



Blowing the cobwebs out of a 1960's switchgear

TYPE OF PLANT

Fertilizer plant that produces an isolated critical power from a 300hp Motor driving 6 ton flywheel and 150kW alternator.

PRIME MOVER

A Detroit Diesel Series 71 V12 engine running at 1800 rpm rated is the backup power source for the rotating UPS.

CONTROL TECHNOLOGIES

Woodward Atlas-II Digital Control
Controls all sequencing for the start/stop of the rotating UPS, protection monitoring, flywheel energy conservation during transfer to engine power. Advanced fault detection pre-empting loss of bus and improving the preventative maintenance process.

Basler DECS-100

Automatic voltage regulator (AVR) provides better control of bus voltage even during load transients.

Woodward EG3P Actuation

The Detroit Diesel engine had its PSG governor replaced with a EG3P actuator allowing for faster startup during a loss-of-mains (LOM) event.

HMI / SCADA System

Touch-screen terminal in the engine room for control, monitoring, alarming, trending and event logging.

Schneider-Electric breakers

Breakers for the alternator and bypass breakers. A special motor breaker to control the motor power.



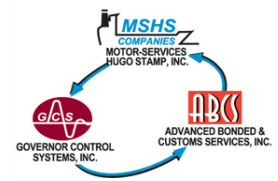
PROJECT OVERVIEW

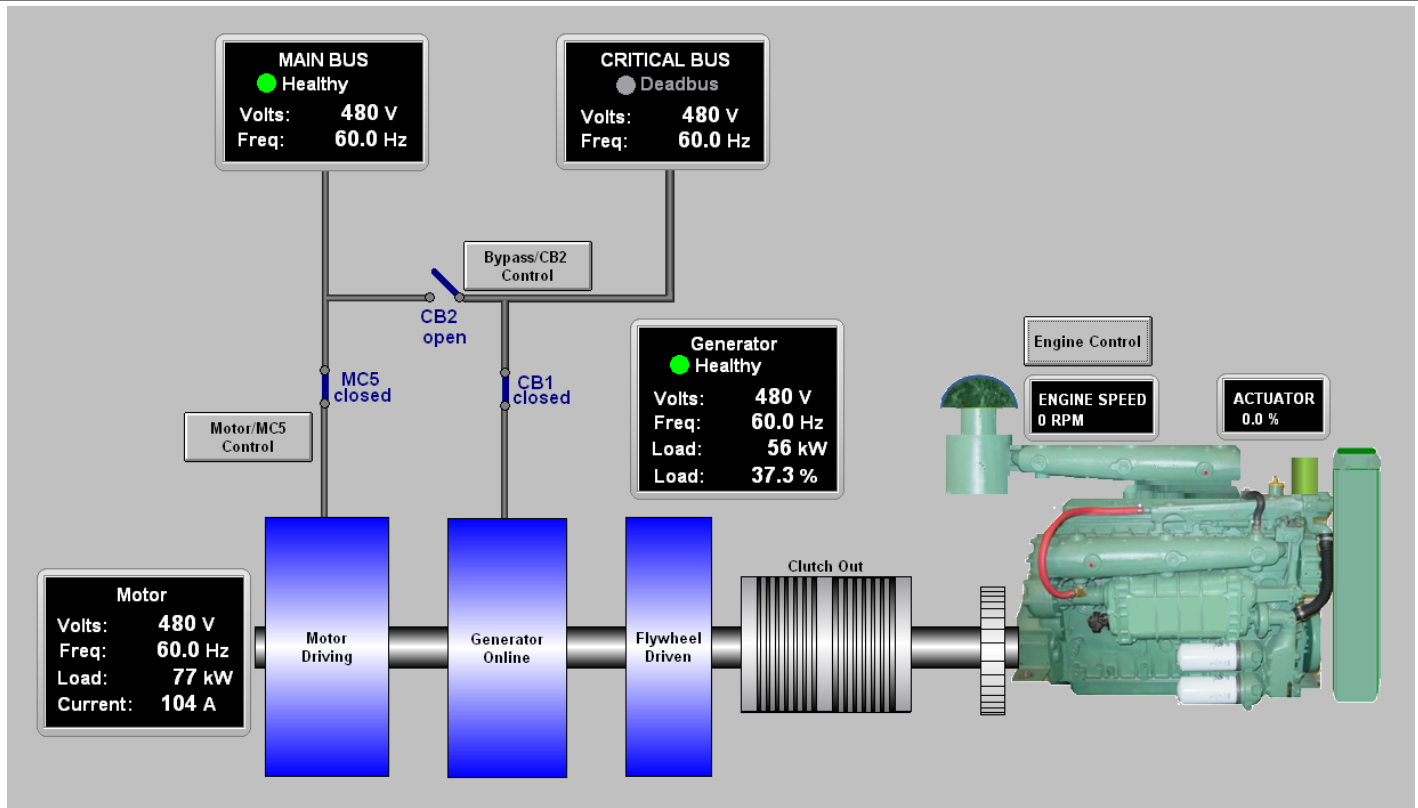
The original rotating uninterruptable power system (UPS) consisted of old relay logic for the sequencing which often failed when testing, providing an inconsistent and unreliable emergency backup. GCS custom-designed a digital Woodward control system to replace the vintage equipment.

