

**When the
chemistry is
right, so is
the physics. Or:**

How the close cooperation
between Boehringer Ingelheim
and Festo brought about an
exceptional solution in process
automation. This is that story.

How the project started or how to find a whole new way of working with pressure.

The project started with a phone call **1**. Between Jürgen Weber, Head of the Process Automation (DE) industry segment at Festo **2**, and the Head of Automation at Boehringer Ingelheim **3**. A date for a presentation was arranged. The subject of the presentation was a specific component from our valve terminals: the proportional pressure regulator VPPM **4**. Up to this point, this valve had not been used for direct regulation of process gases. The question was: can the VPPM be used to regulate process gases – in this case inert gases – and, what is more, regulate both the pressure and the flow rate?

A frequent starting point for intensive cooperation: a phone, the right number and an interesting idea you can present.



The Biberach an der Riss production location
Boehringer Ingelheim is one of the 20 leading pharmaceutical companies in the world. Headquartered in Ingelheim, Germany, Boehringer Ingelheim is represented worldwide by 142 affiliated companies and has more than 47,400 employees.

Biberach an der Riss is Boehringer Ingelheim's biggest research and development location worldwide. The entire project "Construction of K62 Technical Centre for Active Ingredients" with an investment cost of around EUR 50 million comprises around 2,700 square metres of usable space. This includes synthesis laboratories and highly flexible pilot plants where newly developed active ingredients will be produced. The plant will be equipped to deal with active ingredient quantities of 10 to 100 kg for pharmaceutical preparations.



The proportional pressure regulator VPPM.
Shown integrated in a valve terminal here.



Jürgen Weber, Head of the Process Automation (DE) industry segment at Festo. With the company for over 10 years.

→ How do you approach a project like this?

There is no such thing as a ready-made approach to designing projects of this scale, especially for tasks in process automation. Basic requirements are individualism, flexibility and the ability to adapt to the customer. The team must be right, from the developers to the application engineer. And you have to identify with the project.

→ What was the particular challenge?

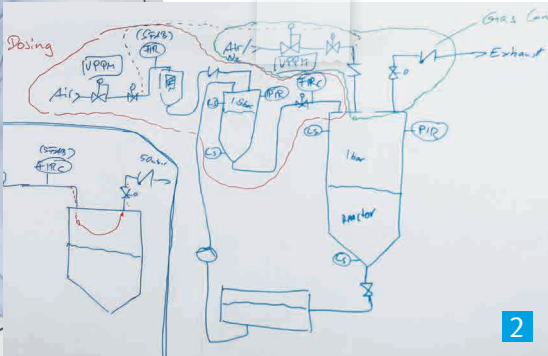
Taking a product that up to this point had mainly been used for regulating compressed air and using it to regulate process gases in an active ingredient reactor for the first time. Fortunately, in our partners at Boehringer Ingelheim we found contact persons who would confront this challenge with us. It was uncharted territory for both parties.

→ What was the most exciting moment for you during this phase?

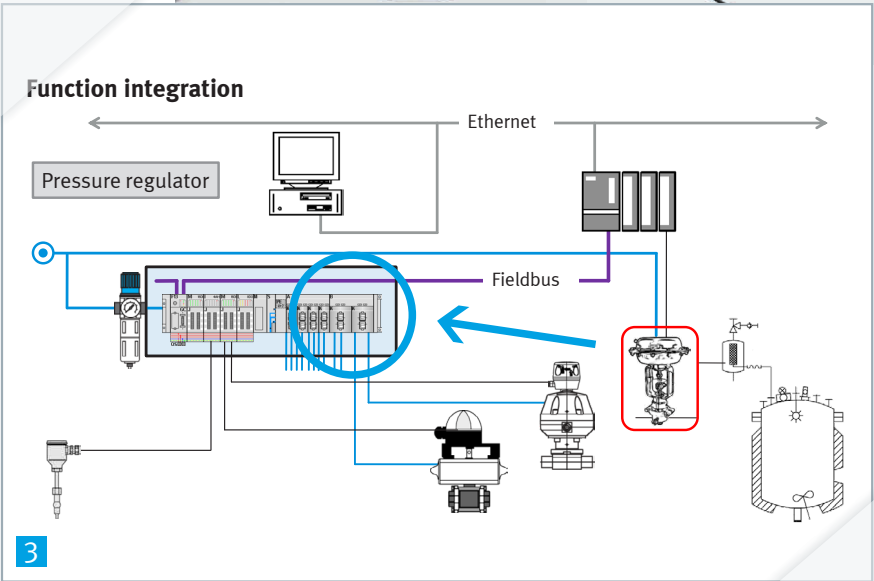
When we jointly tested whether our proportional valve would meet all the requirements for use in the process. It quickly became clear that the advantages were and are huge. But it was also new.

