OPTIMIZATION ON A **WORLD-CLASS LEVEL**

THE SHANGHAI TOBACCO GROUP CO. LTD (STG) *operates a state-of-the-art cigarette production facility in the centre of one of the world's largest metropolises. Together with Hauni China, the best is made just that bit better here.*

Stainless steel production machines reflect in a light high-gloss floor. "Chunghwa" cigarettes, a premium brand in China, are manufactured extremely quietly and quickly on the PROTOS-M5 machines. One red cigarette packet stands next to another on small conveyor belts that wind their way through the vast hall at a height of three metres. More than 74 billion sticks were produced in 2016. Skilled employees ensure that everything runs smoothly on the 18 PROTOS lines belonging to the Shanghai Cigarette Factory (SCF). They keep an eye on all processes, clean the machines whenever necessary and adjust the settings. There is no residual tobacco to be seen anywhere; everything is perfectly clean with no perceivable dust in the air. The Shanghai Tobacco Group, one of the largest tobacco manufacturers in the world, operates an impressive production that runs like clockwork. Is there anything here that can still be improved?

Consistently reduced waste

"The world class level at which cigarettes are produced here doesn't actually make our task easy," says Marco Castro, General Manager Services Hauni China. But his team isn't scared off by this prospect. They have developed a consulting project aiming to achieve stable tobacco consumption by means of a consistently reduced level of cigarette waste. The project bears the name "Consumption Stability Analysis" (CSA). The ambitious target is a stable one percent of cigarette waste from the PROTOS lines.

The special factor is that the Shanghai Cigarette Factory produces the same cigarette brand on an astonishing 18 identical Hauni PROTOS-M5 makers. There is only one such factory in the world, which proves invaluable for exact analysis: Large quantities of data and information are available to the experts, enabling a meaningful comparison of the machines and a valid root cause analysis for deviations in cigarette waste.

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>
> Marco Castro, General Manager Services Hauni China

Hauni as an important advisor

Here, two partners contribute the outstanding expertise that characterizes them in their respective field. “SCF has an extremely high level of competence in the production of quality cigarettes on PROTOS-M5 makers,” says General Manager Castro. On the other side, Hauni is adding its skills as the global leader in the manufacture of machines and systems for the tobacco industry. “We are convinced that we are on the right path by working on optimizations together with the original equipment manufacturer,” says Zhou Yongsen, Vice President of the Shanghai Tobacco Group. Hauni is so much more than purely a machine supplier, as it has also developed a comprehensive services and consulting strategy. “We benefit from that, as we not only strive to be highly efficient, but also want to provide excellent quality,” says Zhou. “Hauni helps us to do just that.”

Optimally managing processes

Jiao Xi, Director of Chunghwa Workshop, also emphasizes the absolute aspiration of the Shanghai Cigarette Factory to deliver outstanding product quality. “Quality is our top priority.” The production of a good cigarette requires skilled employees capable of optimally managing the production processes – and modern machinery. When STG built the new factory six years ago, it decided on the modern Hauni maker. “We know that Hauni produces the best machines worldwide. Now, together with Hauni, we want to ensure that the production processes remain stable and that we continue to improve”, says Jiao, who has been with STG for 24 years.

The pressure on cigarette manufacturers all over the world is enormous. Smoking bans are being increasingly enforced in China too, as health awareness rises and smoking habits change. According to Vice President Zhou, the Shanghai Tobacco Group is facing the challenge of precisely analysing customer behaviour and developing products corresponding to demands.

Efficiency is called for

Only by increasing productivity and reducing costs while still delivering a top-quality product can STG remain competitive. However, in many cases, a high production volume of high quality also means a high level of rejects, in turn resulting in increased tobacco consumption. STG is aiming at an optimal balance between quality and waste, a goal requiring stable processes. “We are pleased to have the Hauni team on board to support us,” says Jiao. The view of internal processes from the outside is extremely advantageous. In doing so, Hauni pursues a “minimum necessary” approach. This means that expenditure is kept as low as possible. The costs of optimization must not exceed the expected benefit, as that would make no sense to the customer all things considered.

