Small causes, big effects:

50 percent OEE increases through comprehensive production analysis

Those who invest in new equipment want significant improvements and a fast return on investment (ROI). If this does not work as expected, an OEE assessment often helps – as it did for a leading global manufacturer of blood plasma products

This long-standing Körber customer is pursuing a sustainable growth strategy. Integral to this strategy is the allocation of resources toward advanced manufacturing and quality control equipment, such as high-performance automatic visual inspection (AVI) systems.

Körber's VI-60 stands out as a leading AVI system in the industry, frequently earning consideration for streamlining inspection procedures in pharmaceutical and biopharmaceutical production. Following an assessment of the post-purchase performance data, concerns emerged as the throughput and the anticipated time and workforce efficiency did not meet the initial expectations. It was only natural to turn to Körber with this problem, for Körber had not only supplied the machine but, as a leading global expert in pharmaceutical technologies, also provides extensive consulting know-how for process optimization. Körber's proposal entailed a comprehensive examination and assessment of the OEE (Overall Equipment Effectiveness).

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At a glance

Challenges	Solution	Customer benefits
• Fully automated visual inspection (AVI) is expected to increase throughput and reduce manpower • **Output was too low,** OEE was only 52 percent • False reject rates (**FRR**) were significantly **too high** • Previous efforts to optimize the process had proven **unsuccessful**	• **Comprehensive on-site OEE assessment:** analysis of the entire process from manufacturing to infeed and outfeed of products to AVI to necessary reinspection and rework • **Clear optimization recommendations to the customer**	• **Pointing out optimization potentials in numerous areas** (product handling, process design, software integration, organization) • **First improvements immediately measurable** • **OEE increase of approx. 50 percent** expected after implementation of key recommendations • Körber offers **AVI, technology, and process expertise, short communication paths and direct influence** on plant development

Comprehensive OEE-Assessment

“The machine only achieved about half of its theoretically possible maximum output, and the false reject rates were clearly too high,” explains Thorsten Mack, Head of Qualification Services in the Consulting business unit of the Körber Business Area Pharma. “Customers often assume that something is wrong with the machine. But we take a close look at all relevant aspects of its use: technology, production environment, processes, and people.”

To track down the causes of the underperformance, the Körber experts conducted a comprehensive OEE assessment. Overall Equipment Effectiveness is a method for assessing the efficiency of a system, where it systematically compares the theoretically achievable performance within a specified time frame to the actual performance in terms of availability, process performance, and quality. Within these dimensions, various types of losses may occur that diminish the overall performance. These losses encompass downtime, both planned and unplanned, which affects availability, delays or interruptions that impact process performance, and reject rates and necessary rework that influence product quality. It’s important to note that not all losses can be entirely prevented, and an OEE over 85 percent is an excellent value in the process industry. With the AVI system in question, however, the OEE was just 52 percent.

What could have caused this?

“The reasons can only be found out by closely observing production on site,” explains Thorsten Mack. “This includes, on the one hand, analyzing all the steps in the actual AVI process from the time the product enters the clean room to the time it is discharged, but also examining the product manufacturing processes themselves.”

Rejection rates too high (FRR)

First, the Körber consulting experts looked at the components upstream of the AVI. The palletizer worked at the expected speed, as did the VI-60. The first problems became apparent during transfer to the buffer table: dust on the vials and bubbles in the product. These led to many vials being sorted out as faulty at the AVI; an average of 33 percent had to be inspected twice and almost 20 percent then still went to the slower, semi-automatic inspection.

A closer look revealed more than one cause for this: The guiding rails at the inlet to the AVI system were made of aluminum; friction with the glass produced particles that settled on the vials. Moreover, the vials themselves were in frictional contact with each other, partly because the feed angles were set too steeply. This resulted in bubbles in the product, abrasion on the glass, and thus particles that contaminated the camera systems and led to incorrect evaluation information.

In addition, vibrations and abrupt stops caused foaming. This made it difficult to clearly determine whether there were particles or air bubbles in the product and forced repeated inspections of the vials.

Thus, essential causes for the low throughput had already been found: The AVI machine itself was operating at the specified 180 vial inspections per minute, but the deficiencies in the infeed increased reject rates and the number of unnecessary reinspections.

Interruptions and delays

Further investigation revealed that the inspection process ran slower than expected due to both process design and organizational issues. These interruptions were only evident after continuous on-site observation over several days.