Phase 1: Engineering or how something new emerges from trust and competency.

Engineering also means including the customer in the development process. In order to find the best solution together, experts from the most different departments work together.



A first P+I chart is produced.



The picture shows the old setup. Traditional control valves and flow meters installed near the reactor, in explosion protection zone 1 or 2. In the new solution, the components are installed decentrally in a control cabinet outside the explosion protection area. This saves valuable space in the cleanroom and enables the use of a compact and low-cost technology based around proportional pressure regulators.

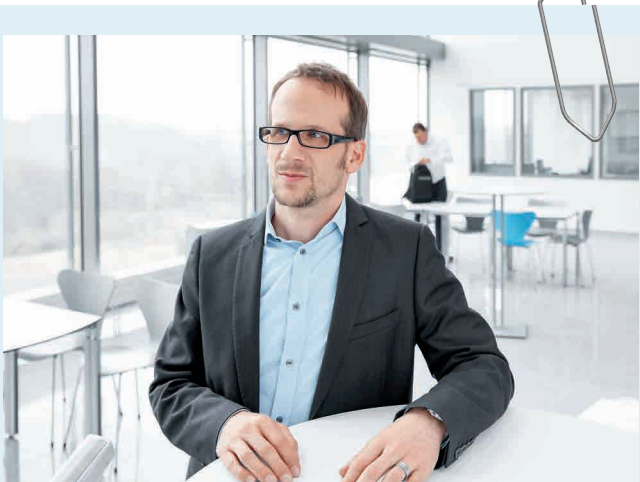
The theory results in a prototype and an initial test setup in a real plant. The conventional technology was switched off and the new technology integrated in the existing plant.



The engineering phase at a glance:

Productivity and production costs are already determined during the engineering phase. An intensive engineering process with Festo has many advantages:

- The early definition of an efficient solution.
- The ability to set standards right at the beginning of the project that lead to smooth implementation and lower operating costs.
- The intensive exchange with developers and application engineers saves you time and reduces your own development costs.
- Coordination by Festo, building on the results of the engineering process, simplifies the subsequent cooperation with all other partners. These advantages hold true regardless of the customer's location in the world, even for cross-border projects.



Matthias Dreher has worked in the Process Application Management department for over four years and is an expert on integrating field components in control systems.

➔ What was special about this project from an engineering point of view?

The very close cooperation with the customer. Specifically, the collaborative engineering approach was remarkable. We didn't just run tests here at Festo under laboratory conditions, but also at a very early stage on site with the customer in a comparable plant.

➔ How did that go?

The conventional technology was switched off on site, and the new inert gas station connected and tested. This work was also done as a team with the customer. This is because collaboration is the only way to work out the sticking points in the application. The customer is familiar with the process engineering sequences and the precise requirements for the regulation technology.

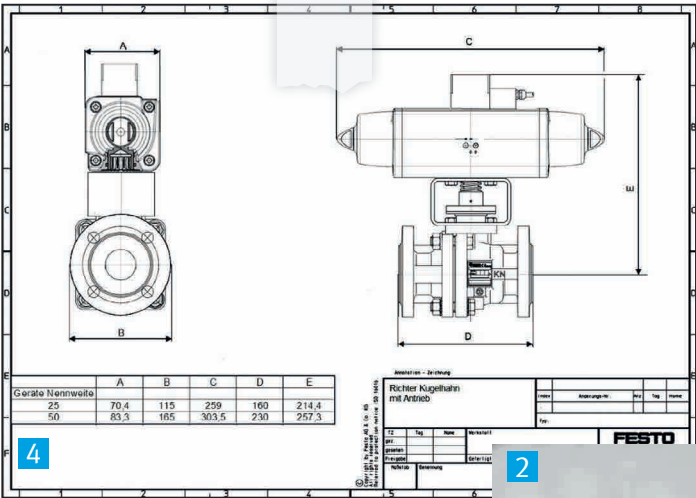
Here is what Boehringer Ingelheim has to say:

“ My clearest memory is our first visit to Festo in Berkheim. The setup and the results they presented were very convincing and made us want to continue to pursue this approach. ”

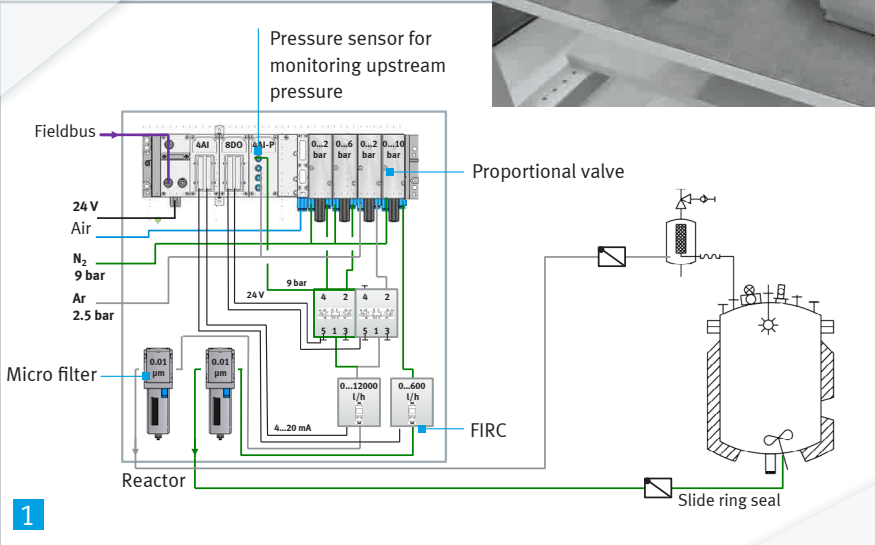
Phase 2: Procurement or how to get everything from a single source and keep the project under control.

Following the successful test, other starting points for the cooperation were discussed. The solution based around decentralised control of the components suggested the complete delivery of ready-to-install, standardised control cabinets both for the reactors and for the centrifuges and compartment dryers **1**. Boehringer Ingelheim also tasked us with project planning and procurement of the quarter turn valves for the plant **2**. The plan was to use the same quarter turn actuator and a consistent valve control for all ball and butterfly valves **3**. Boehringer Ingelheim also wanted CAD drawings of the complete process valves in order to be able to conduct the collision test for construction of the pipeline **4**.

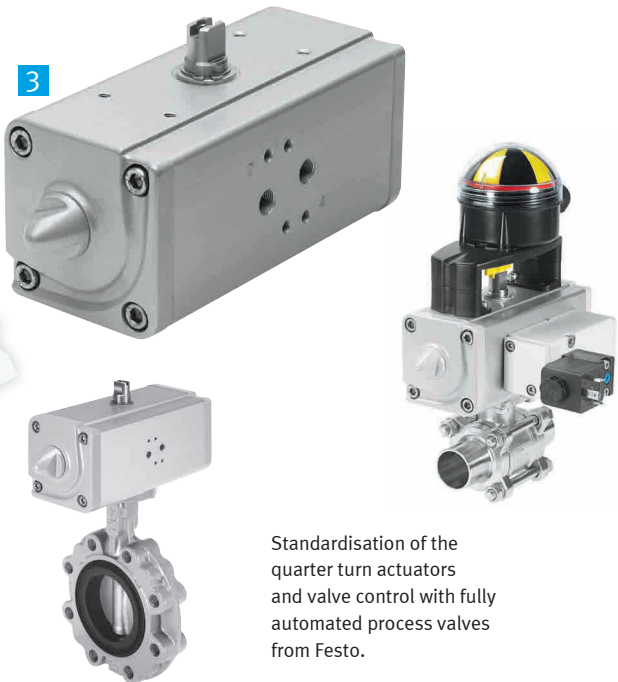
All in all, approx. 200 quarter turn valves from several manufacturers were installed. For each process valve, the actuators were sized based on the required torques including the specified safety factors. The mounting adapters were defined and a 2D or 3D CAD drawing of each process valve prepared. This made it easier to test the installation conditions in the pipeline in CAD. The advantage of this is that all pipes were installed as planned during the actual installation process. All the technical documents for the customer were uniformly edited and handed over as a single package.



