



STRESS-FREE CUTTING OF LAMINATED GLASS

so that all involved remain relaxed, even the glass!

LiSEC

As you probably know, the cutting of laminated glass has its drawbacks. We will show you in the following articles what is important in the processing of this very special material, which is gaining considerably in importance due to its safe fracture behaviour. The contents range from the manufacture of the laminated glass sandwiches to the storage, the tools, the design and maintenance of the machines through to innovations in this field. Because they all have an enormous influence on the quality of the cutting of laminated glass.

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CHAPTER 1

HOW THE PRODUCTION AFFECTS THE GLASS CUTTING PROCESS

Chapter overview

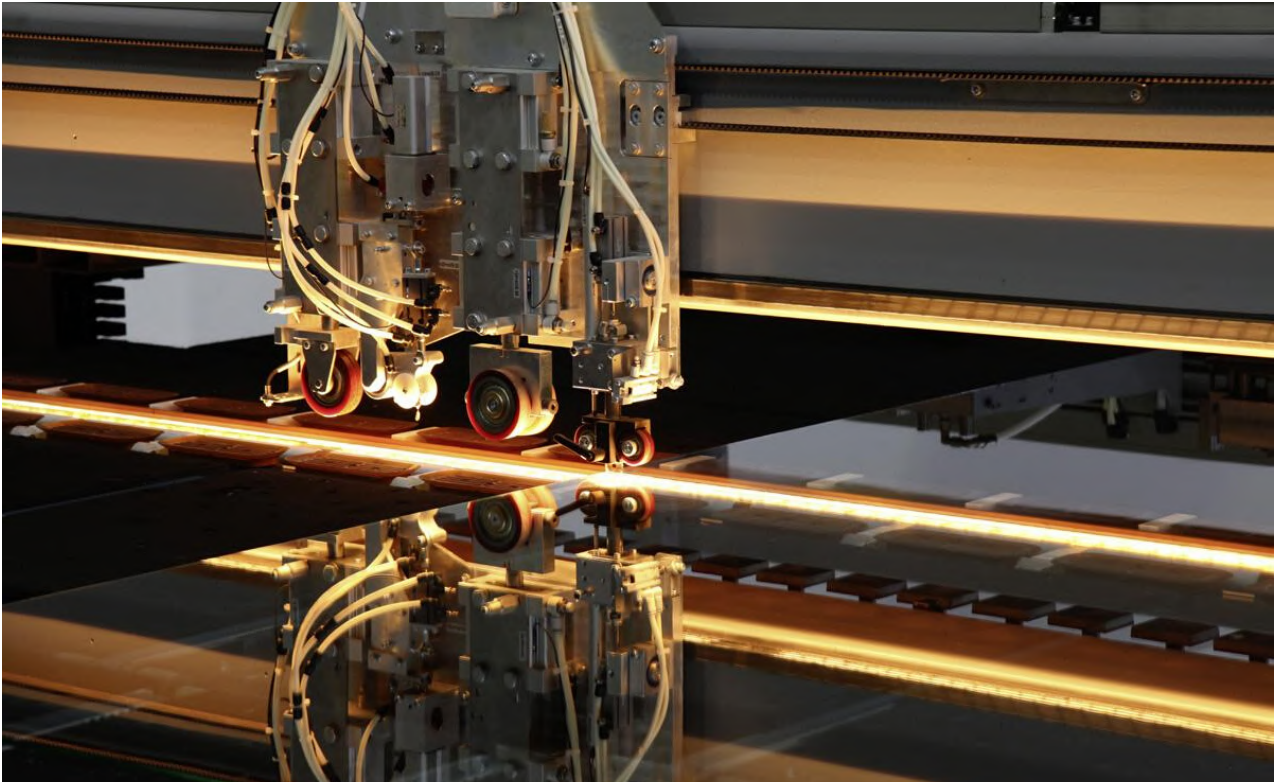
The first chapter takes us on a journey to the beginnings of the production chain; the manufacture of laminated safety glass itself. This is because it lays the foundation for the smooth and clean further processing of the material.

The following important aspects will be addressed:

1. Float glass production
2. Coating of float glass with metallic coatings
3. Production of laminated safety glass
4. Uncoated laminated glass
5. Attention with coated laminated glass

Everyone who processes this material knows that laminated safety glass (LSG) is unconventional and requires a great deal of sensitivity. The LSG cracks and chips and finally the question arises: What was to blame for the breakage? Was the cutting pressure too low? Was the crushing pressure too high? Cutting speed, acceleration, crushing roller feed, cutting wheel angle, temperature, cutting oil or was it tension in the glass during production in the glassworks? The influencing factors are unmanageable and glass qualities fluctuate constantly.

In this blog article we shed light on the production influencing factor when cutting LSG. Further articles will deal with factors influencing the stock, machine settings and the design of the machine.