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Bottom-up approach

Furthermore, the strategy is to proceed from bottom to top – the Hauni experts consider this an essential prerequisite for successful production operations. “Only if quality processes are established for the individual machine and a reliable stability is achieved, can optimizations be considered that affect higher-level factory processes”, says Castro. Liu Guoping, Vice Factory Director of the Shanghai Cigarette Factory and Manager of the Project CSA shares this opinion. It is important to first define the optimal machine settings and processes and to subsequently monitor them. “Operating stable machines is the only way to reduce waste.”

At SCF, 40 employees are involved in the project at different levels and from various departments. Machine data were collected round the clock on 18 machines in three shifts. The goal here was consistent and valid data collection. The in-

One thing is clear to Zhou Yongsen, Vice President of the Shanghai Tobacco Group: *Both sides must benefit from the added value.*

The production hall with the 18 PROTOS lines *is 125,000 square metres in size.*

In the specially arranged project room at the Shanghai Cigarette Factory, *Jiao Xi, Director of Chunghwa Workshop, Vikki Lu and Keith Nicholson discuss the latest machine data.*

The employees of the Shanghai Cigarette Factory *have extensive practical knowledge. With the support of the Hauni team, they are aiming to improve the processes even further.*

We very much appreciate the openness with which Shanghai Cigarette Factory treats the data within the project."

Marco Castro, General Manager Services Hauni China

formation was then jointly analyzed and discussed together with the Hauni experts. The walls in the specially organized project room at SCF were plastered with data sheets, graphs, pie and other charts. "We very much appreciate the openness with which SCF treats the data within the project," says Castro. The cooperation as a whole is based on trust, honesty and open communication. Liu Guoping and Marco Castro jointly assumed the project management to ensure that the cooperation works well on all levels.

Cross-border cooperation

"One plus one is more than two," says Jiao, emphasizing the good teamwork between Hauni and SCF. Both sides respect one another and benefit from the respective counterpart, but this cooperation also poses a great challenge. Both sides agree that this will not work without a "change of mind-set" for all involved. Vikki Lu, Deputy General Manager Services Hauni China, has an excellent knowledge of the production processes and the management in the tobacco industry and also confirms this. Vikki Lu is co-responsible for the strategy and concept development of the CSA project.

A total of 15 engineers, technicians, analysts and strategists from Hauni systematically checked and documented the collected data and the data selection, and communicated closely with the SCF members of the project while carrying out a data analysis on this basis. "We developed our own methodology for this analysis," Marco Castro reports.

The entire project is also a learning process for Hauni. "We have understood that although we are the machine specialists, the customer is the actual expert, as he operates the factory. Only by mutual cooperation can we achieve optimized cigarette manufacturing," Vikki Lu adds. Here, the customer has placed a great deal of confidence in Hauni in advance, thus acknowledging the high resources input, manpower, know-how and great commitment of the team.

A big day for the team:
Zhou Yongsen, Liu Guoping, Marco Castro and Florian Mirus (from left to right) handing over the "Technical Consultancy Report" of the CSA project.

Machine deviations

In the middle of February, Hauni handed over the Technical Consultancy Report and with it the results of the stability analysis to the customer. This report establishes that the machines generally achieve good results in terms of efficiency, quality, output and waste. The process management standards of the Shanghai Cigarette Factory are high, and communication between the management and the employees at the machine is effective. Established processes ensure short response times. Despite this, differences in consumption stability were detected at the 18 examined PROTOS-M5 machines.

To find the causes of the deviations, the Hauni specialists chose four of the machines and compared their performance in shift operation, always bearing the cigarette waste in mind. Focus was placed on the "three Ms" – Machine, Method and Man. The identified improvement potential is now to be tested on two PROTOS-M5 machines. "We have created a roadmap and are now developing a tailor-made methodology in terms of how to put our improvement proposals into practice," Castro reports. In February, two Hauni colleagues from the R&D department in Hamburg visited the Shanghai Cigarette Factory to perform a software update and standardization on all machines as a basis for the necessary collection of waste-related real-time data on the 18 PROTOS lines. "We are convinced that our roadmap will ensure stability, but the actual challenge lies in the long-term assurance of this stability," says Castro. Hauni is also able to develop a customized methodology for this purpose.