Ball valves and butterfly valves from different manufacturers with quarter turn actuators DAPS from Festo and electric position transmitters for explosion protection zones 1 and 2. The goal was to standardise the automation of the quarter turn valves in order to greatly simplify spare parts availability and servicing during operation of the plants.



Procurement is more than purchasing components. It includes the transfer of the technical solution and the engineering of a compact inert gas station in the control cabinet by Festo. One item number per control cabinet instead of 1,000 individual components. Assembly, factory acceptance testing and delivery of 12 ready-to-install solutions.



Standardisation of the quarter turn actuators and valve control with fully automated process valves from Festo.

The procurement phase at a glance:

Procurement ultimately describes the responsibility of bringing together all the dimensions of a project. The keyword here is “everything from a single source”. Festo guarantees this through:

- Products as well as special and complete solutions ranging from standard pneumatic components through to ready-to-install, customised solutions, control cabinets and process valves that deliver greater process reliability through maximum standardisation.
- Coordination, including for international activities, thanks to the tight-knit sales and service network at 250 locations in 176 countries.



Alexander Kelm, Project Management Components PA Europe. Or, to put it another way, the “source” in the promise “everything from a single source”.

➔ What was your job in the project with Boehringer Ingelheim?

Once the engineering phase was successfully completed, we were tasked with taking over handling of the entire package for the quarter turn valves. In other words the quarter turn actuators, the compressed air fittings, the process valves and position transmitters. The aim here was to reconcile the external process valve manufacturers as well as the internal departments at Festo.

➔ How did you imagine this?

A bit like building a house, where the different trades have to be coordinated together. For example, procuring the quarter turn valves from multiple manufacturers was a project in itself. Getting quotations, checking them, costing and coordinating, combining specifications and project controlling. Then we had to coordinate assembly all the way through to on-schedule delivery. With around 200 process valves of different designs and sizes, at times we felt like those circus performers trying to keep all the plates spinning. But we managed it!

Here is what Boehringer Ingelheim has to say:

“ Everything from a single source wasn’t just a hollow promise, it saved us lots of time and our own resources. Festo handled the coordination of the different process valve and component suppliers in this project. The result was the delivery of ready-to-install inert gas stations and process valves instead of thousands of component parts. ”

Phase 3: Installation or how connect something so it all links up successfully in the end.

The installation phase at a glance:

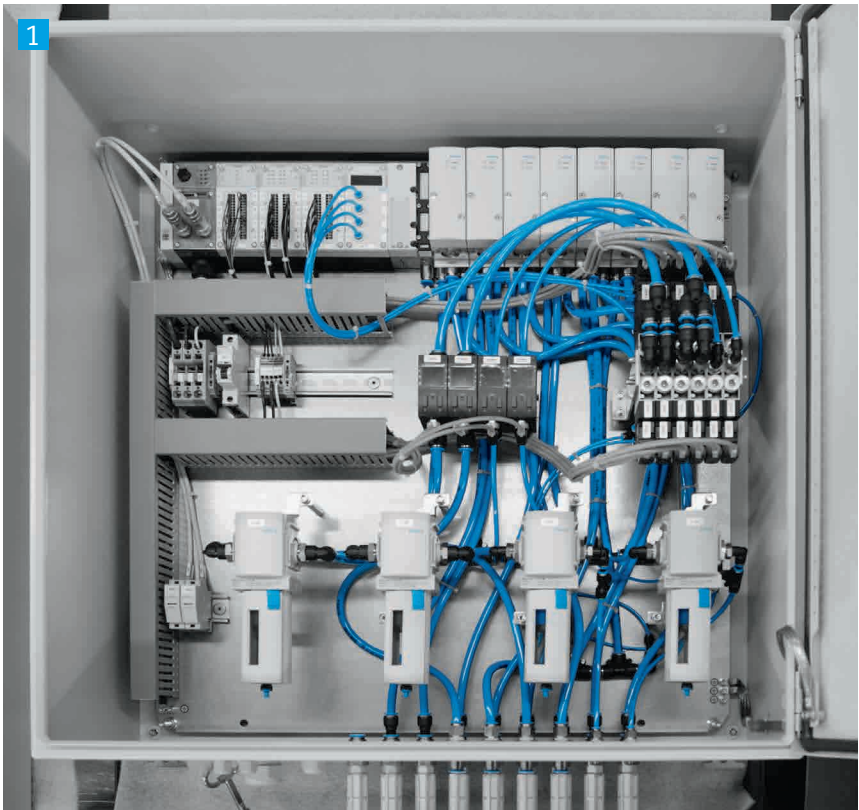


2

The proportional pressure regulator VPPM is fast, flexible in its applications and precise. Its decentralised installation meant there was no need for expensive explosion protection measures in the equipment corridor. It is available both as an individual component and as a module for the valve terminal MPA. It displays its full strengths when used in conjunction with the electric automation module CPX:



The installation phase was made much easier by the procurement of ready-to-install inert gas stations **1** and process valves from Festo. All the inert gas stations and valve terminals **2** for actuating the process valves have an identical design and underwent a factory acceptance test after assembly. The same goes for the fully assembled quarter turn valves **3**. All measures that greatly speeded up installation and integration in the control system and reduced costs.



A glimpse into the control cabinet. It was designed as a ready-to-install solution, in other words pre-assembled as a whole, which guaranteed faster and more reliable installation.

- A comprehensively and precisely planned installation phase saves time and money. Benefit from
- the Festo plug & work solutions that guarantee quick and easy installation on site,
 - factory acceptance-tested and ready-to-install products. Standardisation reduces the projected time requirement for qualification of the plant and validating the processes.

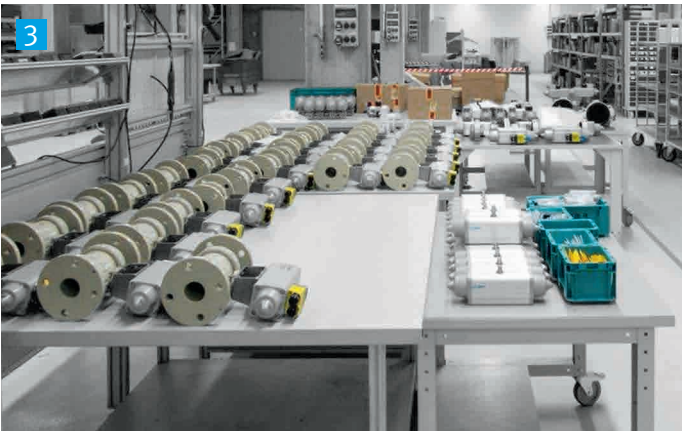
→ Easy to install

- Instead of installing control valves directly in the pipeline at the reactor, the proportional valves are mounted on the valve terminal in the control cabinet.
- The compressed air is supplied internally via the valve terminal or via separate gas lines in the control cabinet. This means there is no need to lay tubing in the field.
- The electrical connection is established via the internal power supply for the valve terminal.
- Actuation takes place via the bus node on the CPX and the internal bus of the valve terminal. And up to 12 proportional valves can be integrated on one terminal. There is no need for a power supply or signal cables using 4-20 mA technology. One bus cable is enough for the whole valve terminal.

→ Diagnostics

- Multi-sensor control through integrated pressure sensors and PID controllers for optimum control results and characteristics. A useful feature is temperature compensation, which means no pressure drifting during temperature changes.
- The VPPM reports the pressure reached as an electrical signal. If the setpoint values are not reached, this is also diagnosed and reported. Integration on the valve terminal CPX-MPA enables convenient remote control and monitoring of all the values.

Regardless of the quarter turn valves design you need and how you want to automate them, we supply you with the complete unit, already assembled and tested.



Here is what Boehringer Ingelheim has to say:

“ The inert gas stations in the control cabinet designed during the engineering phase were shipped ready for installation. Alongside other measures, this meant that we didn’t need as much time for installation as originally estimated. ”

Phase 4: Commissioning, or the day everything and everyone has been working towards.