WHY LAMINATED SAFETY GLASS IS BECOMING INCREASINGLY IMPORTANT

The most important thing about laminated safety glass is how it behaves when broken. This means that the sheet does not collapse, as the glass/foil/glass laminate ensures residual load-bearing capacity through the interlayer (usually PVB foil).

This residual load-bearing capacity is particularly important for glass railings, stair railings or other vertically installed glass lites sheets.

In the event of glass breakage, it is guaranteed that the laminate retains its shape and, in the case of a railing, functions as a fall protection. This property is also a basic prerequisite for overhead glass installations in order to prevent injuries to persons due to glass breakage. The DIN 18008 standard also contributes to the fact that vertically installed flat glass sheets up to a certain height must exhibit safe breaking behaviour.

It is therefore hardly surprising that flat glass processing companies have to increase their processing capacities, especially for cutting lines for laminated safety glass, in order to be able to produce more sheets now and in the future.

WHAT INFLUENCE THE PRODUCTION OF LAMINATED SAFETY GLASS ALREADY HAS ON GLASS CUTTING

In order to show what influence the production already has on the later cutting of laminated safety glass, we start with the most important production steps.

1. FLOAT GLASS PRODUCTION

The basis for laminated safety glass is float glass. Float glass is produced in glassworks from molten glass, which flows out of the "float tank" via a tin bath and is then produced in corresponding thicknesses. Due to the tin bath it comes into contact with, the underside of the float glass is also called the tin side.

The float glass upper side is called the air side because it comes into contact with air after the float tank

- Both surfaces have different properties due to these facts
- The tin bath influences the surface hardness of the later glass due to the fact that the tin side cools down more slowly and thus becomes softer. The air side cools faster but this leads to a harder surface.

These marginally different surface tensions cause distortions on the glass surface. This means that the surface is not 100% flat, but more or less wavy. Another fact is that the tin bath leaves metallic residues on the glass, which have negative effects in the subsequent coating process (application of metallic coatings - heat or sun protection coatings).

2. COATING OF FLOAT GLASS WITH METALLIC COATINGS

Metallic coatings, also known as heat insulation coatings or low-E (lowemission) coatings, are applied to the glass using the magnetron high-vacuum process. In a high vacuum, the glass sheet is exposed to a vapour stream of metallic particles and applied layer by layer.

A high-purity surface on which the coating is applied is the basic prerequisite for flawless optically appealing coatings. Coatings are therefore always applied to the air side, as this has a clean surface.

3. PRODUCTION OF LAMINATED SAFETY GLASS

The production of laminated glass consists of several work steps. The raw glasses are first cleaned, then the lower sheet is positioned and the PVB foil is applied.



Then the upper sheet is placed and the sandwich is complete. This sandwich is prepared in a pre-laminating process for the subsequent auto-claving process. In the autoclave the sandwiches are finished under vacuum and heat. The air is extracted from the sandwich laminate, the PVB foil melts and combines with the glass to form a laminate.

4. UNCOATED LAMINATED GLASS

As already mentioned, the air side of a float glass is highly pure, while the tin side may contain impurities from the tin bath and has other different surface properties. For this reason, laminated safety glass is constructed in this way:

- First sheet: Tin side at top, air side on inside
- Second sheet: Air side at top, tin side on bottom

This constellation of the laminate guarantees excellent adhesion properties due to the situation, as both air sides are brought together. It is an advantage for processing that two sheets with similar tension properties are brought together. Such laminated safety glasses are generally less strained and allow relatively similar cutting pressures on the lower and upper sides, since the tin side is softer on the upper and lower sides than the air side.

5. ATTENTION WITH COATED LAMINATED GLASS

Laminated glass for use on conventional buildings, such as single-family houses, consists of two sheets of laminated glass connected by a PVB foil.

Due to ever increasing demands on insulating glass and the use of triple insulating glass, the processed laminated glass is usually a laminate of a float glass sheet and a coated sheet.

Due to the fact that the coated side must not be laminated on the inside, a non-ideal constellation arises in production, which looks as follows:

- First sheet: Air side at top with coating, tin side on insideFoil
- Second sheet: Air side at top, tin side on inside

This unfavourable constellation leads to different surfaces and therefore also surface tensions being connected by the foil. Furthermore, coated glass lites sheets are usually produced at different locations than the float glass with which they are laminated and therefore have a different chemical property.

Thus the themes of different surface tensions, different origins and not ideal constellations come together. This usually results in the coated laminated glass being much more difficult to process and requiring more experience from the operator and higher demands on the machine used for processing.



CONCLUSION: CHALLENGES POSED BY PRODUCTION WHEN GLASS CUTTING LSG

Uncoated laminated safety glass is usually less strained due to the production process and can therefore be processed more easily.

Coated laminated glass, on the other hand, has considerably higher stresses and therefore requires much more experience on the part of the processor. Of course, the right parameters and flexible machines also help. But more on this in one of the next articles. And if the tension is much too great, then of course all that the manufacturer will be left with is a complaint.

