Iturri Control technology for mobile applications

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Through fire and water with ifm

In fire-fighting, Iturri relies on control technology for mobile applications

Whether in the fire engine or in the equipment container: Almost nothing works in firefighting without electrical control technology nowadays. Iturri is a global manufacturer of fire engine chassis. They have been relying on the control solutions for mobile applications provided by the automation specialist ifm for more than 20 years.

When it comes to firefighting, speed is not everything. Equally important is the reliability of the material used. It must function perfectly even under extreme conditions such as heat or water. Always part of the action: modern control technology which is crucial for the functioning of the various fire-fighting vehicles. Iturri is based in Wilnsdorf in the Siegerland region. The manufacturer belongs to the internationally operating group of companies of the same name. The latter have their roots in Spain and specialise in the construction of customised fire-fighting vehicles. At the German plant, around 80 to 100 fire-fighting and special-purpose vehicles are manufactured and delivered each year. In addition to fire-fighting engines, the portfolio notably includes equipment vehicles, environmental protection vehicles, command vehicles and vehicles for emergency site hygiene. National and international customers include municipalities, the industry sector and airports.

The "CCFM 3000" forest fire-fighting truck has excellent all-terrain capabilities and is equipped with state-of-the-art control technology.





The hygiene station RO/RO container is also equipped with control technology and a graphic operating panel. The self-protection system sprinkles windows and tyres with a water spray jet. This means that the vehicle can even drive through walls of fire to self-evacuate in an emergency.

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Forest fire-fighting truck

At present, there is special focus on the forest fire-fighting truck developed by Iturri. The latter is an extremely all-terrain four-wheel drive vehicle that cannot only master extreme slope angles and gradients but also cross slopes of over 30 degrees. This vehicle combines all the know-how that the originally Spanish company has been able to gather over decades from forest fire-ridden southern Europe. For example, the vehicle is coated with a special paint that is fire-resistant and, due to the special heat insulation, protects the occupants in the driver's cabin from extreme temperatures near the fire. The brake lines and electrical cables are sheathed in heat-resistant material and thus protected against heat and mechanical damage. A special feature of the vehicle is its self-protection system: water nozzles mounted on the outside of the vehicle sprinkle its windows and tyres with a water spray jet if necessary. This allows the vehicle to escape surrounding walls of fire and self-evacuate, in an emergency situation, simply by driving through the fire. The vehicle has a separate 500-litre water tank and its own pump system for this self-protection system.

Germany's densely forested areas, including for example those in Lower Saxony and Brandenburg, have also increasingly been affected by forest fires in recent years. The federal states in question have therefore also decided to purchase these special forest fire-fighting trucks from Wilnsdorf.



The vehicle's "brain": ifm's CR711S central controller.



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Important functions can be selected on the CR0452 ecomat display. On this display page, the proportioning of the wetting agent can be set.



Central control functions

Modern fire engines cannot manage without comprehensive control technology. A central PLC, supported by numerous sensors, takes care of the various control and regulation tasks on board of the different vehicles.

The extinguishing agent, for example, which consists of water with the addition of a wetting agent, is precisely dosed for the type of fire at hand with the help of flow sensors. The proportioning pump required for this purpose is controlled by the PLC via a CAN signal. Firefighters can set and read the dosage, which has been specifically selected for the particular type of fire via a control panel with graphic display.

Pressure sensors detect the water pressure at the jet pipe and control the pump for the required volume flow and pressure. This pump is driven by the auxiliary drive of the vehicle engine. The controller regulates the speed of the diesel engine so that the set value for the water pressure remains constant. For this purpose, the CAN interface with J1939 protocol to the vehicle engine is used.

Additional equipment, such as the special signalling system (flashing blue light and siren) or other signal lamps and illuminations for securing the scene of an emergency, are visualised and operated via a monitor and controlled by the central PLC. Doors or roller shutters are monitored by means of inductive sensors, for the vehicle is only allowed to drive off when these are closed. Logical operations, too, are saved in the controller. Example: when the siren is activated, the blue light must also be switched on automatically. However, the blue light may be illuminated without the siren in return. A rear warning device (yellow LED lights) may only be used when driving slowly, and above a certain speed it must be switched off automatically. The controller receives the speed value directly from the vehicle's control system via CAN bus.

Pressure sensors using the hydrostatic measuring principle monitor the level of the water and extinguishing agent tanks in the vehicle and visualise them on the various displays in the cockpit and at the rear of the vehicle.

An inclination sensor on the vehicle chassis determines the tilting angle in the longitudinal and transverse direction of the vehicle. Depending on the level of the extinguishing agent tanks and the vehicle speed, the controller determines critical angles of inclination and warns the driver in good time - by means of visual and acoustic signals including voice output.

