

# Presses put to the ultimate test



## Punching presses taken to the limit by STIHL, manufacturer of chains for chainsaws

**(gk) “No-one punches as hard as STIHL”. This comment made by a Bruderer employee proved to be right when we visited STIHL in Wil. Every day in this factory in Switzerland Bruderer punching presses process many tons of high-tensile strength steel to make the chains for chainsaws. The STIHL production line is really quite something with its modular tools and punching speeds of several hundred strokes per minute. After a few initial “teething problems”, the Bruderer presses can now withstand the toughest conditions demanded of a punching press.**

One can almost literally hear the demands that STIHL makes on its punching presses: If one of the noise protection doors are left open, you become instantly aware of the untypical, extremely inten-

sive, almost painful stamping noise. Jörg Bräunche, Assistant Manager at Swiss STIHL & Co. explains the reason behind this unusual level of noise:



“The loads on the presses producing the parts for these chains are enormous, because when stamping with a modular tool that punches out several different parts in one single blow, the power behind the

punch is immense. Depending on which particular part is being produced, the monitoring of the press force of every single stroke is taken to the limit”.

Today the Bruderer presses can cope with these extreme demands without any problems whatsoever. However this was not always so, even in the case of Bruderer presses which are renowned for their outstanding high performance.



When STIHL first began working with Bruderer presses, the extreme conditions under which the presses were operating lead to a kind of “disintegration” of the machines. Jörg Bräunche: “It is amazing to think of what used to fall off these presses or break. It was a learning curve for both parties. But Bruderer and STIHL continued to work together, designing presses that can withstand the constant, immensely powerful punching without any repercussions.”

It was this willingness to persevere with the design of the presses that lead Hans Jürgen Baumann, head of production at STIHL for many years, to become a devoted Bruderer fan. Although Hans Jürgen Baumann has now been retired for many years, Jörg Bräunche can still hear his words, said on many an occasion: “With Bruderer presses you still get the problems, but with Bruderer you can get them under control”. A statement that proved to be correct, as experiences at STIHL will confirm.

After undergoing a number of improvements, the Bruderer presses are now living up to their reputation: Even though they are running constantly, day in, day out, recent inspections have shown that after over ten years of operation only insignificant faults due to wear and tear could be found. Although STIHL does not comment on exactly what quantities are being produced in Wil, what can be said however is that the Bruderer presses work in 2-shift operation, every day, processing tons of steel to make parts for the chains for chainsaws.

Despite the manufacture of approximately 60 different types of chain in total, the size of the parts and

the use of modular tools are such that the batch sizes produced here tend to be at least several hundred thousand.



Jörg Bräunche explains: “The large number of different parts in the production of chains for chainsaws is primarily due to the different cutting teeth, which we do in fact need to produce in relatively small batch sizes.” There are, by contrast, only three versions of the drive parts: The STIHL Standard versions of 1.6mm, 1.3mm and 1.5mm thickness, which have been designed so that they are compatible with chainsaws from other manufacturers.

STIHL produces large quantities of connecting parts which are the same for a given chain dimension. For the standard connecting parts 0.404” there are a number of tool sets and the corresponding press is running practically around the clock. The press only stops for tool changes if maintenance work needs to be carried out or if a tool breaks. For control purposes the batch sizes are, generally speaking, limited. However in practice each job is immediately followed by another, therefore meaning the batch size is more or less infinite.

Many saw chains are made solely of stamped parts and clinched bolts that are inserted by cold impact stamping. The connecting, safety and drive parts are flat parts; the cutting teeth are three-dimensional and are manufactured as finished parts in a modular tool. After stamping, the cutting teeth at STIHL are deburred, hardened, hard-chrome plated, dyed blue (a STIHL characteristic), polished and laser marked. Although the chains of various manufacturers all look very similar, there is a great deal of technology and know-how hidden in their design and manufacture. Jörg Bräunche: “I admit: If you lay out the different chains of various manufacturers you will see only small differences. However the geometry of the cutting tooth, for example, the interaction of depth limiter and cutting tooth, and many other features do have a great deal of influence on the cutting performance.”

STIHL chainsaws are reputed to have the best cutting performance in the world. Many years of development and the closest attention to detail mean that STIHL chains are among the best that are available on the world market today. To ensure that the technology remains where it belongs, all tools for the chains are manufactured in-house. Although at a glance the chain tools, rather like the chains themselves, look pretty simple the technology required to design these tools is extremely complex and highly specialized. This was confirmed by Walter Lehmann, who was one of the longest standing employees at Bruderer. During his many years of service in the sales of the Bruderer presses, he saw many tools. Yet one thing is clear: "I don't know of any other company that has anything like the tooling technology of STIHL."

