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To transport the coke drums special equipment is needed.

PROGRESS THROUGH STANDSTILL

Installation of new measuring, regulation and control technology in a hurry —

Downtime in Germany's largest refinery is expensive and still necessary for recurring TÜV inspections. Reliable planning, good preparation and high flexibility during the implementation phase itself are required by the companies involved in the changes. The exchange of coke drums is a good example of this.

DIPL.-BETRIEBSW. (FH) EVELYN LANDGRAF*

In the coker of the Oberrhein mineral oil refinery (Miro—company box 1) heavy residues from crude oil distillation are further processed (cracked) and lighter products such as gasoline and diesel are thereby obtained. This

process produces coke as a by-product. The coke drums (cylindrical containers over 30 metres high), where these processes take place, have been in use for 35 years and have been subjected to considerable loads. Every 16 hours, one

of the special steel tanks is heated up to 490 °C and then cooled down again. These extreme temperature fluctuations demand a lot from the material. To ensure reliable production, the coke drums had to be replaced in early 2018. For this pur-

pose, the refinery used the shutdown planned for the regular TÜV inspection.

But the mechanical exchange of the coke drums is a challenge. Transported by ship over the Rhine adjacent to plant section 1, the 400-tonne steel cylinders were brought to their final position in the coker steel framework with a special crane and secured with bolts and nuts. This was followed by the electrical connection and the installation of the MCR technology. The planning of this demanding task (electrical engineering and MCR technology) was carried out by the automation experts from Rösberg. The company, headquartered in Karlsruhe, maintains its own office on the factory premises of the refinery. As part of their project work, the local employees help ensure that the plant's MCR technology runs reliably, but also help with complex new buildings or conversions. Engineer Adnan Basic is Lead Engineer of Process Automation at Rösberg and was responsible for project management in this case. He explains the key challenges: "Making such complex changes in an existing plant is anything but easy. In addition, the safety control we have upgraded is very complex, with many interlocking components. And finally, much of the work had to be done in a very limited time frame. Of the six weeks, we only had about two, as we first had to wait for assembly before we could test the interplay of field devices, instrumentation and control technology."

Meticulous Planning

The planning for the complex project therefore began immediately after the project was awarded in mid-2016. Then there was the planning of the dismantling process as well as the new installation. The automation experts have benefited from the fact that Miro has been using the I&C-CAE system Prodok from Rösberg for years (see technical box). They were able

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Source: Rösberg

"It was a challenge in the extremely short time span that was still available after the mechanical conversion to make such extensive changes to an existing plant and to adapt the complex safety control."

ADNAN BASIC
RÖSBERG

"It was also our task to adapt the existing safety control to the new processes and the necessary fittings."

SASCHA WIPPERT
RÖSBERG



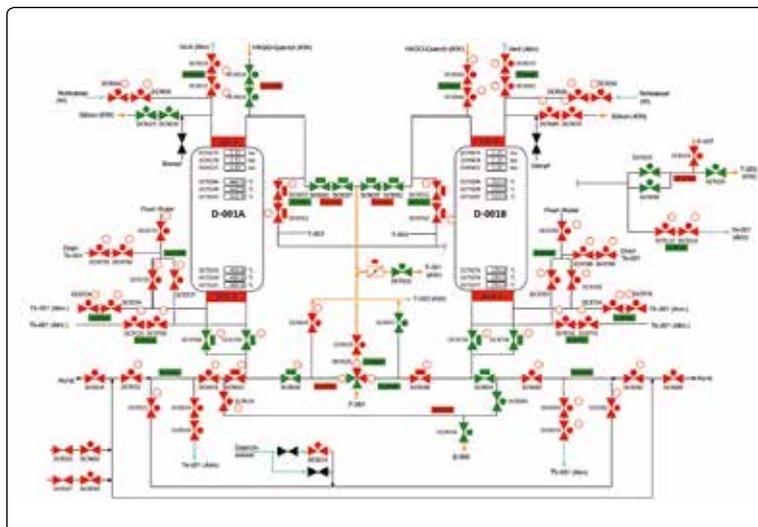
Source: Rösberg

to use their in-house tool for electrical and MCR planning, which enables an integrated planning process based on uniform rules for plant replanning, starting with basic and functional planning through to execution and assembly planning. In addition, the tool also supports further operations, including change and supplement planning as well as company support. With these good planning requirements and the extensive documentation, the actual conversion could be well-prepared. Everything that could be prepared

beforehand, of course, was already done and so the extremely short time window was really only used for the necessary on-site measures.

