

USER REPORT

Altdorf/Landshut und Halberstadt/Germany / November 2018

LWB-Steinl-injection molding technology at TEGUMA / Halberstadt/Saxony-Anhalt

EFE for the 165th anniversary

The fact that a rubber processor buys the first injection molding machine just before the 165th anniversary of existence is a remarkable fact in itself. That this investment marks the starting point of the rebound of a once leading rubber technology company from East Germany, also. It is the now family-owned company Teguma in Halberstadt / Saxony-Anhalt, whose executives have identified the EFE-injection molding system of LWB-Steinl as the best option to increase productivity in the production of thick-walled moldings. But until that investment could be materialized, there were a number of obstacles to be overcome.

165 years of continuous company history are not a matter of course, especially for an East German company that had to overcome two world wars and three political system changes during this time. Specifically it is the rubber processor Teguma in Halberstadt in the west of Saxony-Anhalt. How they have succeeded and how they expect to score in the future, is the common thread of this user report.

The first hundred years: From technical fabrics to rubber-textile composites

It all started in 1854, when Wilhelm Kux, a textile-product-manufacturer in Halberstadt began to experiment with the rubber-impregnation of textile fabrics. He followed the American Charles Goodyear, who in 1839 discovered by chance the sulfur vulcanization of natural rubber known as vulcanization, laying the foundation for the widespread rubber application, as coated fabrics remain elastic over a wide temperature range, do not stick and are waterproof.

In order to avoid the complaints of the neighboring inhabitants about the odor nuisance caused by the rubber fumes of his experiments, he had a weaving mill built on the outskirts of Halberstadt in 1856, with the support of his brothers working in the banking business. This is, where the company headquarters are still located today. There he produced "technical fabrics", which he increasingly equipped with rubber impregnations. Examples of products at that time are fabrics for raincoats, tents, as well as waterproof shoes and mailbags (Fig. 1)

In 1869, Wilhelm Kux hired Carl Ebel (1838 - 1907), an innovative technician, to whom he sold the entire company as early as 1870 and retired. Carl Ebel launched numerous new textile/rubber products, in particular rubberized fire hoses, which have been exported to many countries and their quality has received several awards. In addition, rubber boots

and solid rubber tires for carriages were part of the production program. In 1903 he was awarded by the Prussian king for the invention of a rubberized drive belt. The company flourished, employed several hundred employees and was one of the leading rubber workers in Europe (Fig.2)

The sons of Carl Ebel continued to expand the company. The army demand for waterproof products during the First World War let the company grow further.

During the 1930s, the company temporarily came to a halt due to the global economic crisis. Only the preparations for the Second World War brought the "hose and cloth factory" back to an upswing, whereby the number of employees rose again to more than one hundred workers. The Second World War, the company survived, now led by the third Ebel generation, largely undestroyed. In the short post-war-time of belonging to the American sphere of influence, the pre-war production of tarpaulins, rubber boots and V-belts was resumed. After Halberstadt had come under Soviet administration following a swap of territory between the Us and the Russian forces, it came to the expropriation of companies supplying the German Wehrmacht. Among these also the "Hose Factory Kux-Successor" was affected. However, not every expropriation was carried out directly through the exchange of management, so that the brothers Ebel could remain in their positions. Finally, the Red Army confiscated on 11 August 1948 still machinery and infrastructure and transported them off. But once again, the company managed to continue working on a smaller scale.

After the founding of the German Democratic Republic (07.10.1949), the state influence on the company increased, which is why Karl Ebel III decided in 1951 to leave the company and as well as the GDR. His half-share, which had previously been outsourced to a separate company, was taken over by the state and managed in trusteeship. The second half of the company „Wilhelm Kux Sucessor“, which belonged to Hans-Georg Ebel, was merged with the other half managed by the trustee and renamed „Rubber Works of Halberstadt“ and continued under the leadership of Hans-Georg-Ebel as a semi-public company. However, Hans-Georg Ebel gave up as well in 1957 and left the GDR. Since important industrial components were still being produced, the operation was not shut down but handed over to the trusteeship of the state administration.