Details are of course "classified". However it is possible to coax some information about the modular tools out of Bräunche, e.g. regarding wear: "Even though we are stamping high-tensile strength material, we have got the tool erosion well under control, regrinding the upper and lower carbide tools after a given amount of strokes." As for the tool design: "Our bottom dies are divided into segments simply because it is virtually impossible to manufacture such large carbide dies from a single piece of metal. Furthermore, should there be a problem with the tool, it is a great deal easier to replace just the damaged segment, grinding this down to the same size as the other segments, rather than having to replace the entire plate."

According to the motto "simple, but effective" STIHL ensures that any faulty parts are not passed on to the next stage of the production process. Furthermore, before a new batch job is started a member of the quality control team inspects the tools. Then the entire job is monitored by the press-operator. The parts are inspected at every coil change and when the container is full. If the last parts in the container are good, then one can assume that the rest of the parts in the container are also of the same quality. Yet quality control at STIHL doesn't stop here. The inspection carried out by the operator in the press shop is confirmed by further inspections carried out at regular intervals in the production process by members of the quality control team.

Unlike other companies, STIHL does not use image-processing equipment to monitor the parts. Jörg Bräunche explains: "This simply isn't possible when using modular tools that run at several hundred strokes per minute, especially because these parts are full of oil." This theory confirms that of Walter Lehmann: "The biggest problem is the oil. Presses that are monitored with cameras are the least productive. As soon as the tiniest drop of oil is detected,

the press switches off, even though the part itself is perfect. It is a similar story for press users producing free-falling parts – they cannot visually monitor the part quality. In order to do this, the press would have to be slowed down to 50 or 60 strokes per minute, which is simply not economical."

Similarly press force monitoring is also unsuitable for quality control and STIHL uses this solely for monitoring the press itself. Jörg Bräunche: "We do not use press force monitoring to monitor the tools because if just a minute corner of a tool breaks off the parts are faulty, yet the press doesn't recognize this and just runs on regardless." At best the wear of the tool can be detected by the increasing press force.



STIHL has however had great success with feed monitoring: By monitoring the feed movement in the tool it can be ensured that the coil is constantly fed at the correct pace. The stroke is only initiated when the coil is at the stop, meaning there is never a problem of faulty parts due to incorrect feeding.

Another factor that ensures not only the high quality at STIHL but also the high productivity of the Wiler production is the regular inspection of all production machines. All machines – not only the presses, but also e.g. the cold impact stamping machines used to manufacture the clinched bolts – are sent back to their respective manufacturer on a regular basis for a full inspection. There they are completely overhauled and returned to Wil as good as new. Jörg Bräunche on the reasons for this: "I am convinced that this is the only way to guarantee such a high degree of productivity. It is very unsatisfactory if machines are unexpectedly rendered "out of order" due to a problem. We would rather plan our inspections and be able to run all our machines as planned otherwise. In addition to this, of course, we also avoid total losses which can be very costly."

The presses are overhauled at each inspection to meet any new safety standards. Parts like the electrics, protection devices, lubrication and compressed air supply are also exchanged. Contrary to standard overhauls, STIHL has chosen not to retrofit

its Bruderer presses with the new B-control, as this simply wouldn't be economical for the manufacture of the chainsaw chains. The many special functions of the B-control just wouldn't be used when producing such vast quantities.

However, when it comes to new presses, STIHL cannot avoid the new high-performance B-control that is fitted as a standard feature.



Yet here too, Bruderer remains flexible: After it was ascertained that the B-control is simply too comprehensive for STIHL, offering so many functions that are simply not needed, the Bruderer control designers worked in close cooperation with STIHL, discussing the production process and special requirements. Then, on the basis of this discussion, Bruderer designed a custom program for STIHL that runs on the B-control. "This very "concise" version of the computer control fulfills our needs perfectly and has been a great success among our users," Bräunche explains, clearly impressed by this new development.

## Scrap: Transported to the basement and prepared for recycling

Another thing that becomes apparent in STIHL's Wiler factory is that the press shop appears to be completely free of any scrap. Looking around the hall, one can only see a number of coils with raw material and the containers with the stamped parts. Yet even STIHL cannot work without producing some form of scrap. In order to find the scrap, one simply has to venture down a floor.



Between the two rows of presses there is a basement that runs along below the hall. The scrap falls down out of the presses and is transported directly to the basement by a conveyor belt. Here further conveyor belts transport the scrap directly to one of three centrifuges that reclaim up to 600 liters of oil each day. From here, the scrap is then transported by further conveyor belts to a scrap silo in front of the hall. This is emptied daily by a company that recycles the scrap. The result: Not only does the clearance of the scrap avoid any unnecessary material movements in the hall but also prevents the danger of contamination caused by small parts or oil.

<http://www.stihl.com/>

<http://www.bruderer-presses.com>