“On the second day, it became apparent that the system was productive well over 90 percent of the time for the first batch. But for the second batch, more than 40 longer or shorter interruptions occurred,” Thorsten Mack quotes from Körber’s records. “For example, palletizing had to be stopped several times because vials had fallen over. In addition, the AVI machine was stopped every 30 minutes to reset the monitoring – a configuration error that could be quickly corrected.”

Organizational potential for improvement was also found, for example regarding the setup or the shift changes. Interestingly, there were also clear differences between the two shifts – not only in throughput, but also in reinspection rates. One of the shifts consisted of less experienced employees, including the shift leader. When this team was on duty, the practiced procedures lost effectiveness, some steps were performed more slowly, and vial handling was not optimal. Mixing the teams with regard to the level of experience will enable a more efficient transfer of knowledge within the staff and a balanced shift operation in the future.

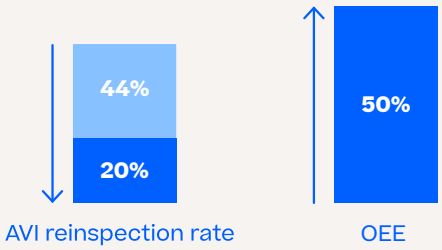
Recommened measures increase OEE by 50 percent

The analysis demonstrated, as is often the case, that the process should be optimized holistically to achieve a substantial increase in OEE and consequently, the production of flawless products. This holistic approach requires considering numerous factors, some of which might appear insignificant in isolation, but their combined impact can result in significant productivity losses. In doing so, many aspects must be taken into account, which are sometimes inconspicuous on their own, but which in their combined effect can lead to significant productivity losses.

Some processes had been optimized on previous machines but not yet adapted to the new plant. Some activities, such as the regular cleaning of the cameras, seem so trivial that they are not specially scheduled and are therefore sometimes forgotten. An external perspective revealed aspects that had become obscured due to routine familiarity.

The OEE assessment revealed a great deal of optimization potential, which the Körber consultants formed into clear recommendations. Implementing more accurate vial handling alone resulted in a nearly 50 percent reduction in the FRR (from 24.0 to 13.6 percent).

Additionally, it reduced the AVI reinspection rate from 44 percent to 20 percent. Even more significant improvements can be expected by reducing waiting times and mitigating optical interference through optimized transport routes for seamless vial intake and output, as well as more efficient cycling. The OEE experts estimate that these measures alone will allow three batches to be tested instead of the current two, which would **increase OEE by approximately 50 percent.**



The required investment is projected to be recouped within roughly nine months. If all the optimization potential shown was leveraged, including process design and organization, even more impressive improvements are achievable.

Efficiency from a single source

Of course, not all inefficiencies found can be eliminated. For example, the machines utilized in the facility are from different suppliers and feature varying interfaces that can impede the smooth transport of products.

That is why Körber's pharmaceutical ecosystem approach offers the possibility of procuring everything from a single source. Here, the customer's "Factory of Excellence" always remains the central focus. In addition to a comprehensive range of machines and systems for packaging, transport, inspection and tracking, Körber also offers market-leading software systems for optimizing production and the necessary process know-how for continuous optimization. Thanks to efficient internal communication, the Körber Ecosystem can mobilize experts from various internal and external business areas as needed to lead customer projects to sustainable success.

About Körber

We are Körber – an international technology group with more than 12,000 employees at over 100 locations worldwide and a common goal: We turn entrepreneurial thinking into customer success and shape the technological change. In the Business Areas Digital, Pharma, Supply Chain, and Technologies, we offer products, solutions and services that inspire. We act fast to customer needs, we execute ideas seamlessly, and with our innovations we create added value for our customers. In doing so, we are increasingly building on ecosystems that solve the challenges of today and tomorrow. Körber AG is the holding company of the Körber Group.

Delivering the difference in pharma

At Business Area Pharma, we deliver the difference along the entire pharmaceutical value chain by offering a unique portfolio of integrated solutions. Based on in-depth experience spanning consulting, inspection, transport systems, packaging machines and materials, track and trace and software, we understand the challenges in pharmaceutical processes and regulation that our customers face day to day, from the beginning to the end of their production. For them, we deliver the difference to unlock the potential of global pharmaceutical and biotech manufacturing.

Delivering the difference in pharma

As your personal partner and expert for the pharmaceutical industry, we support you with industry-leading consulting services – from needs analysis to project implementation:

- Access to industry-leading experts with extensive experience in the pharmaceutical, biotechnology and medical device sectors
- Development of a solution tailored to your company size and needs
- Keep pace with the times and benefit from important trends in Pharma 4.0
- Realize your potential and get support from over 2,500 pharma experts in 100 locations worldwide

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