The synthetic material polyvinyl chloride (PVC) is one of the most important raw materials of the industrial world. At Vinnolit GmbH & Co. KG, Knapsack factory, the production of this multi-purpose material is realized by the scalable ABB process control system Freelance.

Since the first commissioning of the system in 1996 the production procedure has continuously been expanded and updated. The control system – Freelance – has grown with the installation and meanwhile processes more than 2000 analog and binary inputs and outputs.

Dr. Dieter Paus, responsible for the EMR support at Knapsack, points out that “the key to efficiency and product quality is a highly sophisticated automation technique.” Especially in the area of explosion-protected chemical installations, an increased extent the precision and possible communication of the measuring instruments are an important factor. With an annual capacity of 570,000 t, Vinnolit Kunststoff with four locations in Knapsack, Köln, Burghausen and Gendorf is the leading PVC manufacturer in Germany.

Devices with DP connection of external power supply, which are installed in the instrumentation and control room (not in the hazardous area), have been connected directly to a DP line. The advantage is a high data transfer rate of 1.5 Mbit/s.

For the transition from PROFIBUS-DP to PROFIBUS-PA, which exclusively connects the PA devices installed in the hazardous area, DP/PA couplers with a transfer rate of 93.75 kBit/s have been used. Depending on the power consumption up to ten field devices can be connected directly to a segment coupler. Field controller and segment coupler are located in a control cubicle. The respective PA bus outputs of the segment couplers have been led to the field devices via a bus distributor BV.

“With our latest investment, the installation for the recovery of non-consumed vinyl chloride, a future oriented automation technique – the fieldbus with Profibus technology – for the first time has been put into operation satisfactorily at the end of December 1999. By means of this innovation the installation keeps pace with the 21st century and assumes the part of a pioneer.” Due to the implementation of ABB Field Controllers into the existing Freelance System meanwhile approx. 200 measuring points have been installed and put into operation in fieldbus technique. Paus is pleased: “By the introduction of the Profibus technology, costs of more than 200,000 DM were saved”.

Figure 1 shows the typical structure of the fieldbus system as realized in the PVC 2 plant. The process station (ABB Field Controller) as Master Class 1 cyclically reads the process values of the connected sensors and actuators and issues the set-point assignments for the connected actuators (electric actuators and I/P positioners). Furthermore, data regarding the device status are continuously transmitted. The field devices are connected via a two-wire DP cable. In the present case two DP interfaces are made available by the field controller.

Knapsack factory acts as pioneer

“With our latest investment, the installation for the recovery of non-consumed vinyl chloride, a future oriented automation technique – the fieldbus with Profibus technology – for the first time has been put into operation satisfactorily at the end of December 1999. By means of this innovation the installation keeps pace with the 21st century and assumes the part of a pioneer.” Due to the implementation of ABB Field Controllers into the existing Freelance System meanwhile approx. 200 measuring points have been installed and put into operation in fieldbus technique. Paus is pleased: “By the introduction of the Profibus technology, costs of more than 200,000 DM were saved”.

Advantages of the fieldbus technique, user benefits

- Planning and installation
  - Reduced wiring effort, no marshalling
  - Reduced engineering / documentation effort
  - Reduced number of power supply units / Ex barriers
  - Less I/O channels in PLS/SPS
  - Reduced cubicle requirement
  - Reduced size of control room
  - Simple expansion of field instrumentation by clamping to the existing bus line or by extending the bus line

Karl-Theodor Jores, DEAPR/IV-West

FB/AP-P 003 EN
• Configuration, commissioning and maintenance
  - Simple network configuration
  - Central device configuration
  - Self-diagnosis of the field devices
  - Preventive maintenance on valves by information from positioners and/or control actuators

• Operation and observation
  - More information from the field area and due to this:
    Increased operational safety, the process becomes more transparent
  - Reaction on critical plant conditions in good time and thus increased plant availability

To a larger extent the new bus-capable digital field devices of the 2000T series for pressure and differential pressure measurement as well as the new head mounted transmitters TF 12 for temperature detection from ABB are used as field devices. The higher transmission accuracy of the Profibus head mounted transmitters despite the simpler structure compared to the conventional “4…20 mA” technique shall be used for the precise energy balancing. A manufacturer-wide exchangeability and operability of the devices is assured and put into practice in the described installation. The ABB field controller as master also communicates with field devices (slaves) of different manufacturers. The configuration, commissioning and diagnosis up to the field device are effected by only one tool: Digitool.

Paus explains that “PROFIBUS-PA is particularly suitable for applications in the chemical industry”. The development of micro electronics regarding increased computing and storage capacity has made a significant contribution to this. The low and still decreasing energy consumption of the sensors and actuators just enabled the use of the fieldbus in potentially explosive areas (Figure 2).

Figure 2: Profibus and ABB Head Mounted Transmitter TF 12 in the Plant

Hardware structure of the plant section PVC-2

The expansion of the plant section PVC-1 by the plant section PVC-2 has been completed in January 2001. Seven additional control stations and four process stations, three ABB field controllers of which have been connected to the already existing Freelance system and combined in a modern central control room (Figure 3).

Planning, configuration and commissioning of the system including field technique have been effected by InfraServ GmbH, Dept. Process Control Technique, Hüth/Knapsack. Frank Latz, computer science graduate, states: “Freelance with the integrated engineering tool Digitool allows a comfortable and continuous configuration, commissioning and diagnosis – from the graphic display to the field device. This also includes the integrated fieldbus management.”

Quantum leaps of innovation are no problem

Karl-Theodor Jores, responsible for sales and technical customer support at ABB, says: “With decreasing prices of electronic components and the computer technique a quick development of the process control technique as well as of the sensor and actuator systems can be expected. In addition to the technical advantages the user benefit of future-oriented control systems like Freelance is their economic efficiency. This can be evidenced easily by a careful cost-benefit analysis.” Based upon shorter and shorter innovation cycles for the hardware and software development it is important for the user that his installed system can implement quantum leaps of innovation without great problems. These are the particular preferences of the ABB system Freelance. Jores advances further arguments in favour of Freelance:
  - reliable system, successful application world-wide since almost 10 years,
  - scalable and open system with modern system structure,
  - Freelance allows combinations of conventional process stations with the new field controller in one system,
  - efficient and future-oriented system

Increasing sales figures show. The fieldbus is on the move; the traffic lights are at green.