

Mobile hybrid power generation unit



Based in Kassel (Germany) Polyma Energiesysteme specializes in developing and manufacturing customized power generators. In close cooperation with the automation specialist ifm electronic, an innovative hybrid power unit has been developed.

(Source: Polyma, ifm)

Polyma Energiesysteme is a medium-sized family business that has specialized in the manufacturing and distribution of mobile and stationary power generators since 1948. The customized power units are used in many different areas – from vital emergency response measures and stationary solutions in industrial environments to mobile power supplies at festivals or on film sets. To fulfil the requirements for maximum flexibility and ease of use, Polyma relies upon close, trusting cooperation with ifm. An innovative combination forms the core of Polyma’s hybrid power units: a conventional motor-generator unit and a powerful battery.

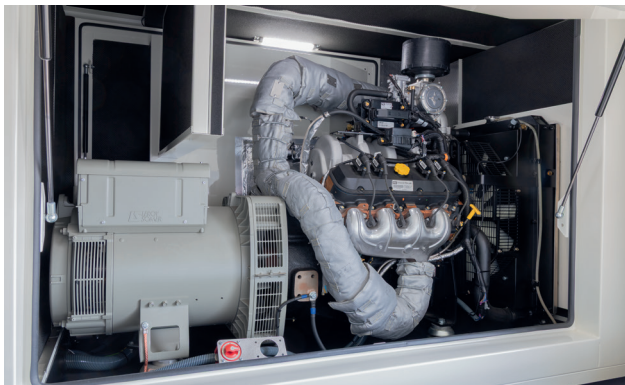


Figure 1: The motor-generator unit for mobile power generation (Source: Polyma, ifm)

Daniel Andler, Development Engineer at Polyma, explains how they work together: “This combination makes our devices extremely flexible and perfectly adapted to today’s energy supply requirements. The motor can be operated with either diesel, gas, or LPG (liquefied petroleum gas), making it highly adaptable to different operating conditions. A powerful generator converts the mechanical energy into electricity, which can be temporarily stored in a modern lithium iron phosphate battery if required. This battery technology not only offers high energy density, but also excellent service life and safety.”

Battery management

At Polyma, battery management is mastered through the use of advanced control systems. “The integration of lithium iron phosphate batteries is more complex than that of conventional lead batteries; it requires a sophisticated management system for monitoring and control,” explains Andler. This is where ifm’s expertise comes into play. A programmable logic controller (PLC) is responsible for the smart operational management of the entire system and ensures seamless coordination of the various components and devices.

The robust, mobile ifm CR710S controller comprises two independently operating PLCs, one of which is a ▶



Figure 2: The CR710S central mobile control unit has both a "normal" and a second independently operating safety PLC (Source: Polyma, ifm)

TÜV-certified safety controller. The triple-core controller, combined with a large working memory, enables complex control functions. If required, the application software can be split so that the safe program part can be executed without interference from the general program execution. The various inputs and outputs can be configured as digital, frequency, or analog inputs with diagnostic function or as inputs for resistance measurement. Analog inputs enable both current and voltage measurement. The outputs can be configured as digital or PWM (pulse-width modulation) outputs with diagnostic capabilities.

All inputs and outputs can also be configured as safe channels, so that safety-related sensors and actuators can be connected directly and their data processed in the application software. The device is also equipped with two Ethernet ports and four CAN interfaces. The CAN interfaces support such higher-layer protocols as CANopen, CANopen Safety, and J1939 as well as transparent, preprocessed data exchange. The control functions are integrated into the application program thanks to Codesys programming. The open programming interface enabled Polyma to implement its own software solutions, which are designed for maximum user-friendliness and efficiency.



Figure 3: The control centre and the various power connections are located at the rear of the vehicle (Source: Polyma, ifm)

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Designed for mobile applications

The robustness and reliability of the technology are vital for mobile applications. Polyma prioritizes ensuring that the housings and technology of the power units function reliably even under harsh conditions. “The devices must be resistant to vibration and shaking, as they are often used on the move,” states Daniel Andler.

This is what the mobile ifm controllers are designed for. The units are equipped with ifm sensors for comprehensive condition monitoring, including, for example, a capacitive sensor for leakage detection. This sensor is located in the collecting tray under the unit. If a line is defective and fluid leaks out, it collects in the tray and is detected by the sensor. This then sends an alarm signal to the controller. This prevents fluids from leaking unnoticed into the environment.

Visualization and operation

The developed customized automation solution gives Polyma and its customers maximum flexibility. Thanks to the implemented battery technology, the motor can be switched off at low load, which enables fuel savings while increasing the service life of the motor. The user always has full control of the system via the programmable CR1204 touch display. They can check the current status, apply settings, and switch functions on and off.



Figure 4: The central ifm CR1204 touch display is used to visualize all operating parameters and to set a wide range of functions (Source: Polyma, ifm)

The display has been developed for use in cabins and outside vehicles. A protection rating of IP65/IP67 means that it is optimally protected against moisture. It is resistant to strong impacts, permanent vibration, and extreme ambient temperatures. The high-resolution RGB LED panel offers optimum readability even in a bright environment. The display has programmable buttons and a capacitive touchscreen for operation tasks. The integrated 64-bit PLC can perform visualization and operation tasks and is programmable via Codesys. Interfaces at the back of the device include CAN, analog video, USB 2.0, and Ethernet.

Conclusion

From the initial contact with ifm, Polyma felt it was in good hands and a long-term partnership was formed. Daniel Andler particularly appreciates the fact that ifm took the time to closely support the medium-sized company. The hybrid power solution is an example of how customized technology and close cooperation can result in products that meet today's requirements and contribute to environment protection by optimizing energy consumption and reducing emissions. ◀



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