CHAPTER 2

HOW THE STORAGE OF LAMINATED GLASS AFFECTS THE GLASS CUTTING

Chapter overview

Of course, the storage of this material also has an enormous impact on the quality of the results during glass cutting and/or subsequent crushing. You should use the practical tips described here to optimise the storage and handling of your laminated glass sheets so that problems can be avoided.

The following important aspects will be addressed:

1. Glass storage
2. Glass temperature and humidity
3. Glass handling
4. Stress in the glass

It is well known that laminated safety glass (LSG) is a material that is specifically processed because of its composition. But transport, storage space properties, handling, temperature, humidity, age of the glass and much more have another dramatic influence on glass cutting.

“The best glass and the best machine can have processing problems if the storage is counter-productive.”

Flat glass can be obtained in various qualities from the manufacturers and the quality naturally has an influence on the processing. This article, however, deals with influencing variables that each processing company has under control.

1. GLASS STORAGE

The delivery of the flat glass is carried out with internal loader trucks. The internal loader racks are picked up by the truck and usually transport 20 tonnes of glass, which is stored in glass packages on the frame. Glass packages of 2.5 t or 5 t are commonly used.

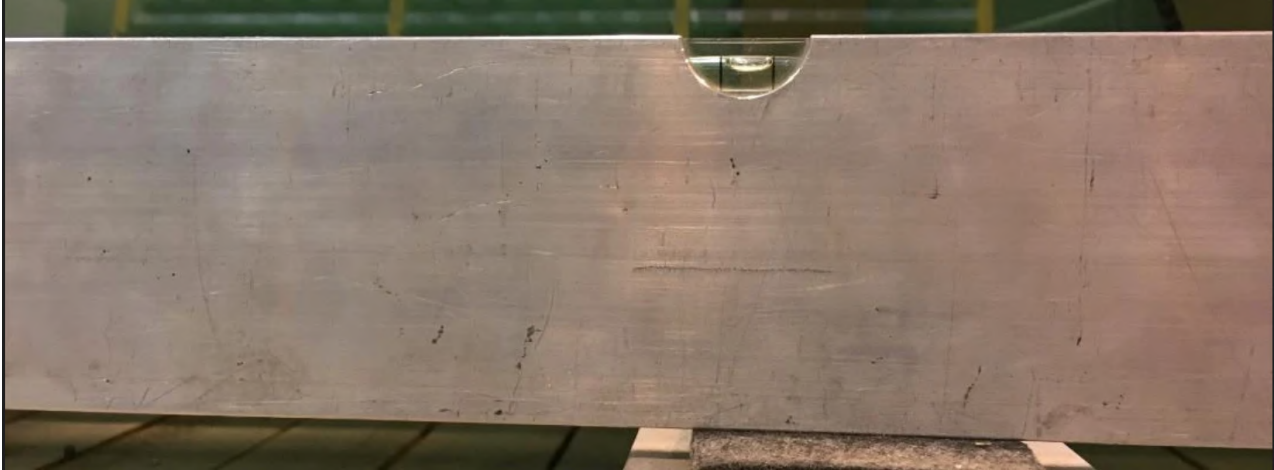


These individual packages are separated from each other by cardboard strips (spacers). The respective glass packages are individually placed in the storage areas by an employee in the glass storage with a lifting device attached to the gantry crane. The storage areas are L- or A-frames. These are simple steel constructions with a support surface on which the glass lites sheets stand.



It is not obvious at first glance that the storage racks have an influence on subsequent processing, but they do have a clear effect. It is essential that the support surfaces remain at the same level. The glass edges must lie evenly on several support points and so the glass can be stored more or less free of stress (see image above).

If, on the other hand, the supports are inclined or of different heights or the support surface is worn on one side, stress is induced in the glass, which can be noticeable in the glass cutting process through increased glass breakage.



2. GLASS TEMPERATURE AND HUMIDITY

Hot, cold, warm, dry, moist: Essential factors that should be considered in order to optimise the glass cutting process. Laminated glasses consist of a laminated layer of two flat glasses joined together by a foil (PVB, EVA, Setry glass, etc.). Due to their physical properties, glass and foil have different temperature behaviour and this must be taken into account during processing, especially when glass cutting.

Glass is a brittle material. The colder the more brittle, the warmer the softer. The foil has similar properties, but unfortunately in a different temperature range. Air humidity also influences the properties of the foil.

Whether summer in Australia or winter in Norway - laminated glass is transported by truck and therefore assumes the ambient temperature during transport. In extreme cases, glass packages can have a core temperature of minus 20 °C to plus 60 °C on delivery. The acclimatisation of the glass to the temperature in the glass storage can take up to a few days!

There is no predetermined processing temperature on the part of the glass manufacturer. However, a processing temperature above 20 °C has a positive effect on the subsequent cutting process. Freshly delivered glass should acclimatise in the glass storage for 2-3 days. This way the glass cutting temperature can be kept stable and the glass storage always remains well filled.



