

ENGINEERING

Code Name Akoya

Converting a Japanese chemical process to European conditions is no simple feat. Indeed, Bayer Technology Services had to pull out all the stops for the Grillo-Werke in Germany, before everything worked properly. The result is very convincing – a veritable pearl, in fact.

The prescribed pipes made from ordinary steel were out of the question for this project,” says Günter Möwius, shaking his head. Among other things, they were too prone to corrosion for the conditions at the site chosen for construction. “Despite the thick-walled steel, another protective coating would be necessary, which was why we wanted to use stainless steel pipes.”

In the European chemical industry stainless steel pipes are absolutely nothing out of the ordinary. On the contrary, they are considered the standard. However, they can become a problem, for instance, if a facility is being built under license. Or if the licensor is located in Japan, where the customary “simple” steel pipes are stipulated instead of the stainless steel version. With every deviation from the specifications, subsequent warranty claims made by the licensee are at stake.

This is exactly happened with the project that Günter Möwius managed for nearly three years on behalf of Bayer Technology Services. It involved the construction of a facility for the production of dimethyl ether (DME). The customer was the Grillo-Werke, located in Duisburg, Germany. DME is an intermediate that is mainly required for further processing into dimethyl sulfate. Until now, Grillo had purchased the chemical. Having the company’s own production would reduce its dependence on suppliers and market fluctuations.

The Grillo plant in the Hoechst Industrial Park in Frankfurt was chosen as the site for the planned facility. For this purpose the company had obtained a license for the process, and thus also for the plant itself, from the Mitsubishi Gas Chemical Company and JGC Corporation in Japan. As a tribute to its Far Eastern partners, Grillo gave the project an appropriate code name: Akoya, for a particularly beautiful type of cultured pearl, mainly found in Japan.

Round, a flawless surface and exquisite luster – these are the qualities associated with Akoya pearls. Unfortunately, the project itself did not proceed as smoothly and brilliantly at first – also

because of the very exacting specifications from Japan – for instance, for the facility design and the materials to be used.

The problem with the steel was just one of many issues that caused Möwius and Grillo’s Project Manager Dr. Oliver Groß headaches. “The Japanese have, for example, rotary pumps with 14,000 rotations per minute, however, these are not commonly used in European chemical facilities,” explains Möwius. But what happens when you simply use the standard pumps for Europe with 3,000 rotations? This was just one of the many questions that had to be addressed.

The team from Bayer Technology Services eventually decided to eliminate some pumps completely – in those locations where the system pressure of the facility was sufficient to cover the necessary flow pressure. Furthermore, the team

Versatile DME

Dimethyl ether (DME) is an important intermediate for the synthesis of dimethyl sulphate (DMS). Among other applications, Grillo’s customers use DMS for the manufacture of tensides, which are found, for example, in fabric softeners. DMS is also known as a so-called methylating agent for the chemical syntheses of, for instance, active ingredients used in crop protection products. However, Grillo also markets some of the DME that it produces directly to customers. The main users are manufacturers of spray cans for cosmetics. DME is a preferred propellant because of its low boiling point.



Akoya pearls are real gems – perfectly round and smooth. And this is exactly how the joint project between Grillo and Bayer Technology Services was expected to run.

in Germany wanted to make changes to the design of the distillation columns as well as to some of the more than 20 heat exchangers. Because of the stainless steel pipes, these had to be modified anyway. The punch disks used to regulate the flow of liquids and gases through the pipes under high pressure were another issue. Here, too, the engineering team members developed their own designs. The colleagues from Technology Development always helped with these kinds of decisions. They made calculations for many of the apparatuses, thus testing the feasibility.

“Because of the later warranty, we had to have each of these changes approved by our Japanese partners,” explains Mōwius. What sounds like a formal act was in reality an extremely challenging task, for example, when it came to the materials and the piping components. “Japanese pipe classes are often not identical with those in Europe or the U.S.,” says Mōwius.

And then there were also the language and cultural challenges that had to be overcome. Mōwius refers to the intercontinental communications as “time-consuming”, while Groß calls them “stressful”. One team colleague described the de-



“It was impressive how the colleagues from Bayer Technology Services identified with the project and truly made this undertaking their own!”

Dr. Christian Ohm, Board Member of the Grillo Werke AG responsible for the Chemicals and Zinc Oxide Divisions

viations in the license process as a “balancing act”. Perhaps it was this very delicate balancing act that bonded the colleagues from Grillo and Bayer so tightly together from the beginning. In any case, both sides are full of praise about the particularly close, as well as pleasant collaboration.