100 years after formation transformed into a VEB (=state-owned enterprise), which continues to work despite insolvency

In 1962, the Halberstadt Rubber Works were seized by the centralization of industrial production in the GDR and placed under the central administration of a state combine as VEB Teguma (Technical Rubber Articles). In 1972, the company was fundamentally reoriented, moving away from textile production to rubber processing. Seals for the automotive industry or rubber bulges for train-wagon transitions (Fig. 3) and rubber finger plates for agricultural machinery and track construction machines were also produced, as well as simple tools such as rubber hammers. Unfortunately, the products had to be delivered to the higher-level trade organization at predetermined (not cost-covering) industrial prices. That and the obligation to produce to produce components for consumer goods (e.g. sheets and individual parts for stoves and heaters, including enameling) and

to set up recreational facilities for employees, Teguma skidded in the early 1980s into theoretical bankruptcy. Theoretically, because a bankruptcy was not provided in the central economy and therefore was not enforced. Thus, production could be continued. The losses were cleared within the state-combine, but necessary renewals were not carried out.

With Bernd Meyer as reorganizer, the tide begins to turn

But after all, in 1984 an industrial engineer named Bernd Meyer was delegated from the "State-combine Progress Agricultural Machinery" as operations manager to Teguma. Under his leadership, Teguma profited as of 1985 on the finally implemented reform of the centrally determined sales prices, which together with an internal rationalization measures, gradually improved the economic situation.

But Bernd Meyer had to pass the real test after the "turnaround" of 1989. In the spring of 1990, after the central economic system collapsed, he convened a works council and saw no choice but to take drastic measures. Bernd Meyer comments: "I had to familiarize my employees with the necessary changeover to work under private-sector conditions. For example, the political agitation or the participation in demonstrations during the work time could no longer be tolerated. But the hardest was, that due to the drastically collapsed order situation I had to announce an equally drastic reduction of the number of employees. We had lost the export business to the COMECON-countries and also the orders for the anyway unpopular electrical appliance enamel sheet metal production. Thus, it was foreseeable that only 25 of the previously employed 260 employees would have work in the future. But since I was able to promise a socially acceptable processing of the dismissals, I was confirmed in my position, despite the bad news for the workers collective. It was an unexpected vote of confidence on which I could build my further work."

An additional change of importance during the political turn was that Teguma was assigned to the "Trust Company for the Privatization of National Enterprises" and had to wait for their decisions.

Just in time for the 150th anniversary Teguma is a private company again

Despite the restructuring, the new "fiduciary" for the Teguma saw, as in the majority of former GDR enterprises, no chance of survival in the free market economy and ordered the liquidation. In contrast, plant manager Bernd Meyer filed an objection and handed over a detailed continuation concept. Since the concept was coherent, the liquidation was stopped. Subsequently, Bernd Meyer commissioned a valuation report and examined the chances of buying the company. These were good because the so-called investment priority procedure could be applied. It determined that the common good interest in securing jobs was to be valued higher than the return of nationalized property to the former owners. Still, the purchase was more complicated than thought, through the split in half, analogous to the division made by the Ebel brothers before they left. But in 1993 Bernd Meyer bought the company share controlled by the "Trust Company for the Privatization" with the help of a bank loan. A few years later he also reached an agreement with the old

owners, who renounced a retransfer. Thus right at the 150th anniversary Teguma had new owners: The Meyer family, who were willing to succeed Kux and Ebel.

Slowly back to state of the art performance

In parallel with the privatization process, Bernd Meyer and his son Ronald set about to reorganize the company. The most important thing was the retention of old customers, especially the local agricultural machinery manufacturers and the Deutsche Bahn. Another important task was to eliminate contaminated sites in the factory, such as the dismantling of the discontinued sheet metal production or the long overdue refurbishment of the partly one hundred year old building fabric, which took place between 1990 and 2004. The machines were also overhauled and, where possible, modernized, for example, a veneer press converted into a rubber press, on which the large-area rubber components for the railroad car transitions have been produced for around 50 years (Figs.4 and 5) or the rubber calender. Overall, this increased productivity by 25 to 30 percent per annum, which meant that headcount could be reduced from 25 to 10 people over the same period.