Tip:

When redesigning a production hall or expanding an existing one, it has proved successful to position the tempering oven close to the glass storage area. The waste heat thus automatically heats the glass storage.

3. GLASS HANDLING

The 2 t or 5 t packages are placed in the storage area by the internal loader truck. From the glass storage to the cutting lines, however, the sheets must be transported individually. Please note that the glass loading or the handling device can also have an influence on the later processing.



Simple handling devices for manual loading usually consist of several vacuum suction cups attached to one design (see picture above). If the vacuum suction cups are arranged too tightly, central stress is created during the lifting process. A lifting device with vacuum suction arms that distribute the lifting forces over the entire surface should be preferred.

With automatic loading devices, care must be taken to ensure that they have a sufficiently large quantity of vacuum suction arms in order to distribute the forces better over the entire surface. It is better to use a FlyOver feed. A FlyOver feed has only one vacuum suction bar, which sucks in the glass sheet at the upper edge. The glass sheet therefore hangs freely and is not additionally clamped.



4. STRESS IN THE GLASS

The glass is of the best quality, the storage is suitable, the temperature is in the ideal range and even the handling of the raw glass storage sheets does not introduce any additional stresses into the laminated glass, but nevertheless it is difficult to cut. Often a glance into the glass storage is sufficient and stresses in the laminated glass can be visibly detected. Even if the flat glass sheets are apparently manufactured identically and flow out in a float glass plant on a tin bath, each individual glass sheet is unique.

Marginal unevenness is caused when two glass lites sheets are then joined by the foil to form a laminated glass, a raw material that is stressed in itself.

This stress pattern is very well visible in the glass storage (see image above arrow). Reflections of geometrically straight surfaces are no longer straight, but become waves or arcs. This is a clear sign of a stress range.



Experience has shown that the cutting parameters and tools such as cutting wheels must be adapted for such batches. If there is any doubt, then in some cases the only option is to complain to the glass supplier.

CONCLUSION: HOW THE STORAGE AFFECTS THE GLASS CUTTING

Not only the quality of the laminated glass, but also its storage and handling must be taken into account during processing. In this case it depends on the supports of the glass frames, handling machines can create stresses and glass must acclimatise before processing. Before starting processing, it is worth taking a look at the glass storage: Stresses can easily be visually detected.

CHAPTER 3

Chapter Overview

The third chapter deals with the three essential tools for LSG cutting - the cutting wheel, the crusher roller and the foil cutting blade. Flawless end products naturally require them to be in perfect condition and optimally matched to each other. The following important aspects will be addressed:

1. Cutting wheel
2. Crusher roller
3. Foil cutting blade

Due to the specific properties of laminated safety glass (LSG), a number of factors must also be taken into account when processing this material. After all, the shaped parts not only have to meet very high quality and functional standards, in most cases the aesthetic and visual requirements for the finished products are also extremely high. When cutting LSG, the systems and tools used therefore also play an essential role when it comes to achieving the best results.

In this blog article we deal in detail with what to pay attention to when handling the respective machines and tools.

“If the cutting wheel is blunt or has the wrong angle, the best machine won't help.”

The three essential tools for cutting LSG are the cutting wheel, the crusher roller and the foil cutting blade. These three must not only be individually in top condition, but must also be optimally matched to each other when they interact. Of course, regular and appropriate maintenance of the individual tools is also necessary in order to be able to cut laminated glass professionally and properly.



1. CUTTING WHEEL

In glass cutting, the cutting wheel is the connection between machine and material and thus the most important component. The following applies in principle: Only the right cutting wheel with the correct angle and well-oiled makes the cut sing - that is, it cuts optimally. It is indeed the case: When the cutting wheel moves cleanly and neatly over the hard glass surface, it is music to the ears of the professional glass cutter. A clean cut is the prerequisite for crushing the glass as desired afterwards. Since cutting wheels also wear out at some point, it is absolutely essential to check them regularly for their condition.

Tip:

Our systems automatically record the consumption for each cutting wheel used and indicate when a cutting wheel change is required.

The characteristics of the cuts are divided into Active (A), Basic (B) or Contact Plus (CP) depending on the fineness.

- Active: Cut for Standard and Low-e glass lites sheets
- Basic: Cut for thin glass lites sheets or mirrors
- Contact Plus: Grinding for increased cutting pressures - especially for special shape cutting and trim cutting

In order to prevent a so-called shelling-out of the scoring furrow, it is also important to ensure that sufficient cutting oil is always used and that the angle of the cutting wheel is optimally selected.

The cutting oil fulfils a very special function. Since glass is basically a type of polycrystalline liquid, the micro-fissures that occur during cutting tend to grow together again or "heal". The cutting oil fills these micro-fissures and prevents this process, so that the glass can then be broken perfectly and with much less force and energy.



In addition, the pressure or cutting force, cutting speed and acceleration must also be adapted to the respective glass.

