Out of sight, not out of reach

Solution for remote parameterization and maintenance of HART devices in ex areas wins "plant of the year" award.

The Clariant company in Gersthofen (formerly Hoechst) manufactures, among other products, additives for plastics production. Their products are used, for example, in garden chairs and stadium seats to prevent the material from becoming too porous from sunlight. In the pilot plant, new developments are examined continuously under frequently changing application conditions, which often require reparameterizing the field devices. To minimize the time and costs involved in parameterizing the devices on site—particularly in potentially explosive areas—the facilities engineering department opted for a remote parameterization concept based on a Profibus Ethernet gateway and FDT. The plant has been nominated for the HART Foundation's Plant of the Year award. ULRICH SCHUSTER, LUDWIG WENNINGER

On-site device parameterization by EMR technician from IGS GmbH In future, he will be able to do this directly from his workstation at the workshop.

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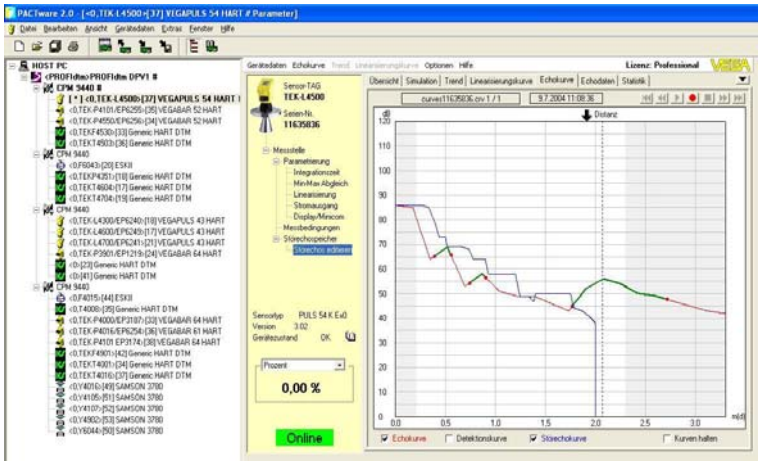
Clariant's pilot plant uses mainly HART devices from different manufacturers as intelligent field devices. The field devices transmit and receive their main process data via Profibus remote I/Os which map the 4-20 mA main signal of the HART devices on cyclic DP data. Being RS485-Exi capable devices, these remote I/Os from R. Stahl can also be operated in potentially explosive areas. From there, the RS is led from the Ex area to the non-Ex area where it is converted into standard RS485 by a converter 485-Exi based Profibus and connected to the Profibus master interface of the process control (DeltaV from Emerson).

This system offers various advantages for plant operation: A baud rate of 1.5 Mbauds can also be used in Ex areas, thus achieving short bus-cycle and system-update times even with a great number of field devices. With regard to bus physics, the system offers ample freedom of scope since a vast number of field devices can be connected to one bus line; for example, 10 remote I/Os with up to 40 HART devices each. The implementation of remote I/Os in Ex areas also allows a reduction of cable lengths. Unlike protection using pressure-tight encapsulation

or a special design, the explosion protection achieved through intrinsic safety facilitates device replacement. Last but not least, HART devices are available at a reduced price compared to other Ex-capable bus systems—and the service staff feel more at ease with these devices, which all in all act just like other 4-20 mA devices, and can benefit from the easy-to-use diagnostic possibilities.

This implementation had a few drawbacks on field device parameterization, however: To parameterize the devices in the built-in state, the staff had to be on site, taking the applicable parameterization tools (notebook with appropriate software) with them.



The FDT user interface of a radar level meter

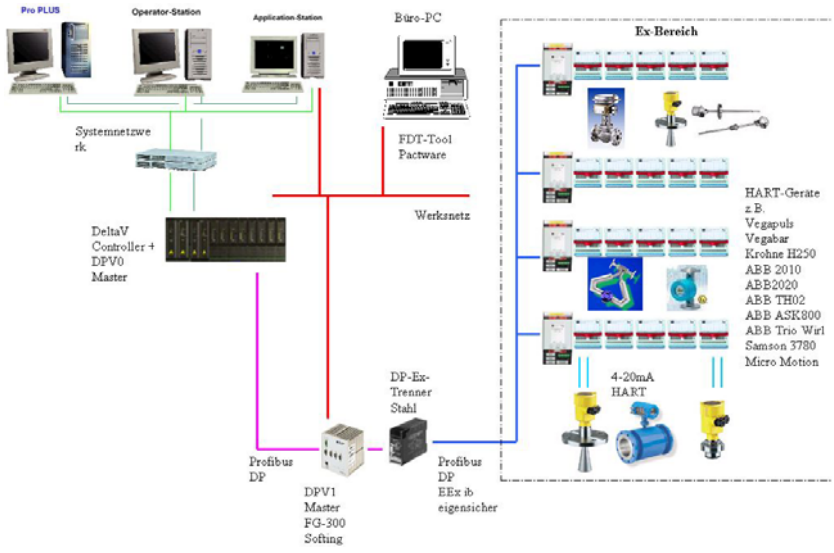
This implementation had a few drawbacks on field device parameterization, however: To parameterize the devices in the built-in state, the staff had to be on site, taking the applicable parameterization tools (notebook with appropriate software) with them. In many cases, however, the devices need to be parameterized while built in. Particularly in a pilot plant, recipes are changed relatively often and frequently require a reparameterization of the field devices. This is the case, for example, if a specific container with a level meter needs to be used for a different material. The characteristic curves of a radar sensor, for instance, cannot be determined until the sensor has been installed in the target container Another problem was that, to be able to use a notebook in Ex areas, the applicable work permit has to be issued and the required tests completed.

