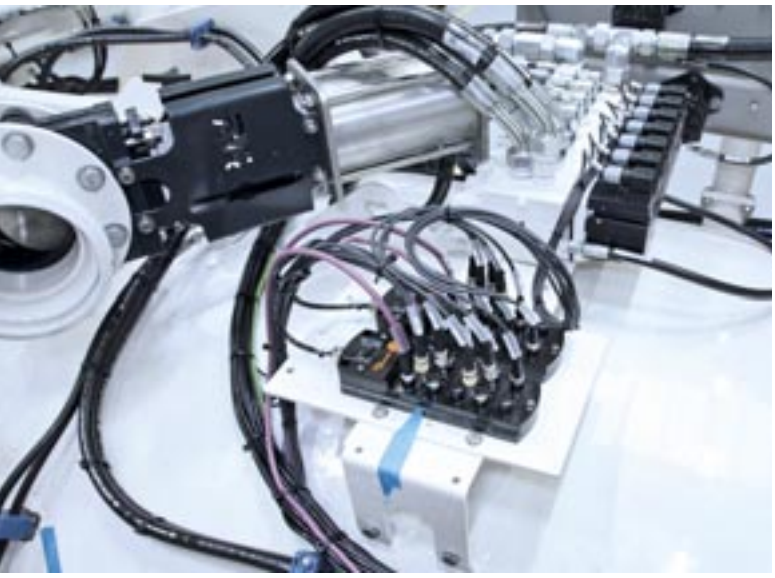
A powerful controller for automated pipe cleaning

Automation technology for municipal vehicles

Sensors and control components used in municipal vehicles must meet the highest of demands: Their components are exposed to extreme temperatures, humidity, dust, dirt and vibrations. With the "ecomat*mobile*" series, ifm offers automation components for these harsh environmental conditions. The company Bucher Municipal uses the ecomat*mobile* products for its sewer cleaning vehicles.



Decentralised CAN I/O modules outside the vehicle connect the sensors and actuators to the controller.

Bucher Municipal is a global supplier of special vehicles such as refuse collection vehicles, sweepers and winter maintenance equipment. In the Danish city of Silkeborg, at the Competence Center Special Vehicles (CCSV), among others the company manufactures sewer cleaning vehicles.

Brian Munk Andersen, Technology Director at Bucher Municipal in Denmark, explains the structure and function of this vehicle type, *"Sewer cleaning units from Bucher Municipal feature two pump systems. The jetting pump cleans sewers and tanks. With the vacuum pump, we can suck sludge and industrial waste into the tank mounted on the vehicle."*

With two ifm control units for mobile applications installed outside the vehicle, the vehicle operator can perform a variety of work steps: rotate the boom, unwind and rewind the hose, switch the pumps or empty the sewage water tank. The displays of the dialogue modules show the relevant system parameters and process values and

A sewer cleaning vehicle with the uncoiled jetting and suction pump for sewer cleaning.

Bucher Municipal is a division of Bucher Industries AG, a global leading technology group in special fields of mechanical and vehicle engineering.

assist the user in performing the work steps. A control unit inside the vehicle – also supplied by ifm – ensures that the individual processes run smoothly.

"*The intelligent control of our sewer cleaning vehicles ensures efficient processes and enables maximum focus on the task, guaranteeing the highest possible added value for our end users,"* says Andersen.

ifm as a partner

For several years now, the automation specialist ifm has been supporting Bucher Municipal as a partner for sensor components and control technology.

Brian Munk Andersen: *"At Bucher Municipal, we have a constant focus on innovation and development. That's why we use automated and intelligent solutions. When we entered into a cooperation with ifm in 2016, we were looking for a reliable supplier of control solutions. ifm offers a wide range of components for our product – from sensors to displays and IO systems to controllers. Throughout the development phase, we worked closely with ifm to develop a solution and choose the ideal products. Our vehicles have to operate reliably in very varied conditions such as cold, heat, dust and dirt. This places particularly high demands on the components. Together with ifm, we have created a good and reliable solution with many automated features that offers the operator high quality and safety standards when our machines are on the road."*

The central components in detail

The core element of the system is the ecomatController CR711S, an extremely robust PLC for mobile applications. What makes it so special is that is has two independent internal PLCs – one of them a certified safety controller. Powerful integrated multi-core processors allow even complex control functions to be processed

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The BasicDisplay CR0451 indicates the most important parameters on the control panel.

quickly. The application programs can be divided between the two internal PLCs if necessary. Consequently, the safe program part can be executed without interference from the general program execution. This ensures reliable operation even with complex control functions. The controller can be used in safety-related applications up to ISO 13849 PL d and IEC 62061 SIL CL 2.

In addition to its many multifunctional inputs and outputs with diagnostic capabilities, the ecomatController features two Ethernet ports and four CAN interfaces. The CAN interfaces support all important bus protocols (CANopen, CANopen Safety and J1939) as well as the transparent and preprocessed data exchange.

The control functions are easily integrated into the application program thanks to CODESYS programming (version 3.5).

At Bucher, the controller is additionally connected to a GSM radio module.

Brian Munk Andersen: *"In many cases, our remote connection allows us to solve issues while the vehicle is still on the road. This saves our customers a lot of time. Only in cases where remote troubleshooting is not possible the municipal vehicle needs to be checked at one of our many service centres."*

The core element at the top right of the control cabinet: the powerful ecomatController CR711S with two integrated PLCs (1x standard, 1x safety).

I/O modules

Various sensors and actuators are installed on the sewer cleaning vehicle to monitor and control the different work steps and process values. Using decentralised I/O modules, they communicate with the controller via CAN bus.

Brian Munk Andersen explains the benefit: *"With CAN units installed at different positions on the truck, we reduce wiring and also achieve greater reliability and an easier operation of the equipment."*

The type CR2032 control modules each have 16 ports that can be configured multifunctionally, for example as digital inputs or outputs or as PWM outputs for controlling proportional valves. A controller integrated in the modules enables decentralised evaluation of the sensor signals in advance.

This pre-filtering of the data not only reduces the data flow on the CAN bus to the controller, but also simplifies the application program on the PLC.

The robust metal housing is designed specifically for the harsh outdoor use of mobile machines and offers protection rating IP 67 for high ingress resistance of the connectors.

Dialogue modules

A range of displays for mobile applications are mounted outside the vehicle as human-machine interfaces.

Brian Munk Andersen: *"On the large display in the main cabinet, the operator can control the entire system and make the basic settings. After this, the system can be operated via the remote control or the operating panels."*

Dialogue modules are programmable graphic displays for controlling, parameter setting and operation of mobile machines and installations. They can be used in conjunction with a mobile controller or as a stand-alone solution. Data and device functions are safely transferred via CAN interfaces. The displays feature many freely programmable backlit function keys. The units offer increased EMC levels and an e1 type approval for operation on public roads. Thanks to the high protection rating of the housing, the modules are suited for outside panel and surface mounting as well as for cabin installation. Just like the other ifm components for mobile applications, the displays are vibration resistant and have protection rating IP 67.

Conclusion

ifm offers a comprehensive portfolio of products for efficient and reliable automation of functional units on municipal vehicles.

Brian Munk Andersen concludes: *"With ifm's solution, we can create a highly automated system that offers us superior reliability and makes the lives of those operating our equipment a lot easier."*

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