By deciding for LWB-machines TEGUMA caught up with the state of art

The years since 2004 have been characterized by further consolidation and substance accumulation. The staff remained with 10 people. With the takeover of the management by Ronald Meyer, the course was finally set for the future. Ronald Meyer: "On the one hand, the future means making the current production more efficient and, at the same time, searching for alternatives to the decreasing numbers of rubber bulges for wagon transitions. In order to minimize the financial risk of switching to a new technology, we have participated in an EU-project for regional funding. Within that program we could partly finance the investment in our first injection molding machine. The choice of machine supplier and machine type was not easy. As already mentioned, it was the first injection molding machine in the 165-year company history. After extensive market research and plasticizing trials, we decided in favor of LWB-Steinl, specifically for a VSEFE 3000/2000 P vertical machine with the integrated EFE injection module (see Factbox: EFE-system). This technique impressed us. Thus we were able to shorten the cycle time of an NR / SBR thick wall section from our scope of railway components of 15 min cycle time on one of our presses (including 5 min manipulation time) by 67 percent to 5 min (including removal). With a 2-fold- mold-tool, the hourly output increased by 200 percent from the previous 8 pieces to 24 pieces (Fig.6). Since we mainly produce molded parts with larger wall thicknesses, we firmly believe that LWB technology will give us positive impulses for our further development." (Fig. 7)



Infobox: EFE-System

How does it work?

The EFE injection system is the combination of a FIFO-plasticizing unit (EF-unit) and a subsequent nozzle unit (E unit) consisting of a nozzle and a piston. With the EF-unit, a certain amount of a rubber compound is plasticized per cycle and then injected with the screw piston through the adjoining nozzle in the tool. The piston of the nozzle block is positioned at the deflection point so that a bottleneck is created. During injection, the flow rate and shear increase. This leads to an additional heating of the rubber compound. After the auger piston of the EF unit has reached its end position, the nozzle piston is moved forward, thereby emptying the nozzle. Parallel to injection the screw unit begins to plasticize again with the nozzle channel closed.

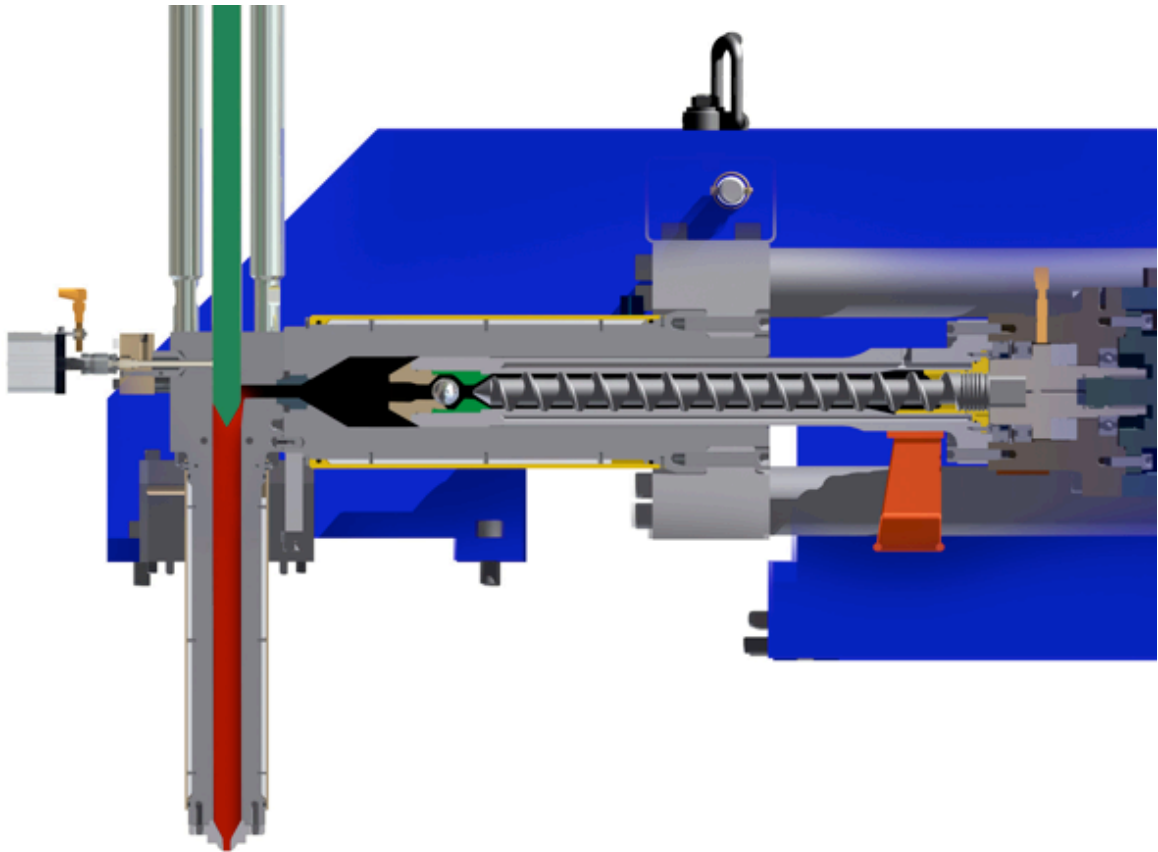


Fig: LWB-Steinl

What advantages?