In extreme cases, the staff is allowed to enter the hermetically sealed areas only after great administrative efforts. In addition, a variety of different software packages and different HART adapters had to be kept on hand for the devices from the different manufacturers. Considering the wide range of models used (ABB, E+H, Krohne, Samson, to name just a few), parameterization was a quite complicated task. Preventive maintenance using data provided by the HART protocol, such as number of strokes or self-diagnosis, was practically impossible under these circumstances.

The restrictions mentioned above gave rise to the wish for a transparent parameterization and maintenance system that was to be located outside the Ex area and that was to provide access to different HART field devices at the most remote locations of the production plant from a homogeneous software environment and by using only one hardware interface.

The Solution

On the hardware side, an acyclic class 2 master in the form of an FG-300 from Softing was added to the existing cyclic class 1 master (DeltaV). This Ethernet Profibus gateway gives any office computer on the company network access to the Profibus. In addition, the remote I/Os from R. Stahl required the use of Profibus interfaces which supported not only the cyclic DP data but also the HARTonDP protocol, which is based on acyclic DP/V1 telegrams.



System structure of the process control system

On the software side, PACTware was selected as the FDT frame application. The basic version of PACTware is available on the Internet free of charge. PACTware can also be obtained at a small charge from the members of the PACTware Consortium, i.e. mainly

from the field device manufacturers.
The PROFIdtm from Softing, a gateway DTM from R. Stahl and the various device DTMs were then integrated into this frame. DTMs have their own interfaces which open in the FDT frame and allow the user to enter specific settings for the individual devices. At the same time, they also offer a driver functionality, so to speak, in that they ensure that a specific setting is converted into the corresponding field bus telegram. A communication DTM is always needed first. This Comm DTM gives the FDT access to the corresponding fieldbus. In the Clariant pilot plant, the Comm DTM is provided by the PROFIdtm which makes the FG-300 (Ethernet Profibus gateway from Softing) available to the FDT frame. Its interface is used predominantly to set the Profibus parameters such as baud rate, highest station address, etc. One or more gateway DTMs can now be integrated below the Comm DTM. In this case, the gateway DTM from R. Stahl is assigned to the remote I/O and ensures that the HART telegrams created by the device DTM are converted into HARTonDP telegrams, i.e. Profibus DP/V1 telegrams. The device DTMs from the various manufacturers, in turn, are added below the individual

The Clariant system won the HART-Plant-of-the-Year Award

gateway DTMs. Their interfaces serve to read and modify the field device parameters, to generate characteristic curves and to display diagnostic information. For HART devices from manufacturers who do not yet provide DTMs, HART profile DTMs can be used which allow access to the standard profile parameters.

Advantages of the Crafted Solution

The combination of hardware and software, as chosen by Clariant, now allows the fast and easy parameterization and remote diagnosis of the HART devices directly from the office. The EMR workshop of Industriepark- Gersthofen-Service-GmbH, the company in charge of maintenance, is soon to be equipped with an FDT worksta-ion for remote mainte-ance, as well.
The advantages are obvious: Firstly, the solution

The Softing on-site support provided assistance with Profibus problems

allows reacting more quickly to requests from the production department, e.g. in a recipe change. Secondly, the administrative work involved in issuing work permits for Ex areas is eliminated. Even devices in hermetically sealed areas can be reparameterized without problem. Since access to the diagnostic device data offered by the HART protocol is now possible at any time, the data can also be used for preventive maintenance schemes. In addition, parameterization is now performed from a homogeneous software environment and using only one hardware adapter, i.e. the Ethernet connection of the PC. A general advantage of the FDT concept comes in particularly handy when a field device is replaced by an identical, but unparameterized device during repair or maintenance work. In this case, the centralized data management of FDT helps to quickly supply the replacement device with the location-specific parameters stored on the hard disk. The set parameters can also be documented on paper, if required. Many DTMs feature a specific protocol print functionality for this purpose.

Technology with Potential

The facilities engineering department of Clariant believe that FDT and DTM offer a solution which, even though it might not fulfill all the wishes yet, is sufficiently stable to ensure a reliable and efficient operation. During startup and commissioning, difficulties initially arose due to thecombination of multi-master operation, token loss and automatic baud rate recognition of the Ex couplers. These difficulties could soon be eliminated with the help of the Profibus on-site support from Softing. In addition, occasional problems occurred with device DTMs which did not run in combination with the gateway DTM, thus proving unsuitable for remote parameterization. In

these cases, a temporary solution was found by using the HART profile DTM until the device manufacturer supplies a suitable DTM which allows using all HART functions of the device.

"The communication DTM and PROFIBUS / Ethernet gateway from Softing are the central components in our plant. Softing's PROFIdtm provides our FDT based engineering application remote access to field devices via Ethernet. Via the FG-300 PROFIBUS from Softing we can control three Profibus segments in parallel. Softing's components fit perfectly into our architecture and allow us to extend our plant in future in a very cost efficient way."

Ludwig Wenninger, Plant Technics Plastics Additives, Clariant GmbH

Summary

The use of FDT/DTM as a parameterization tool in conjunction with gateways

- from Ethernet to Profibus
- from standard Profibus to RS485-Exi based Profibus
- from Profibus to HART

has provided Clariant with many advantages in their daily work and has considerably simplified and accelerated maintenance and changeover processes. The possibilities of diagnosis have been enhanced substantially. FDT has proved a suitable parameterization tool in a nearly heterogeneous network structure. The hardware and software costs were very low. In view of the fact that this solution can significantly cut plant downtimes, this investment is likely to pay off before very long.

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