In the end everything worked out well. The Japanese granted permission for all the modifications, and the facility was eventually built in line with the engineering of Bayer Technology Services. Just three days after the plant went on stream, it delivered what is called “premium quality” in technical jargon. Oliver Groß still recalls the emails he received late in the evening of September 27, 2012: “3 tons produced. Gas chromatography: everything in accordance with specifications.” “The fact that it went so quickly was actually a big surprise for me,” Groß admits. The satisfaction was even greater as it was the first larger investment project of his career.

Of course, the smooth start-up of the facility without any teething problems did not come of its own accord. The experienced team working with M \ddot{o} wius had prepared everything down to the last detail and paid careful attention to a whole range of things. For example, there was the meticulous pre-cleaning of all parts of the facility. “The more thoroughly this is done, the purer the product will be from the beginning,” says M \ddot{o} wius.

Another important factor was the good preparation of the Grillo personnel at the Frankfurt plant. When Grillo considered sending some of its staff to Japan to be trained there, an Operator Training Simulator (OTS) was suggested. This is a software that simulates processes in a facility so realistically that when they are shown on a computer monitor, they cannot be distinguished from the process control system in a production control room (see also *technology solutions* 1/2012, page 20 f.). An OTS is thus the perfect basis for realistic dry runs, without having to start-up a reactor or pump in any liquids. In the end M \ddot{o} wius’s colleagues from Operation Support & Safety developed a customized OTS for the DME facility. And as a result, the Grillo employees in Frankfurt had completely mastered the control of their new facility long before it was even commissioned.

And that was not the only special service. During the course of the project Bayer Technology Services offered over and over again solutions for which Grillo had never originally considered Bayer. Take, for instance, when it came to a process analyzer technology container for quality control and wastewater monitoring. Or another example was when they needed support for a safety concept. After all, DME is an easily volatile and at the

Dr. Christian Ohm, Gabriele Grillo and Ulrich Grillo (from left; all representing Grillo) cut the ribbon to mark the commissioning of the facility for the production of dimethyl ether. That Japanese know-how could be used in Frankfurt is also thanks to Bayer Technology Services.





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Günter Möwius, Project Management & Engineering Chemicals, Bayer Technology Services



same time highly flammable substance. They also helped with the quality control of the delivered plant components, which became particularly interesting when a pipe sprang a leak during commissioning despite all the testing prior to the start-up. An expert from Bayer Technology Services found the fault in a longitudinal welding seam resulting from a fabrication error. After this same fault was discovered in several different places in the facility, all of the installed pipes from the same delivery batch were eventually replaced. It was only possible to rectify this problem within such a short time because of the painstaking construction site documentation.

“It was really an all-round carefree package,” as Oliver Groß summarizes the service provided by Bayer Technology Services. The project manager, who is also the Head of the Grillo Sulphate Division, also liked the fact “that everyone in the team fully identified with the project”. From Bayer’s viewpoint, this is completely self-evident and also has an official name: owner’s engineering. As Möwius sums it up: “We represent the interests of our customer, find solutions and accompany planning and construction up to the commissioning of the facility – and often beyond.”

The process engineer has worked at Bayer for 30 years. He has experienced many projects in this time, most of which he also managed. However, the Grillo cooperation was special for him. “We were a real team, and nobody differentiated between ‘them’ and ‘us.’” Groß also stresses how much they “were on the same wavelength”. The many evenings spent together after the project work no doubt helped – for instance, during visits to Japan.

Talking about Japan, despite the many modifications, the Japanese licensors were also very satisfied with the end result. Several representatives from Mitsubishi and JGC attended the successful production start-up in Frankfurt and tested the flawless operation. Marking this outstanding joint accomplishment, both German and Japanese flags flew high over the 38-meter facility.

The plant produces DME with a purity of 99.99 percent and thus in a higher quality than the 99.9 percent guaranteed in the license. This too is a result that pleases the experts at Grillo. Oliver Groß is equally impressed that Bayer Technology Services did not immediately abandon the camp, but continued to be available after the facility was commissioned. Among other things, the chief technician employed by Bayer helped to set up a service logbook, which will come in handy later for planning or when carrying out turnarounds as well as for maintenance and revision activities. For Bayer Technology Services this added assistance is simply part of the package!