Here are a few rules of thumb for a clean cut:

The thinner the glass,

- the more acute the angle ($135^\circ - 90^\circ$)
- the lower the pressure or cutting force (60 N - 10 N) and
- the finer the cut

• The thicker the glass,

- the more obtuse the angle ($135^\circ - 165^\circ$)
- the higher the pressure or cutting force (60 N - 250 N) and
- the coarser the cut

If all these parameters have been taken into consideration, nothing stands in the way of a beautiful, smooth cutting edge.

Tip:

When buying cutting wheels, make sure that they have already been properly run in by a professional!

This is because the running-in process will shape the future running meters of each cutting wheel - which of course has a decisive influence on the cutting quality.

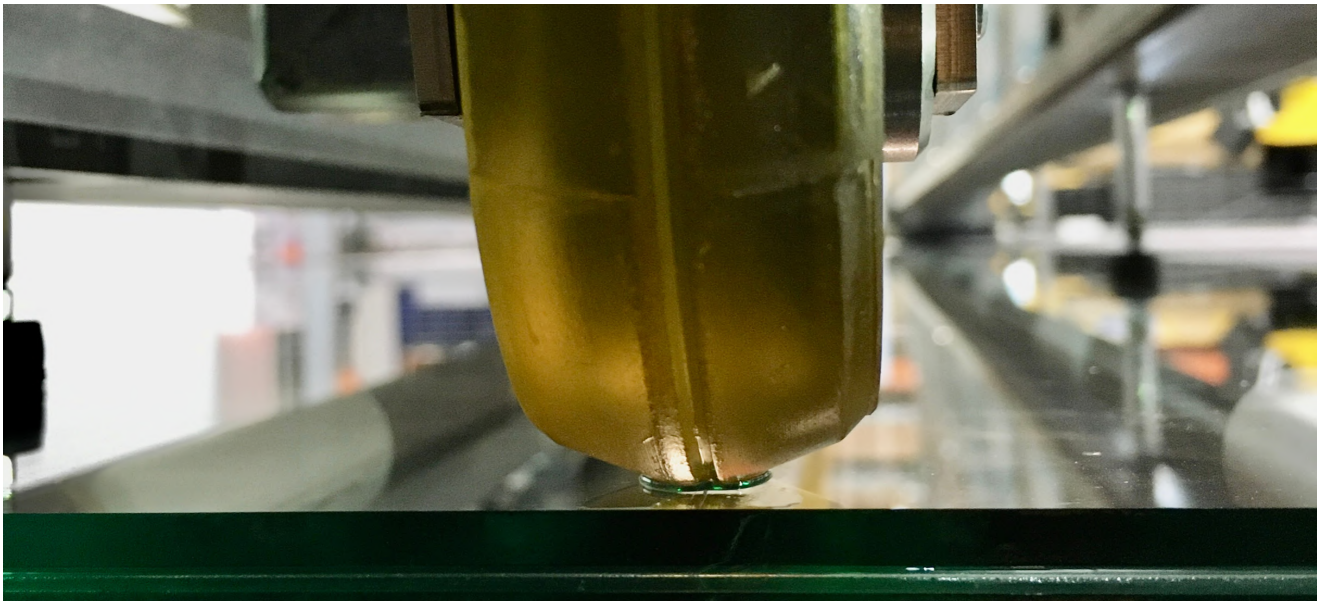
Due to our decades of know-how as an original equipment manufacturer, we trust in the Cutmaster Gold carbide cutting wheels from the manufacturer. These are provided with a titanium nitride coating (TiN coating) and are characterised by an enormously long service life. In addition, they are already retracted and enable a very stable, consistent cutting process.

2. CRUSH ROLLER

The crusher roller is used in the next work step of the glass cutting process. This is located directly on the rear cutting head and after cutting the glass is placed on the scoring edge with a certain pressure to crush the laminated glass - this applies: When the crusher roller runs along the top of the laminated glass, the lower glass is crushed - when it runs along the bottom, the upper glass is crushed. One thing is particularly important here: the correct geometry of the crusher roller! This is because it must travel exactly over the crack edge of the glass.

Tip:

Use LiSEC crusher rollers. We have continuously developed these over the decades and they therefore have the optimum geometry for every use. And remember: Crusher rollers also wear out and have to be maintained accordingly. In the LiSEC maintenance recommendation (operating instructions), all the necessary details can be found.



3. FOIL CUTTING BLADE

Last but not least, the PVB foil of the laminated glass sandwich has to be cut. To do this, a foil cutting blade is used which, after the cutting wheels, is the second most important tool for glass cutting. It is particularly important that the foil cutting blade is not only very sharp but also in perfect condition so that the foil is cut cleanly along the edge of the glass and thus prevents what is known as "delamination".

In the worst case, the glass edge can be destroyed if the foil cutting blade is in a poor condition. As part of our commitment to continuous process improvement, we have used all our expertise to find a blade that delivers optimum cutting results while maintaining high durability.

LiSEC therefore relies on a round blade. The advantage: Each blade wears out over the course of a day's use. In contrast to conventional blades, the round blade can easily be readjusted up to three times and thus sharpened before it has to be replaced.

