

Customized Tracker for PROFIBUS Reveals Optimization Potential

Analyzing PLC-independent Process Data Can Improve Processes in Machines and Plants

Process data from plant control and visualization systems can only go so far towards optimizing large machines and plants, such as those used in automobile production. But with powerful software and customized data trackers which extract process parameters directly from the fieldbus communication, it is possible to shorten cycle times, lower operating costs and improve quality in the long term – as the case of Daimler AG shows.



Increasing throughput and reducing costs without modifying a plant mechanically or electrically sounds like a dream, but it can be achieved by optimizing the plant's process flows and process parameters. To do this, however, the plant operator needs access to all of the data accumulated during the production process. With seamless, time-correlated data, plant operators can identify process weaknesses, potential problems and areas in need of improvement. If a failure occurs despite this, then such data can help pinpoint the cause of the error to minimize downtimes.

Independent Data Base Updated during Operations

In practice, however, the data from controllers and visualization systems is only a subset of the process parameters needed for optimization. Furthermore, since such data is acquired from different sources with different system times, it is not time-correlated. It takes a good deal of time and effort to meet this prerequisite for analyzing an entire plant. As a result, it is nearly impossible to realize an economically and functionally viable solution by accessing PLC data.

Since plant and machine components are usually networked with fieldbuses – Daimler AG and many other automobile manufacturers use PROFIBUS and will soon use PROFINET – one option is to tap directly into the fieldbus communication in order to collect the necessary information. This approach avoids the bottleneck or filter of the PLC or HMI and enables independent access to “pure” process data in real time.

In principle, an additional non-reactive bus station can be integrated in the fieldbus network to act as a bus analyzer for recording fieldbus communication. Softing AG offers the hardware and software solutions needed for this in the form of PC interface cards in a number of formats.

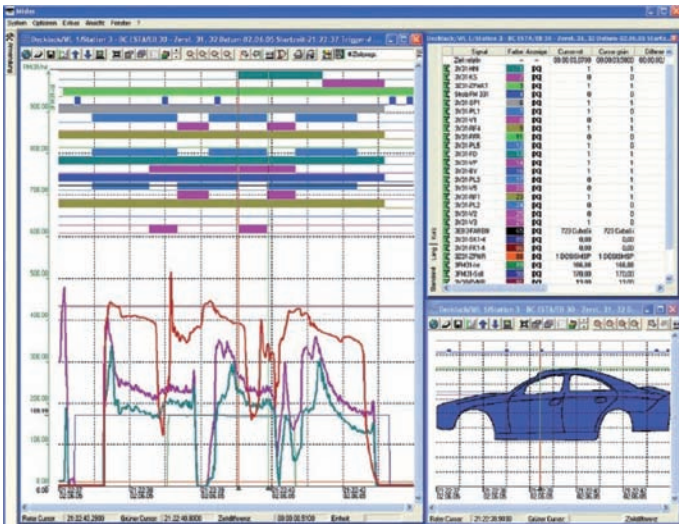
However, when data is transmitted at the maximum rate in a large plant with numerous stations and several segments, so much raw data accumulates so quickly that it is impossible for a downstream process diagnosis and management information system to seamlessly record and store it. If the data acquisition process in the fieldbus interface cards was not optimized, it would be necessary to lower the fieldbus transmission rate – which is rarely an acceptable option.

Additionally, due to the limited number of available slots on the host PC, another PC may be needed to monitor all segments of a manufacturing cell simultaneously. In this case, the situation would be further complicated by the extra software processing needed to time-correlate the data from the two systems. If even this barrier were overcome, resulting in seamless, correlated data, the sheer amount of uncompressed data generated during operations would be unmanageable and thus ultimately useless to the plant operator.

Customized Solution

But these obstacles can be eliminated by reducing the amount of data and integrating as many fieldbus channels as possible into a single PC. The data that is acquired must then be processed, filtered and visualized according to user needs with the appropriate software.

Softing AG has worked with TechnoStep GmbH in the field of data acquisition and can meet the above-mentioned requirements with its new PBpro PROFIBUS PC interface family. All of Daimler AG's manufacturing units use the Primas process diagnosis and



Process diagnosis with Primas

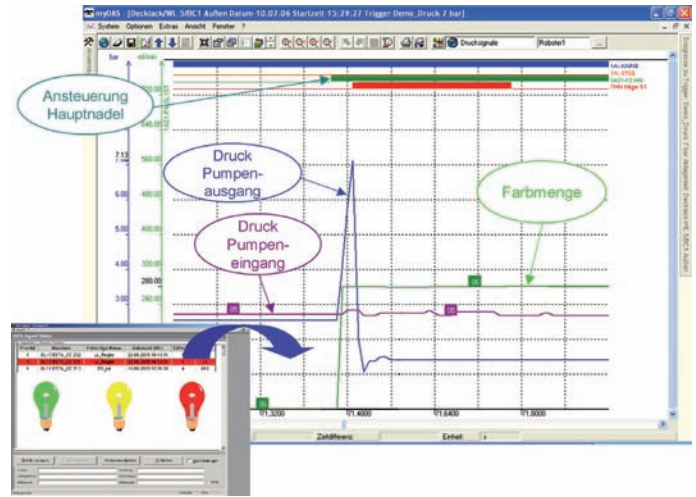
management information system. The extended version of this system with the Softing data interface was first implemented in the new paint shop of the Mercedes Benz plant in Sindelfingen, Germany, and can now be found in several other Daimler AG plants.

