



A reliable and safe backup power supply for farms

A manufacturer of emergency power generators equips its agricultural power take-off unit with Eaton circuit breakers as standard

Location:

Ahaus, Germany

Challenge:

Generate mobile power while simultaneously securing electrical power for agricultural operations in the event of an outage.

Solution:

The generator circuit breaker NZMN2-VE250 uses an effective value measurement to detect the generator's actual power consumption, which ensures that the generator can only be run at up to 110% load for a maximum of one hour.

Results:

The generator circuit breaker protects the generator and therefore prevents physical and financial damage to the agriculturalist. With this circuit breaker, by adjusting the tripping current and time lag, high-performance systems can be started up and operated safely until they are switched off.

"The circuit breaker not only protects our generator from overloading and short-circuiting, it also prevents harm to humans and electrical systems on the farm."

*Hermann Kemper, from
Zapfwellenaggregatebau Kemper*

Agricultural businesses must have emergency power generators on standby to protect humans and animals. Kemper is installing Eaton circuit breakers on its emergency power generators to protect both the electronic control units of the farm and the emergency power generators from damage caused by overloading and short circuiting.

Background

A power outage can be extremely hazardous for agricultural businesses with livestock, and may have devastating effects, with considerable financial implications. Farmers need to ensure continuous operation of automatic milking, heating, feeding and ventilation systems in the event of a power outage. As such, the German Animal Welfare and Livestock Regulation [Tierschutz-Nutztierverordnung] for agriculturalists stipulates that farms should have an alarm system to notify of any outages. Additionally, they should also have a stationary or mobile emergency power generator at the ready.

It is essential for tractors to be constantly available in agriculture and power take-off

units powered by emergency generators are widely used. Given their mobility, power take-off units can ensure a power supply for the farm in the event of a grid outage as well as being available for use at any other location. The German company Zapfwellenaggregatebau Hermann Kemper (Kemper) is specialized in manufacturing mobile emergency power generators.

Challenge

Starting up conventional emergency power generators does not always go smoothly, and may cause irreparable damage to the electronic devices used to control and regulate agricultural operations. Malfunctions can sometimes be caused by frequency fluctuations from the emergency power generator. Moreover, for short circuiting in domestic lines, the miniature circuit breakers allow overloading by a factor of five to 10. In an emergency power generator this is limited to double the nominal power supply. The conventional overload protection systems for domestic service lines (for instance safety fuses and B- or C-type circuit breakers) do not offer sufficient overload and



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short-circuit protection for the emergency power generator when connecting systems with high energy consumption such as slurry mixers or hammer mills. If there is a short circuit in the generator caused by overloading, then the housing can become live. In this case, the miniature circuit breakers would not be able to respond quickly enough due to the rapid voltage drop. In order to prevent thermal and mechanical overloading of the generator, which can cause a fatal electric shock in the worst case, emergency power generators require a special safeguard that will also secure a power supply for the agricultural business in the event of a power outage.

Solution

Kemper has made it its mission to manufacture durable emergency power generators. These must be forgiving of any operating errors and, most importantly, protect agricultural operations against damage from short circuiting and overloading. Hence, the company developed two special generators (75 and 150 kVA) each with their own gearboxes aligned to the features of modern tractors. This means that the engine will have no trouble compensating for the higher load produced by other connected systems.

To ensure that the generator starts up reliably and safely, Kemper equipped its power take-off unit with a generator circuit breaker, the NZMN2-VE250, which is part of Eaton's Moeller series. With this circuit breaker, high-performance systems can be started up safely by adjusting the tripping current and time lag. In the process, the setting range for overload trip units is between 125 and 250 A. The short-time delay short-circuit trip can be set between double and 10 times the value of the overload trip unit, with the short-circuit trip responding instantly at 3,000 A. When used in the Kemper emergency power take-off unit, the overload trip units were set to the generator's nominal voltage of 220 A. The short-time delay trip was used

to suppress short-time current peaks, such as those that occur when engines start up. Kemper programs the circuit breakers such that they are triggered within 20 ms when a maximum of double the nominal power output of the emergency power generator is reached.

In addition, the device recognizes the generator's actual power consumption by means of a continual effective value measurement. Together with the thermal memory provided in the electronic trip unit, it ensures that the generator can only be run at up to 110% load for a maximum of one hour. When the generator heats up due to overloading, it must then run in normal operating mode for at least five hours in order to cool down again. Otherwise, if the current-time values and therefore the temperature reach unacceptable levels, the generator circuit breaker will be triggered to protect the system from damage. Since the circuit breaker responds even if minor short-circuit currents occur, the wires to the terminal point are also protected. This means that fires caused by overloading cannot occur.

In principle, after being triggered, the circuit breaker can immediately be put back into service by performing a reset. If overloads continue for a longer time, however, the thermal memory prevents the circuit breaker from being reset straight away. The circuit breaker is triggered to allow the machine to cool down. The main purpose of this cool-down phase is to protect the machine components, and it is determined by the thermal memory based on the duration and level of overloading.

Kemper undertakes commissioning on-site to ensure that its emergency power generators operate reliably and without faults. It also checks compatibility with existing tractors, the readiness of switching and protection devices, and tests the power take-off unit under full load to operate the entire agricultural machine.

Results

The generators are equipped with an Eaton generator circuit breaker as standard, which provides a versatile and broad range of settings. It protects not only the generator, but also any connected electrical systems and all electronic control systems from overloading and short-circuiting. This reduces the risk of fires or the build-up of dangerous contact voltages in the event of an error.

"Safety is our utmost priority," said Hermann Kemper, the company's managing director. "From our perspective, this means providing optimum protection for humans, animals and infrastructure. An important part of this is the established generator circuit breakers by Eaton, which we have been integrating into our emergency power generators as standard for many years. With these circuit breakers, it is not just the product itself that gets it right: the advice and service are outstanding too."



Kemper's 150 kVA emergency power generator, powered by a tractor, ensures that machines with high power consumption can continue agricultural operations in the event of a power outage (source: Kemper)



The tools of the Kemper power take-off unit are clearly visible from the tractor: on the left, various plug sockets and the domestic power feed-in; on the right, indicators showing current, voltage and frequencies; below, the generator circuit breaker (source: Kemper)



Kemper has installed Eaton's NZMN2-VE250 circuit breaker in a prominent position on the dashboard. In this image, it is combined with a turning handle to switch it on and off (source: Kemper)



The NZM circuit breakers, which are part of Eaton's Moeller series, offer versatile settings and stand out with their high-performance and cost-effective design (source: Kemper)

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Publication No. CS083096EN
June 2016

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