Tip:

After each cut, check whether the foil cutting blade is still in good condition! The LiSEC “Automatic Blade Control” control device helps you enormously, because it automatically reports if the blade is worn or even broken.

Conclusion: Cutting the laminated glass: How the tool affects the glass cutting

If you want to achieve the best results when cutting laminated glass, you not only need professional machines and tools, but you also need to ensure that all components are optimally matched to each other for the respective use and are maintained accordingly. This means that cutting wheels and foil cutting blades must always be sharp and in perfect condition and the crusher roller must have the appropriate geometry.

In the next article we will look at how the design of the machine affects the glass cutting: “The best machines are of little use if the laminated glass does not lie flat on the work surface.”

CHAPTER 4

HOW THE DESIGN OF THE MACHINE AFFECTS THE GLASS CUTTING OF LAMINATED GLASS

Chapter overview

There are also numerous influencing factors to consider when handling the machines for cutting laminated glass. This is because it really is a matter of millimetres - that is, all components must be checked regularly and readjusted and aligned as a unit so that no stresses are applied to the glass.

The following important aspects will be addressed:

1. Level of the felt
2. Synchronisation of the cutting heads and settings of the foil heater
3. Level of suction cups, laminate material is raised

Cutting laminated glass requires a total of three machines, which must be joined together to form one unit. However, the cutting process is not only influenced by the quality of the devices themselves, but also by the correct horizontal positioning and regular maintenance and inspection.

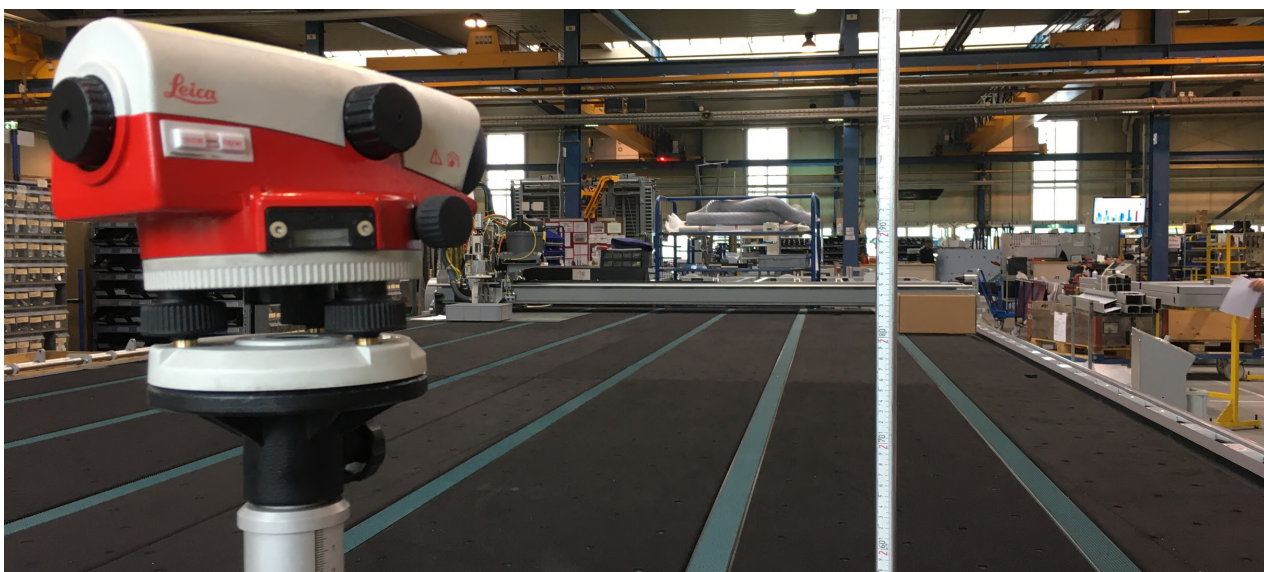
Even if everything has been correctly positioned, fastened, adjusted and coordinated so it is level from the very beginning, the production unit must be checked again and again. The reason for this is quite simple: The ground on which the production hall stands is always in motion. The ground rises and sinks over the years, which of course also affects the position of the machine. The level of the individual components should therefore be checked and adjusted approximately every six months, since even slight differences in level can lead to stresses and unclean cuts, and in extreme cases even to false fractures.

