrician.

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2.0 General Specifications for Operating in an Agricultural Environment:

Most of the applications require robust construction for units that will operate in a dust laden environment in extreme weather, winter through summer. Most farming applications require the generator to be installed outside near the facility or equipment being powered.

The following are usual areas to be considered when applying a generator in an agricultural environment:

- **Air Filtration** – Intake air is frequently laden with dirt, chaff and other wind borne particulates. Heavy duty air cleaners should be fitted. The air cleaner should be inspected daily or fitted with a blockage sensor to warn of blockages. The alarms can be audible or remote, if daily checking is not practical.
- **Enclosure** – Many installations will be outside near the equipment or facility being powered. The generator set system should be installed in a weather-protected enclosure. Sound attenuation usually is not critical.
- **Fuel** – The system will use diesel or LPG fuel, the two most commonly supplied to remote agricultural facilities. Diesel is the most frequent choice for applications such as pivot irrigation systems that run for extended periods because those engines are more durable in continuous operation and allow longer intervals between servicing.
- **Alternator** – Specific alternator sizing on a agricultural generator system is usually required. Many farm applications have a high motor load coefficient that results in a high starting kVA. Also, certain applications have a higher single phase motor load than other applications. The system designer must calculate the phase loading and starting kVA. Frequently an oversized alternator will be specified to manage the starting load.
- **Controls** – Several manufacturers that specialize in agricultural generator sets have developed controls suitable for those environments. Control panels are designed for operating in damp conditions using stainless steel enclosures with sealed doors and entry ports.
- **Extended Operation Between Service** – Generator sets installed to power irrigation pumps and motorized pivot irrigation systems frequently are required to run unattended for long intervals. The engines are equipped with lubricating oil make-up systems to extend the service interval between oil changes and automatically top up the engine oil.
- **Power Rating** – The majority of generator sets in agricultural applications are given a prime power rating. A prime power rating means the generator have been rated to run continuously on full load and with 10% overload permitted for one hour in any 12-hour period of consecutive operation. A prime rating is usually for an application where the generator set is the primary power source. If the set is a secondary power source, the unit may be assigned a standby rating that has no facility for overload.

3.0 Typical Agricultural Applications:

There are many applications for generator systems used in agricultural settings. Most of them have common specifics to the application. The following are sample applications with details specific to the type of load:

- **Poultry** – Mass production of chickens for food and egg production uses intensive, high volume methods. Chickens in large buildings are kept in highly dense populations. Adequate ventilation is critical to keep the birds healthy. Poultry house ventilation systems rely on many electric fans. Should the power be lost to the ventilation fans, heat from the birds and ammonia gas emanating from chicken manure will quickly suffocate the densely packed bird population. Likewise, chicks will not survive during the cold winters without heat 24/7. Poultry farmers usually have a contractual commitment to deliver a level of quality eggs or meat. Poultry houses will be equipped with standby generator sets when utility power is available as a primary source. Otherwise, a generator will be the prime power source, backed up by portable generator sets.
- **Livestock** – Much of the meat we consume today is produced in facilities designed for intensive feeding of cattle in densely populated open-air feedlots and hogs in confinement houses. Both use equipment powered by electric motors to provide reliable sources of feed and water. Confinement houses also require electrically powered ventilation and temperature control systems to keep animals healthy. As in poultry houses, any interruption in power can be lethal. And again, alternators must be sized correctly so that electric motors can handle high in-rush currents on starting.
- **Irrigation** – Many linear drive and center pivot systems rely on 10 to 40 kW diesel generators to power the system's drive motors and pumps. Also, larger generator sets are used to power electric pumps that pull water from the aquifer or other water source. Again, this application requires a high percentage electric motor load. Permanent magnet generators (PMG) excitation is used to enhance reliable starting. As in other agricultural applications, specifying the correctly sized alternator on a generator set will ensure the best starting capability and avoid the need for an oversized engine.
- **Aquaculture** – Much of the fresh water fish we consume is raised in ponds stocked with large populations of fish. To avoid suffocating these densely populated fish, the water must be continually aerated. Aerators that are used on catfish and other fish farms inject oxygen into the ponds either by shooting a column of water into the air from a pump or by paddle wheel aerators that beat the surface water to increase oxygen transfer. Both applications use mechanical or electrically driven pump motors.