High demands

These examples show how extensive and complex the requirements for the central controller are. Iturri has been relying for this on solutions from the automation specialist ifm for years.

Jens Schöler, programmer at lturri: "In the past, control functions were implemented using conventional wiring. Then the vehicle manufacturers switched to CAN bus. The controllers used until then could not handle this. We then tested various controllers from different manufacturers and the ifm controller was the best fit for our requirements. It covered everything we needed, and at a good price. That's how we came to choose ifm."

Relying on their ecomatmobile product line, ifm offers powerful controllers, displays, operating units and I/O modules for mobile use. Compared to their counterparts for industrial environments, these components are designed for the specific requirements of use on vehicles. For example, the housings are specially sealed, and they can also be mounted outside of driver's cabs. Extreme temperatures such as heat or freezing cold do not affect them any more than shocks and vibration. The enclosures are also EMC-resistant.



Dr.-Ing. Klaus Kutzner, management representative at lturri: "EMC is an important requirement for our vehicles. All electrical devices that are installed in a vehicle must have this E Mark, for example radios, blue lights and also the electronic controller. And ifm is one of the few manufacturers to offer control components and sensors with this E Mark".

Performant controller

Modern vehicles and mobile machines need very powerful control electronics to be able to process the high number of input and output signals. The new third generation ecomatController was developed specifically for this purpose. It has two independent internal PLCs – one of them a certified safety controller.

The control electronics are integrated into a compact metal housing with front-mounted, coded central plugs for mobile use, providing all the necessary connections for inputs, outputs, communication and programming. RGB status LEDs indicate the most important system messages.

The core of the controller, which has been designed according to the applicable standards for electronics in mobile applications, is one of the most advanced multi-core 32-bit processors with 300 MHz clock frequency. Its 6 MByte application memory includes a 1 MByte file storage system.

The ecomatmobile controller comes with CAN interfaces for communication. The latter are used for communication with the vehicle units via the J1939 protocol. Other components in the vehicle chassis such as signal horns, lights, environmental sensors or reversing cameras communicate via the second CAN interface via the CANopen protocol.



The CR711S controller used here offers 60 input / output ports. The entries can be configured as digital, frequency or analogue inputs with diagnostic function or as inputs for resistance measurement. The analogue inputs enable both current and voltage measurement. The outputs can be configured as digital or PWM outputs with diagnostic capabilities, with or without current control. More ports are available via CAN I/O modules. Programming is done by means of the standardised IEC 61131-3 languages. Programme creation is facilitated by the fact that ifm offers free function libraries, for example manufacturerspecific function blocks to address the diesel engine via J1939 protocol.

Visualisation and operation

The forest fire-fighting truck has three HMIs (Human Machine Interfaces) from ifm, two of them in the driver's cab and one at the rear of the vehicle. Relevant vehicle and extinguishing agent parameters are displayed to the firefighters via customised visualisations with clear symbols. By means of easily accessible pushbuttons, the operator can switch the displays or change process values.

The CR0452 and CR1082 displays and operating units from ifm used here also have an integrated PLC with input / output ports and CAN interface. Iturri uses these decentralised controllers in the HMIs for data pre-processing. For example, the measured values from the environmental sensors (including outside temperature, air quality, wind direction and speed) are pre-processed in the display controller and transmitted to the main controller as a finished data set. This not only simplifies the programme creation at this point, but also ensures a lean process flow.

ifm Partnership

Iturri has been working closely and in partnership with ifm in the field of control technology for more than 20 years.

Jens Schöler explains what he appreciates about ifm: "One of the great advantages of working with ifm is that ifm offers ready-made software modules for many functions, for example for the connection to the chassis of various well-known vehicle manufacturers. These modules can be downloaded free of charge from the ifm website. That helps us a lot. We write all the control programmes ourselves. Here too we can count on ifm's support, for example when new displays are used, and the programme has to be created or adapted in the process. ifm has provided dedicated contacts who also come to us and help us with the implementation on site. This is a huge asset of ifm. There are also other renowned manufacturers. If I call there, I can wait a long time in vain for support. But with ifm, I get quick help, either over the telephone or through a visit from their service staff".

B-Abgang Wasser

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Pressure sensor with E1 type approval for detecting the water pressure at the jet pipe.

Conclusion

Extensive control functions in the background, including comprehensive sensor technology and intuitive input displays ensure that the firefighters can concentrate on their actual task in the field: the effective extinguishing of fires. With ifm as a long-standing partner, Iturri can fully meet this requirement.