Upgrading Safety Control

But not only the hardware had to be well planned and installed correctly. In order for hardware to do what it needs during operation, the right control technology is necessary. In the course of the coker exchange, the plant operators wanted to make some procedural changes for process optimisation.



Source: Rösberg

Simulation of the field level in order to be able to test the software extensively beforehand and to train the system operators in advance.

This required additional fittings and consequently also an additional control cabinet with the necessary I/O slots. Therefore, an adaptation of the existing safety control to the new requirements was necessary. B.Eng. Sascha Wippert, Automation Engineer of Process Automation at Rösberg, was in charge of this adaptation. He reports: "In 2012, we implemented an interlock system, i.e. a locking and release concept of the fittings used, with the aid of a Hima safety controller. Now it was necessary to adapt this control system to the new processes and the necessary fittings."

Success Through Simulation

Because the commissioning of the control software was only able to start after complete installation of the new coker, all electrical cables and fittings, etc., time was running extremely short. To ensure that everything could run smoothly, the software was extensively tested in advance in a simulation. Implementing the field level simulation alone was an extensive project. Wippert recalls: "After all the procedural adjustment requirements had been determined in the planning phase, we received the specifications for the control software and were able to start development relatively early. So in October 2017 we were ready to test the new software extensively in the



Oberrhein mineral oil refinery (Miro) is the largest German refinery.

Source: Miro

PROCESS-Tip

Meet the experts of Rösberg at **MSR-Spezialmesse Südwest** in Ludwigshafen on September 18th.

simulation." During a seven-day functional test in the plant simulation, the automation experts, together with a number of plant operators, examined the reaction of the plant to various input parameters. With the findings from the tests the control software was then adapted accordingly. Many problems with the actual commissioning could be avoided in advance. During the transition itself, the software developers then had to show flexibility. Wippert reports: "Since many processes were completely redeveloped, commissioning was of course an exciting time. For the past ten days, my colleague or I have always been there to provide the necessary support around

the clock and to make adjustments to the software as needed. In fact, there was always work for us to do. However, it was not about fundamental changes to the sequencers, for example, but mostly about re-adjusting individual process parameters."

Two Birds with One Stone

However, the elaborately developed simulation not only enabled a smooth commissioning process, but also safe operation from day one. Because with it, the employees could be trained already before the commissioning.

The fact that the last on-site measures and commissioning worked out so well had to do with the good planning and the simulation as well as the fact that the Rösberg employees working on the premises are very familiar with the plant and its processes. However, they cannot handle projects of this complexity alone. Here they have the added benefit of being able to call in their colleagues from other locations. The necessary manpower is more of a superficial concern. Above all, it makes it possible to put together a powerful team that has the necessary qualifications for the respective project. These include, for example, automation engineers (basic planning), detail planners, engineers for control software (Siemens, Hima), junior engineers as support for the extensive test activities and much more.

PLT-CAE-System Prodok

CONSISTENT DATA ENSURE AN INTEGRATED PLANNING PROCESS

Modern process plants can only be operated effectively if the data from the planning phase is also available for operation, maintenance and modernisation. System reality (as-built) and documentation must be consistent. Only when all data is consistent can costly re-entries and unnecessary engineering effort be avoided. This is where the I&C-CAE system Prodok comes in. It ensures an integrated planning process according to uniform rules. Because all data is gathered and exchanged in the same system, there are no more annoying data transfer errors. The functions include basic, functional, execution and assembly planning for new planning, change and additional planning as well as the operational support. This supports the complete life cycle of a system. With its continuous and consistent documentation, Prodok ensures that the system reality is reflected in the documentation at all times. Noticeable improvements in quality and efficiency and considerable time and cost savings are the result. Investment security results from the widespread use of the system in the process engineering industry and from the use of state-of-the-art software technology.