



Solution for process automation

Simple operation, flexible expansion and low-cost maintenance

Plant operation experience at Rhein Chemie in Mannheim/Germany

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Figure 1: Remote I/O system with control valves fitted

Rhein Chemie is a company in the chemical industry that has been successful for more than 100 years in widely changing markets. Approximately 1,000 employees produce and sell large numbers of products worldwide for various areas of the plastics, rubber, lubricant, and polyurethane industries. Since 1956 Rhein Chemie has produced high-performance additives for lubricants.

Safety, the protection of people and the environment, high quality, and optimal cost effectiveness are factors for success given equal priority when achieving corporate objectives at Rhein Chemie, a subsidiary of LANXESS Deutschland GmbH.

Production and quality are controlled using process control systems. A large number of quality related process parameters are acquired online and ensure optimal product quality with ›in-process control‹. In addition, further process-related quality checks are performed around the clock using the latest analytical technology.

Rhein Chemie continually improves the quality of its products and manufacturing processes in collaboration with its customers. These improvements are due to the innovative relationship between the application technology team and the process technology team.

Further important elements of the quality system here are the high level of flexibility and speed with which it is possible to react to new or changing customer wishes. For these reasons it is necessary to abandon conventional process structures and to modify and optimise existing structures to suit the new requirements. To comply with these requirements, the modern I/O technology manufactured by R. STAHL has been used for the process control system. This system acquires and conditions the process signals.

By using this technology the following advantages can be fully exploited for high plant cost-effectiveness:

- › cost savings on hardware, installation and commissioning
- › cost reductions during servicing and maintenance
- › high degree of flexibility in the event of changes, additions and upgrades

The high level of flexibility has been further improved by installing the ›process-near component‹ (PNC) controller directly in the production plant, which had previously been in the control room some distance away.

As a result short cable runs are used to connect the signal inputs and outputs to the related PNC via the Remote I/O system. These connections are installed with conventional copper cables. The bus connection between the Remote I/O system and PNC is realised using Profibus DP. With this bus structure it is possible to very easily and quickly accommodate changes and additions to input and output components. These tasks can also be undertaken during operation (online) without interfering with the other parts of the plant or other functions. Information then flows to the higher level process control system via an Ethernet optical fibre connection using the standard TCP/IP protocol.

Installations in hazardous areas

As explosive substances are used in the production processes, related regulations must be observed.

The zone plan for explosion protection here indicates Zone 2. This zone classification permits cost-optimised and therefore economical installation. For the Remote I/O system explosion protection is a simple matter thanks to its layout and design. However, the situation is different for the controllers. These groups of components are normally installed in the safe control room and therefore do not comply with the requirements of the apparatus standards for explosion protection.



Figure 2, top: Controller in the housing with restricted breathing; bottom: Field station with built-in I/O systems and solenoid valves

So that advantageous installation in Zone 2 is possible, an appropriately explosion-protected housing was designed. As there are several options for the type of protection, it is recommended that the best solution for the specific application be used.

For measurement and control circuits, the type of protection ›intrinsic safety‹ is predominantly recommended, for terminal boxes ›increased safety‹ is used, and for the controller ›reduced breathing‹ is suitable. This type of protection relates to housings that are so designed that ingress of gases is restricted. However, the sealing of the housing must be re-checked every time it is opened. Nevertheless, the effort required is within acceptable limits if suitable test equipment is used (Figure 2 top).

Concept for simple maintenance of valves

A further important aspect is the necessary control valves with position feedback.

To obtain the required advantages in installation and maintenance, the control air for the valves for the product pipes in the plant is switched by the solenoid valves installed directly in the field station for the Remote I/O system. →

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A digital output module in the Remote I/O system operates the solenoid coils directly (Figure 2 bottom). The combination of an 8-channel output module and a 16-channel input module for the feedback has proven to be the ideal solution.

For maintenance and testing in accordance with German regulations, the switching function of the valves must be checked at regular intervals.

For this purpose the »manual adjuster« is actuated on the control valves installed centrally in the field station, thus it is not necessary to go looking for valves installed separately in the plant as it has been in the past.

Supply of power using Ex e/d miniature circuit breaker distribution boards

Along with the concept described above, good experience has also been obtained with supplying power via miniature circuit breaker boards located directly in the plant and therefore in the hazardous area. As the miniature circuit breakers are fitted behind flaps in the housing cover, operation and monitoring is possible without the need to open the housing in type of protection increased safety »e«. In this way the plant can be operated locally both easily and safely. Additional residual current circuit breakers are integrated for the protection of people. For these miniature circuit breaker distribution boards, explosion protection is achieved using the combination of the types of protection increased safety »e« for the housing with the flaps, and flameproof enclosures »d« for the miniature circuit breakers and residual current circuit breakers (Figure 3).

In the event of simple faults with miniature circuit breaker tripping, it is possible to switch the circuit breaker back on again locally and immediately without an electrician. In the case of installation in the control room, an electrician with access authority must be called.

Conclusion

The modern automation system manufactured by R. STAHL, designed and installed as described here, has proven itself extremely well in its two years of operation. The experience obtained shows that even in plants with potentially explosive atmospheres, economical and safe installation and operation are possible by exploiting all the possible types of protection for the individual items of electrical equipment.



Figure 3: Miniature circuit breaker distribution boards with housings in »increased safety« and circuit breakers in »flameproof enclosure« are operated from the outside via flaps