- > Temperature increase during the injection process lowers the viscosity of the rubber compound and thus allows to inject thinner walls without increasing the injection pressure
- > Additional energy input reduces the heating time
- > Due to the two-stage energy input, fluctuations in the quality of the rubber compound can be balanced in certain limits.

Which sizes available?

- > Injection volumes from 115 to 8500 cm³, depending on the unit size
- > Injection pressure range up to 2200 bar

Figures:



Fig.1: Today's Teguma Ltd has its origin in the manufacturer of technical fabrics Kux & Weber, where Wilhelm Kux started the coating of fabrics with rubber.



Fig. 2: At the turn of the century Wilhelm Kux's successor, Carl Ebel, already employed several hundred employees, who made crude and rubberized fire hoses, hemp and cotton belts, rubberized belts and technical rubber goods.



Photo: Fal – Wikipedia

Fig.3: Rubber bulges for wagon interchanges have been manufactured by Teguma for about 50 years. They are delivered to many railway companies around the world.

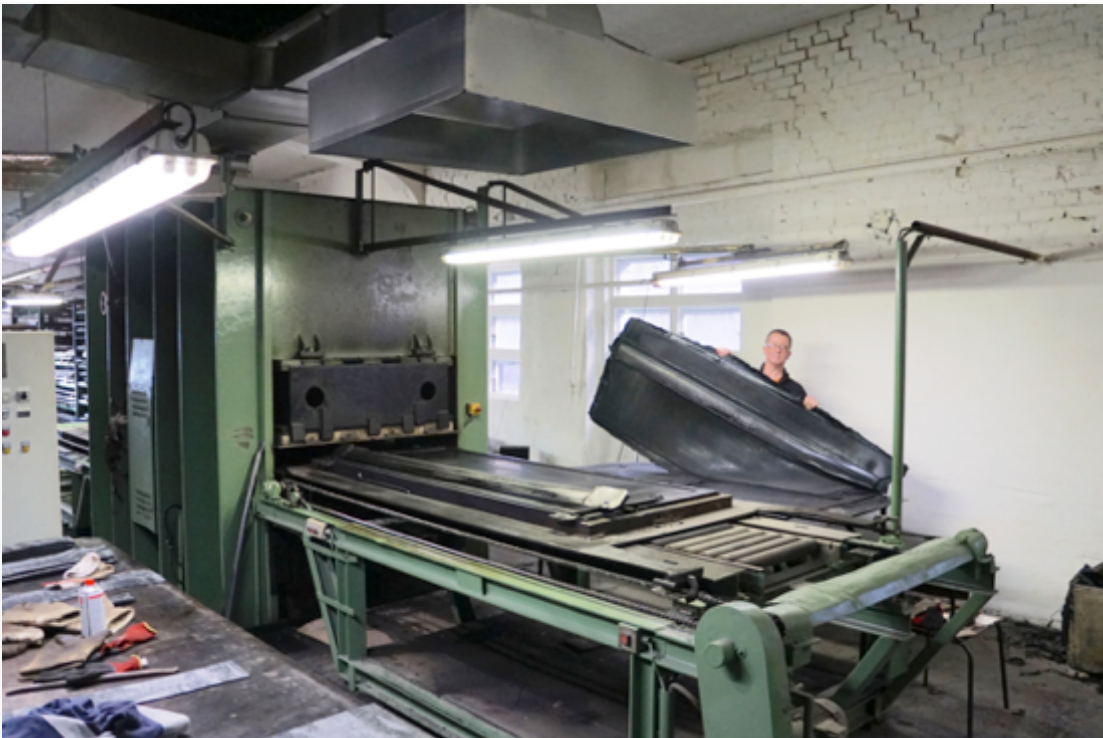


Photo: Author

Fig.4: The up to 19 kg heavy and almost 2 m² large rubber bulge components for wagon-interchanges are produced on a converted veneer press.