Added value for both sides

Florian Mirus, Managing Director of Hauni Far East Ltd., also sees the "Consumption Stability Analysis" report as only the beginning of a larger-scale project. Long-term stability is only achieved by means of continuous control, monitoring and reproducibility. "In future, we would like to accompany the Shanghai Tobacco Group as a cooperation partner." Vice President Zhou also views the report as a good basis for the next steps. "We want to continue to improve and see what the project brings" says Zhou. Because what counts in the end is that both sides benefit from the added value. =

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SEEING THINGS FROM **A NEW PERSPECTIVE**

Computer gamers aren't the only ones living in **VIRTUAL REALITY.** *The possibilities it offers have long been exploited by urban planners, medical professionals and industrial companies.*

Virtual Reality (VR) replaces the real world with a virtual one, both visually and acoustically. Viewers can look around in real time and feel as if they are part of events thanks to the high display resolution and high-quality 3D images. In addition to pure VR, there are also mixed forms such as Augmented Reality that extend human reality perception. This means that virtual information, animations or graphic elements are faded into the real human field of vision.

The endoscope as the surgeon's eye: *VR operations give surgeons the impression of working inside their patients, rather than just next to them.*

Also interesting for architects and urban planners: *Building processes can be optimized using VR technology.*

Versatile applications

While the new technology was initially predominantly of interest for computer games, its advantages for training and educational purposes soon became evident. Pilots can practice aircraft operation in a virtual environment, and captains can perfect the art of manoeuvring their ships. Physicians have the opportunity to digitally simulate operations. To ensure that this works, a three-dimensional model of the patient is created using computer tomography or magnetic resonance imaging, thus enabling the physician to safely test the entire operation. However, the medical aspect offers more than just planning and training. Millimetre-based endoscopy, which is increasingly used during operations, can now project its images with tiny cameras directly to the VR glasses of the physician, thus giving him or her the impression of moving directly inside the patient. The surgical instruments are connected by control line to special data gloves worn by the surgeon.

An increasing number of industrial companies also make use of VR technology. According to a study of the Deloitte Consultancy Company, German companies wish to invest just 850 million euros in innovative applications from the Virtual Reality and Mixed Reality fields by 2020. Be it development, production or maintenance, the technology can be profitable at many points in industrial processes. For example, before the Meyer shipyard in the Emsland region builds a cruise liner, it takes a precise virtual look into the machine rooms or laundry in order to detect possible sources of error, identify optimization potential and initiate any necessary remedial measures before actual construction begins.

Automotive manufacturers also test the first prototypes prior to construction to establish what the newly developed ideas actually mean in terms of later assembly. Using a VR tool, they virtually assemble the components and find out whether the employees at the assembly line can implement the planned measures.

Training in extended reality: *With the appropriate technologies, the real physical world and the virtual world are combined into a mixed reality.*

This saves time and costs, as it helps to avoid changes in later project stages, as a result of which fewer prototypes are required. Using this technology, machine builders can visualize their systems in the machine parks of their customers true to scale. They can then check material flows together or optimize work flows in line with more efficient and precise system planning.
When used at trade fairs, Virtual Reality applications give exhibitors the possibility to present the biggest products and most complex systems. Visitors simply put on VR glasses, enabling them to wander through whole new worlds. These worlds open up in perfection in the only fully immersive stereo projection room in Germany. It is operated by the Fraunhofer Institute for Industrial Engineering. Here, equipped with VR glasses, you can dive headfirst into the world of virtual reality. This enables urban planners, project developers, architects, building owners or traffic experts to optimize building processes, make residential area concepts visible, perform architectural visualizations, walk through virtual buildings or simulate traffic projects.
At least as spectacular is the “Elbedome” of the Fraunhofer Institute for Factory Operations and Automation, a mixed reality laboratory used by companies for the depiction of machines, factories or even entire towns or cities over a 360-degree projection area. Six laser projectors fill a projection area of 300 square metres and give planning teams and customers the impression that they are standing inside the planned building.

Viewing technology is developing

Technology for virtual reality is becoming more and more established. Suitable image material can be created using 360-degree photography, amongst other things, and special software calculates complex three-dimensional worlds in real time. The technology for VR glasses is also well advanced. Along with a near-to-eye display that covers the entire field of vision, they have headsets and sensors that record movements of the head. As the display follows the head movement of the wearer, the sense of moving directly in the virtual world is generated.
Augmented reality glasses, also known as data glasses or “smart glasses” function in a different way. They virtually project information in front of the wearer’s eye, without screening him or her off from the outside world. Such smart glasses are the tool of choice for complex maintenance work, amongst other things. They fade the required tools, parts or work steps into the working environment for the technician. =