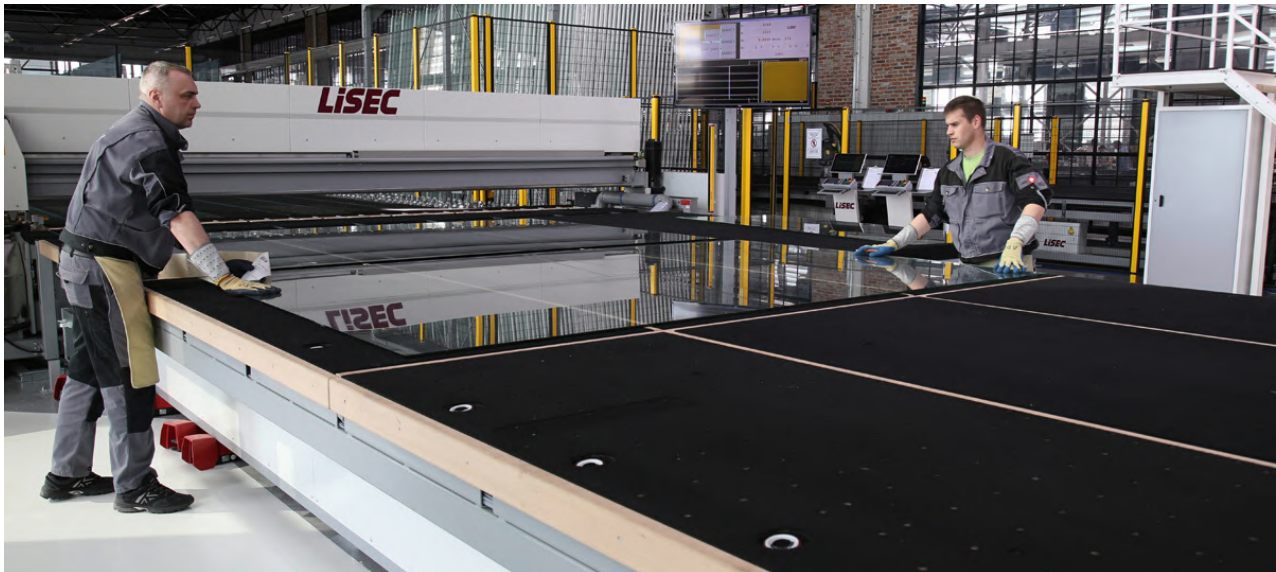
In addition, there are a lot of other details to consider in connection with the machines, which we would like to discuss in more detail in this blog article.

“The best machines are of little use if the laminated glass does not lie flat on the work surface.”

1. LEVEL OF THE FELT

LiSEC generally uses a 6 x 3.3 metre jumbo sheet (raw glass sheet) as the starting product for manufacturing the various glass units. During the cutting process, this jumbo sheet rests on the working surfaces of the three machines, which in turn are covered with a special felt. A blower forces air through this coating so that the glass sheet floats over the machines during cutting. Since this so-called air cushion felt also wears out over time and level differences can occur, it must also be constantly checked.



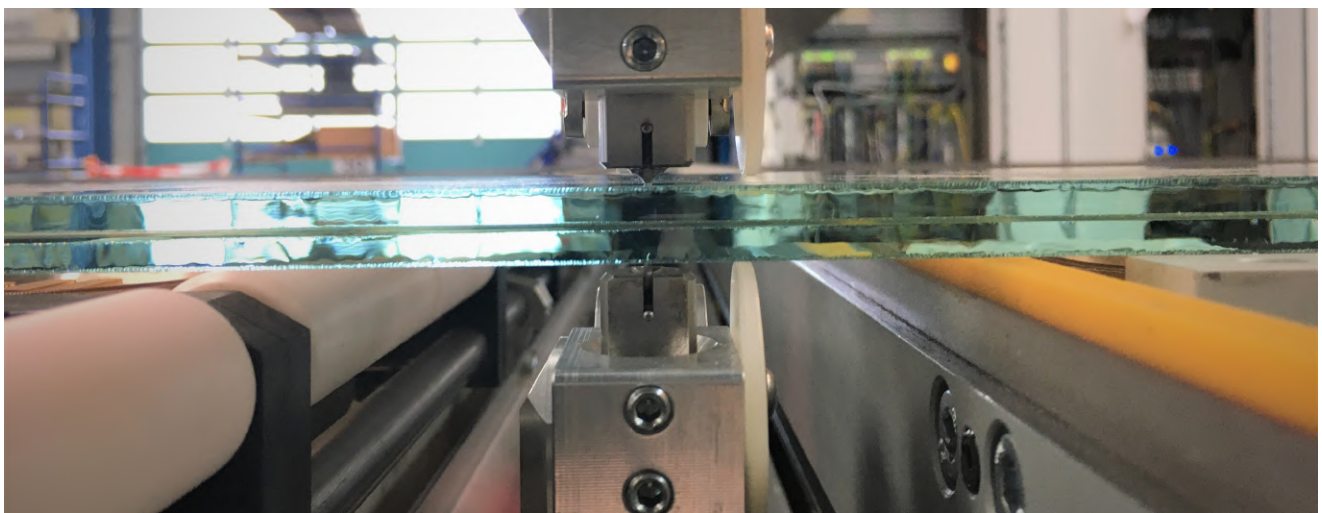


Tip:

Check the levels of the complete machine group every six months to ensure that all components are always optimally matched to each other and level. This also applies to the air cushion felt, which must be replaced in the event of heavy wear. In the field of laminated glass cutting, LiSEC relies on a newly developed, very robust felt that can easily be used for several years.