Photo: Author

Fig.5: The rubber bulges for wagon-interchanges made of flame-retardant NR / SBR, demonstrated by Teguma-CEO Ronald Meyer are almost 2 m high and fully assembled, 23 kg heavy.

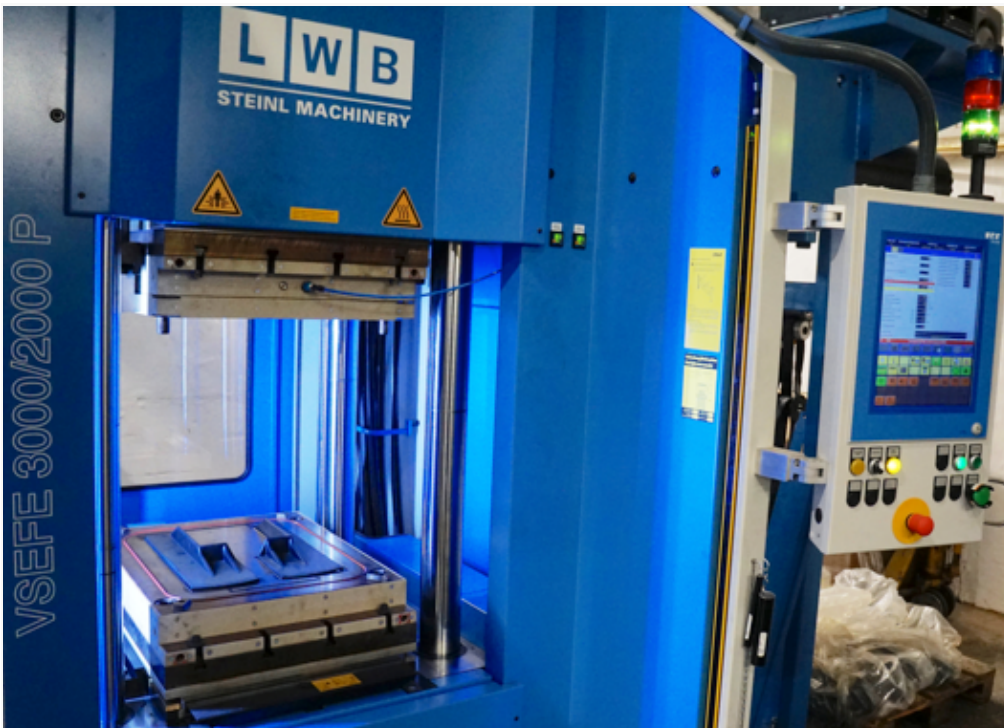


Photo: Author

Fig. 6: With the newly invested LWB vertical injection molding machine mainly thick-walled components for railway wagons and track construction machines are molded.



Photo: Author

Fig.7: After years of consolidation, the acquisition of an LWB VSEFE 3000/2000 P vertical injection molding machine in 2018 marked the starting point of a new era in the 165 years of company history, jointly driven by the LWB-sales-technician Thomas Vodnansky and Teguma-CEO Ronald Meyer.

about LWB-Steinl

Founded in 1962 by Alfred Steinl, the company started with punching tools and rubber processing machinery. Today, the company, still managed by the Steinl family, is one of the world's leading manufacturers of rubber injection molding machines. The product portfolio covers the complete range of rubber and plastic injection molding machines, from the vertical C-frame machine to vertical 4-tiebar or gantry-frame machines, to horizontal tiebar and tiebarless C-frame machines.

The company currently employs around 250 people and has about 500 machines per year, based in Altdorf near Landshut.

In 2011, LWB acquired a bio-material development and processing company and has since continued to run it as Biofibre GmbH. In 2013, the sealant developer and application machine manufacturer Dreibond was taken over. In 2014, the joint venture URP (United Rubber & Plastic Machinery Ltd) was established in China, for manufacturing machines for the local market. In 2015, LWB-Steinl entered into a cooperation agreement with REMA TIP TOP AG and founded VulcTech GmbH (manufacturer of repair presses for rubber conveyor belts) at the Landshut / Altdorf site. In the same year, the Steinl Group took over the Italian Prodicon International Srl. (Development of production of rubber batch-off plants). In 2017, with LWB Automation, a separate subsidiary for production automation in Germany has been opened, offering handling solutions focused on elastic components.

For more information see: www.lwb-steinl.de

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