The normal running of the rotating UPS is to have the electric motor supplying the power to turn a 6 ton flywheel and an alternator. The critical bus is then supplied by the alternator effectively isolating this bus from the main utility. Should the utility power fail the motor breaker will be opened and the energy in the flywheel will continue to rotate the alternator keeping the critical bus alive. During this time the diesel engine is started and clutched in to the UPS shaft to take over supplying the rotational power and bring the frequency and voltage back to rated.

A third breaker exists in the system that is used to bypass the rotating UPS so that maintenance can be carried out if necessary.

The Woodward Atlas-II controls the sequencing of the breakers, start/stop logic for the motor and the engine, and protection relay functionality for the motor and alternator. In automatic mode the systems primary goal is to maintain the health of the critical power bus.





CONTROL SYSTEM FEATURES

Master/Supervisory Control: Woodward Atlas-II Controls

- Engine start/stop sequencing
- Motor start/stop sequencing
- Clutch control and engine loading
- Synchronizing across CB1 & CB2
 - Deadbus closure
- Motor breaker control
- Parallel control against utility
 - Baseload setpoint control
 - Power Factor control

Voltage Control: Basler Decs-100

- V/Hz ramp to prevent over excitation at slower speeds
- Voltage control from bias input.
- AVR failure to manual mode (FCR)

HMI / SCADA System

- Touch-screen HMI
- System Monitoring
- Alarm Handling and Performance Data Trending
- Modbus and Direct Ethernet Comm. to Control
- Multiple User Access Levels

Safety and Isolation:

- Main cabinet isolation via MB1 & MB2
 - Critical bus supplied by bypass section
 - Main cabinet isolated from high voltages
- Lockout/tag-out
 - Engine start push button lockout
 - Engine AUTO/OFF key switch lockout
- Breaker interlocks
 - Atlas-II controls breaker interlocks
 - Electrical interlocks between MC5 & CB2

Redundancy

- Dual 480Vac supply (Bus/generator) input
- Dual 24V battery supply (external/internal)
- Internal dual 24Vdc supplies

Performance under LOM event

- At 80% load system maintained correct bus voltage for 70Seconds
- Critical bus frequency recovered within 12Seconds by engine with no dip in voltage.

GCS offers comprehensive control system support, from engine and turbine systems integration to turnkey project management for a broad range of marine, power generation and industrial projects. GCS is a member of the MSHS Group. [Learn more at www.govconsys.com.](http://www.govconsys.com)

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