The new Technical Centre for active ingredients was opened **1** + **2** and commissioned **3** in December 2014, around two and a half years after the first stone was laid. Commissioning was made much easier by the excellent software support provided by Festo. Driver modules **4** ensured seamless integration in the PCS7 control system from Siemens. A total of 52 valve terminals for inert gas regulation and actuation of the process valves were connected to the control system via PROFINET nodes. The provision of these driver modules as well as the active support on site **5** helped to keep commissioning on schedule.



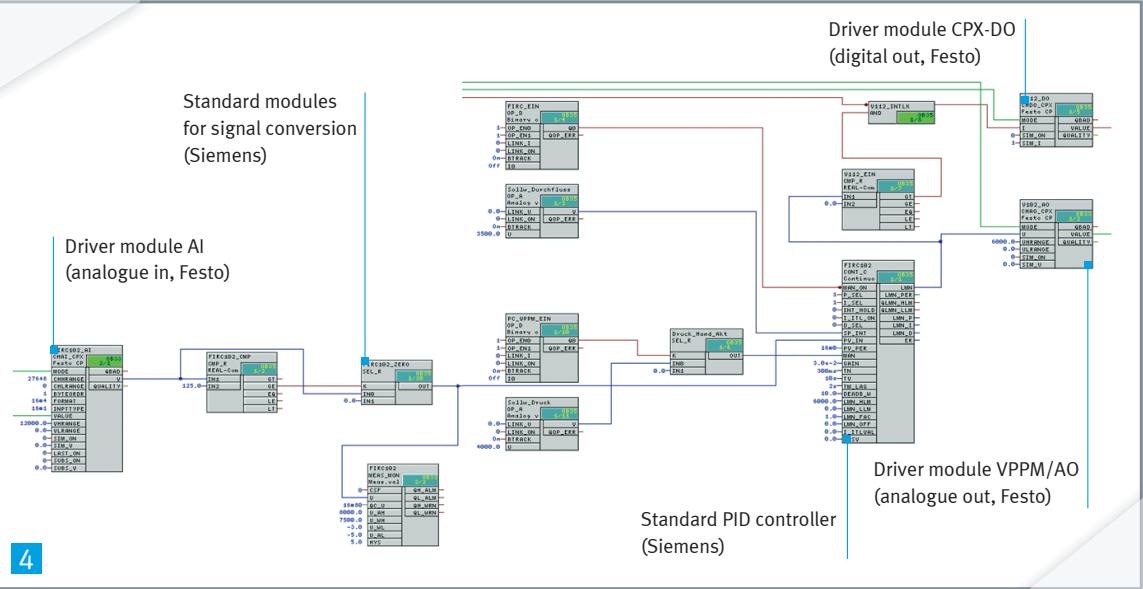
The new K62 Technical Centre at Boehringer Ingelheim in Biberach.



Present at the opening of the new Technical Centre:
Dr Rainer Soyka,
Prof. Dr Dr Andreas Barner,
Christian Boehringer, Peter Friedl,
Dr Fridtjof Traulsen, Roland Wersch, Norbert Zeidler
(from left to right)



Matthias Dreher was responsible for the successful integration of the inert gas stations in the process control system.



An extensive library of drivers is available for integrating the valve terminals and the electric terminal CPX as well as the valve terminals based on them in the PCS7 control system from Siemens. The rack and module drivers are automatically integrated in the system and interconnected by the control system software. The programmer doesn't need to do anything. The driver modules can be downloaded free of charge.



Article taken from the "Schwäbische Zeitung" dated 5.12.2014

The commissioning phase at a glance:

The ultimate goal is quick and reliable commissioning of the plant. Festo supports you by

- reducing complexity without loss of function thanks to flexible and modular valve terminal technology,
- providing freely downloadable driver modules for integration in different control and bus systems,

and

- offering expert training to ensure reliable and efficient operation right from the start.

➔ Is commissioning always a knife-edge?

Of course, you have to honour all the promises made to the customer. The theory doesn't always reflect the reality on site. For example, the software that was written in an office has to be adapted to the actual behaviour of the plant on site.

➔ Were there any complications?

Actually there was one unexpected behaviour during the commissioning process. Since the proportional valve technology requires the control circuit to be programmed in a different way than with conventional control valves, we did have to match the functional description and the implementation in the controller software. Luckily, we were able to correct this on site with some quick and effective cooperation.

