

Colorado Arapahoe County Colorado Sheriff's Administration Building – White Paper

Roughrider Supply recently completed our dual-fuel (diesel-natural gas) modification to the emergency standby generator at the Arapahoe County Colorado Sheriff's Administration Building in Centennial, Colorado. When electricity to the building fails, the switchgear automatically starts the 500 KW Cummins diesel-generator and delivers electricity to critical circuits within the facility. The generator depends upon diesel fuel from a 2,000 gallon above ground tank. The emergency generator consumes approximately 100 gallons of diesel per hour. Using diesel fuel, the generator will run for about 20 hours before refueling. A wide variety of natural disasters can cause long-term power outages to facilities in Colorado. They come in several forms: snow storms, floods, fire, lightning, earthquakes, tornados, ice storms and blizzards can take out the power for hours or days at a time.



Natural Disasters

To this list of natural disasters, we must also add manmade disasters: bio-agents, chemical spills, nuclear explosions. Of greatest concern is the fact that these manmade disasters may be intentionally caused as part of a terrorist attack. All of these incidents can damage the power distribution grid, causing the emergency generator to start. Even something as simple as a blown transformer or a car running into a utility pole can knock out the electricity in an entire neighborhood for a day or two.

Fuel Supply Problems

Diesel generators have a critical dependency of fuel delivery by a tanker. Recently, (during the blizzard of 2003) it would have been almost impossible to get a fuel delivery truck to the facility due to snow depths of up to five-feet. Across the nation, the critical supply of diesel fuel delivery is delayed due to disasters. During the recent hurricanes in Florida, diesel fuel delivery was a big problem. Local fuel delivery trucks are highly dependant upon the refinery unloading facility's ability to receive fuel by pipeline. Also, the fuel delivery companies may receive delivery requests from non-critical facilities offering higher payments. All of this impacts the critical facility manager's ability to obtain diesel fuel. So, how can we stretch the time for a critical diesel fuel delivery?

Roughrider Supply Solution

In December of 2004, Roughrider Supply proposed and installed a dual-fuel system for the Arapahoe County Sheriff's facility generator. This enables the emergency generator to use both natural gas and diesel fuel. The emergency generator will then consume 30% diesel and 70% natural gas. In simple terms, under dual-fuel operation our system stretches the fuel supply to several additional days. Also, the NO_x per megawatt of electricity produced is reduced by at least 40% (no black smoke from the exhaust).

Roughrider Supply Dual-Fuel System Description

A central computer controller manages our dual-fuel system. When the hardware is installed and calibrated, the engine retains all the desirable characteristics of efficiency and dependability normally associated with the diesel engine cycle. No internal modifications are required to the basic diesel engine and the engine performance closely follows the original manufacturer's power, torque, and fuel curves. During dual-fuel operation, only enough diesel fuel is supplied to the engine to overcome its own internal friction and typical fixed operation loads. Natural gas is provided in proportion to both throttle position and engine speed in order to develop power and acceleration. Through electronic control of natural gas and diesel fuel, the horsepower of the combined fuels matches that of the diesel alone without any temperature increase in the cooling or exhaust systems. While operating in the hybrid-fuel mode, natural gas is supplied to the engine air inlet manifold through electronic natural gas injectors. Diesel fuel is reduced to a minimum through various sensors providing feedback to the central controller regarding engine load, speed, exhaust temperature, and gas and diesel use. The controller automatically adjusts the fuel supply and ratio based on a built-in algorithm to meet the changing speed and load conditions. A targeted blend of 80% natural gas and 20% diesel fuel is reported in high load/high RPM conditions. The engine can be switched from hybrid-fuel operation to 100% diesel fuel operation in the event the compressed natural gas supply is interrupted. Users indicate less wear on engine parts with reduced maintenance and oil changes. Our dual-fuel system is also described in more detail at:



<http://www.roughridersupply.com/Generator-dual-fuel.htm>