In this process diagnosis and management information system, up to six PBpro PROFIBUS PCI interface cards from Softing act as independent, powerful data trackers. One particular advantage of this card is that it has two channels. This means that a PC with six slots – the usual number for a PC – can be connected to 12 fieldbus segments. This eliminates the need for a second PC and makes it considerably easier to correlate the data.

The hardware of the Softing card did not have to be modified for the process diagnosis and management information system. To collect bus data non-reactively, the card uses a special operating mode of the PROFIBUS ASPC2 ASIC. Softing's customized, performance-optimized firmware ensures that the card only extracts the cyclic process data – including its origins (segment and nodes) – with no restrictions on the data rate or

number of stations. The remaining bus traffic, such as parameterization and network management information, is filtered out by the cards so it does not overload the PC. To integrate the solution in Windows, Softing developed a hardware driver which makes the process data available via a FIFO memory, thus helping to avoid the problems associated with the latency of Windows. Techno-Step uses this driver to connect its Primas process diagnosis and management information system.

The process data acquired with the help of the PBpro PCI cards is furnished with time and process stamps and then evaluated by Primas, which searches for the events specified by the operator. The processes associated with these events are presented in clear graphic form with a resolution of a millisecond for further analysis by the user. This enables not only comprehensive quality control and process optimization during the entire life cycle of a plant, but also efficient error diagnosis (even for sporadic errors) and preventive maintenance. Even when several thousand parameters must be taken into account, users can optimize cycle times, lower operating costs and improve the quality of their products in the long term.

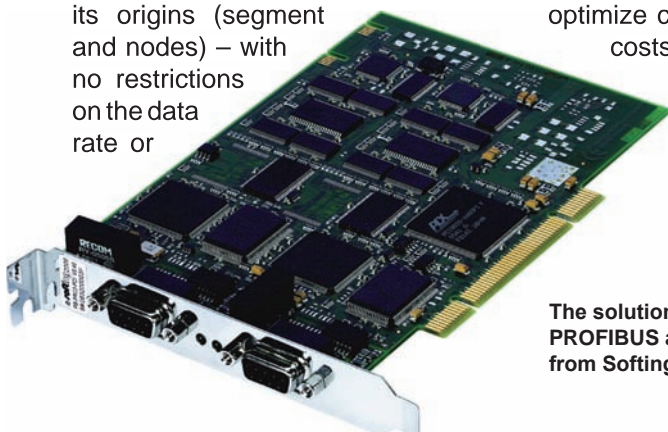


The main needle is triggered before the dosing pump starts but opens too late, causing a large increase in pressure at the pump outlet.

Example: Automatic Monitoring of a Paint Gun Needle

By seamlessly recording and allocating data from the individual processes in a paint shop, it is possible to visualize all key parameters of the needle/pump combination – such as the triggering of the main needle, the pressure at the pump outlet and the amount of paint – in a time-correlated y-t diagram. Devices can be monitored automatically thanks to algorithms defined with the DiagNet virtual measuring point editor in Primas.

In the ADS agent from Techno-Step GmbH, for example, users can see at a glance whether the main needle is being triggered before the dosing pump starts and opening too late. In this case, the pressure at the pump outlet would rise to an undesirably high level. Changing the parameters can solve this problem and eliminate the probable cause of any disruptions. Furthermore, by comparing paint usage in different lots, it is possible to track down potential faults and reduce the amount of paint used. Last but not least, this simplifies quality assurance and documentation for every single auto body.



The solution for flexible, high-performance PROFIBUS access: PBpro PC interfaces from Softing

Summary

The data integration achieved through the use of PROFIBUS interface cards from Softing in the Primas process diagnosis and management information system from Techno-Step shows that modified firmware and an additional driver can open up entirely new fields of application. The cards – which are mostly being used as active master or slave interfaces in countless applications – make it possible to create applications like process data analysis systems which help save costs, improve processes and simplify quality assurance. In this development partnership, the competencies of Softing, an automation and communication specialist, perfectly complemented those of Techno-Step, which has years of experience in the development of process diagnosis software. The Softing solution is also available to all other applications which want to read and analyze PROFIBUS data.

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