Here is what Boehringer Ingelheim has to say:

“What really remains etched in our minds is the personal commitment of the project team. In each phase of the project, we felt that everyone involved was completely invested in its success. For us, this was the difference between being just a supplier and being a partner.”

Phase 5: Operation and on-site service or how the close cooperation during development and project engineering becomes an advantage during daily use.

When the plant is commissioned, the ideas and solutions have to prove their worth in daily operation. Our deep understanding of the complexity of the task and the continued very personal support and services also guarantee high plant available and reliable process for the customer during operation.



24-hour emergency service from Festo.
We're here for you 365 days a year.



The on-site service from Festo.
One call and help is on its way.



The Energy Saving Service from Festo.
For energy-efficient and environmentally responsible operation.

Operation and maintenance phase at a glance:

High system availability and reliable processes are guaranteed in the long term by the comprehensive operating and servicing support provided by Festo. Festo guarantees

- lifelong support for your plants,
- worldwide availability of spare parts,
- support for modernisations and upgrades,
- comprehensive advice and services for further optimising process and operating costs.

The advantages during operation at a glance:

→ Few spare parts

Standardisation of the components both for valve automation and for the pneumatic quarter turn actuators means fewer spare parts in stock, lower training costs for the operator and less servicing complexity.

→ 24-hour emergency service

As a registered customer of the 24-hour emergency service provided by Festo, you receive those standard parts you desperately need within just a few hours by express courier service without any waiting times. The Festo 24-hour emergency service is there for you 24 hours a day, 365 days a year.

→ Our on-site services – always there for you when you need us.

Whether commissioning, troubleshooting and fault clearance, replacement of components, installation, modification, product training and much more, one call is all it takes.

→ Energy Saving Services – reduce your operating costs

By this we mean an integrated concept for optimising compressed air systems for energy-efficient and environmentally responsible plant operation. We determine your potential savings and assist you in the planning and conversion of energy-relevant optimisation measures on site. We ensure your energy savings will be sustained in the long term both through safeguarding measures and by training your staff (not part of this project).

The Boehringer Ingelheim/Festo project or how engineering and coordinated activity in all project phases can deliver a more efficient production plant.

The plant at Boehringer Ingelheim in Biberach has been running for several months. We are now on the other side of an intensive process, which **1** you have read about on the previous pages. We have given you an insight into how complex tasks **2** can be successfully solved through structured and standardised process sequences, automation competency and personal commitment. We look forward to also contributing to the success of your future projects **3**.

2 → The task

To create and maintain an inert atmosphere in the process tanks, centrifuges and compartment dryers in order to increase the reliability of the plant and the processes. This is generally done using nitrogen and argon. Depending on the process step, the inert gas is regulated by means of pressure or flow rate.

1

The project team at Festo for Boehringer Ingelheim



→ The requirements

The following functions are required to guarantee this:

- Inertisation, i.e. complete replacement of the contained gas volume (unregulated, high flow rate)
- Pressure blanketing (pressure regulation e.g. at 40 to 100 mbar)
- Flow regulation of the unpressurised tank (closed-loop flow control, low flow rate)
- Material transfer (pressure regulation)

→ The challenge

The previous plant required separate lines (e.g. 40-100 mbar, 2 bar and 9 bar) with control valves and flow meters for each pressure stage and each gas for these process steps. The objective was to increase the functionality and flexibility of the new plant.

→ The solution from Festo

The use of proportional valve technology provided an interesting alternative for regulating inert gases in process automation.

→ The advantages

Proportional valve technology delivers the same accuracy as the existing technology, but the level of installation and investment required is lower. Building an inert gas station in a compact control cabinet saves space and simplifies access to all process components. Integrating the proportional valves in the valve terminal reduces the installation effort required, makes it easier to connect to the control system and increases diagnostics options.

3



Jürgen Weber, Head of the Process Automation (DE) industry segment

“ The close cooperation with the customer, the open-mindedness everyone brought to working on this new solution and the opportunity to be able to apply our know-how to engineering, procurement, installation and commissioning were critical for success. ”

**You are looking for a partner who understands your objectives.
You require more efficient production facilities.
We are your solution for automation.**

**→ WE ARE THE ENGINEERS
OF PRODUCTIVITY.**

For further information:

→ www.festo.com/process