2. SYNCHRONISATION OF THE CUTTING HEADS AND SETTINGS OF THE FOIL HEATER

Particularly when cutting a laminated glass sandwich (glass-foil-glass), the positioning of the cutting heads and wheels is of utmost importance, as this material has to be cut simultaneously from below and above. In order to produce a precise cutting edge, it is absolutely essential that the cutting heads, including the cutting wheels, are placed exactly on top of each other on the glass, i.e. that they are not offset from each other, as otherwise a step or offset occurs during cutting, which in turn can lead to difficulties when cutting through the foil and during subsequent crushing.



The foil of the laminated glass must then be cut. For this purpose it is heated from below. This is achieved by means of foil heaters (infrared radiators), which concentrate the heating effect over a certain area using a gold coating as a reflector. Therefore, the distance between the foil heater and the glass underside is extremely important.

At a distance of approx. 1 mm, the foil heater works most effectively because it heats the foil and not the glass. This not only ensures clean and accurate foil cuts, but also saves a lot of energy, while at the same time significantly increasing the output of the system.



Attention:

Cleaning the machine can damage the gold coating of the foil heater, which in turn reduces its reflectivity. In this case, the entire infrared radiator should be replaced. Since 2018 LiSEC has been using 900 mm long SIR - Selective Infrared foil heaters. Depending on the cutting length of the system, up to seven heating modules can be assembled in a row to form one unit.

The great advantage of this system is that only the module with the gold coating destroyed and not the entire length, as is the case with conventional one-piece solutions, has to be replaced. Incidentally: LiSEC also offers this SIR - Selective Infrared foil heater - for retrofitting older machines.

Tip:

Check the cutting heads and cutting wheels once per shift as well as the distance between the foil heater and the lower edge of the glass.

3. LEVEL OF SUCTION CUPS, LAMINATE MATERIAL IS RAISED

Throughout the cutting process, the laminated glass is fixed by suction cups positioned on the left and right along the entire cutting line. It is particularly important to ensure that they are all positioned at the same level and that the vacuum or the suction force (the vacuum ratio) is 100% identical so that no stresses are introduced into the glass.

Since Lucite release agent is also used in glass storage to prevent the sheets from sticking together, the vacuum should also be checked regularly - at least once a week. The suction processes can of course also cause Lucite to enter the suction cups' valves and subsequently clog them, resulting in an imbalance in suction power.



Tip:

With the LiSEC suction cup control device, you always have the vacuum of your system firmly under control. This is available from us as a spare part. For machines built before 2012, LiSEC also offers a very flexible vacuum suction cup level modification kit.

Conclusion: How the design of the machine affects the glass cutting

In order to achieve consistently perfect results when processing laminated glass as a material, it is absolutely essential to continuously monitor the entire cutting process and to constantly readjust and coordinate the individual components. Optimum coordination of the individual machines with each other is just as important as a flat work surface and the correct positioning of cutting heads and cutting wheels. But also the distance of the foil heater to the underside of the glass and the uniform vacuum level play a decisive role when it comes to achieving the best end results. In the next chapter, we will answer the question "How the maintenance of the machine affects the glass cutting". There are some important aspects to consider here as well.

CHAPTER 5

WHAT YOU NEED TO BEAR IN MIND WHEN MAINTAINING YOUR LAMINATED GLASS CUTTING MACHINES

Chapter overview

It goes without saying that proper maintenance of all system components is also necessary for a clean cut of your laminated glass. Chapter five goes one step further and outlines how you can significantly increase the performance of your machines by taking a few additional measures and always achieve the best results. The following important aspects will be addressed:

1. Cleaning of the vacuum suction cups
2. Checking the return valves
3. Checking parameters and settings

As we have already emphasised in the previous chapter, the correct handling of the machines plays an essential role in the clean and high-quality cutting of laminated glass. And, of course, proper production also includes regular maintenance of all components.

However, this involves much more than routine cleaning and basic servicing of the system components according to the operating instructions or the corresponding check and lubrication of the bearings. In addition to these, there are a number of other aspects that should be considered in order to improve the performance of the machines and the quality of the products.

In this blog article we are therefore focusing on the following three points:

- Cleaning of the vacuum suction cups
- Checking the return valves
- Checking parameters and settings

“Only those who not only do their duty in terms of maintenance, but also their freestyle routine, will achieve truly satisfactory results.”

1. CLEANING OF THE VACUUM SUCTION CUPS

The vacuum suction cups are permanently in contact with the glass. It should therefore also be one of the priority daily tasks to inspect them and check their suction power. This is because the Lucite release agent is used to prevent the individual sheets from sticking together when the laminated glass is stored.

The Lucite is also enriched with dust from the warehouse and even the smallest glass particles are added during the cutting process. Together with the cutting oil, this results in a mixture that gets into the vacuum suction cups where it can lead to adhesions which in turn impair the suction power.

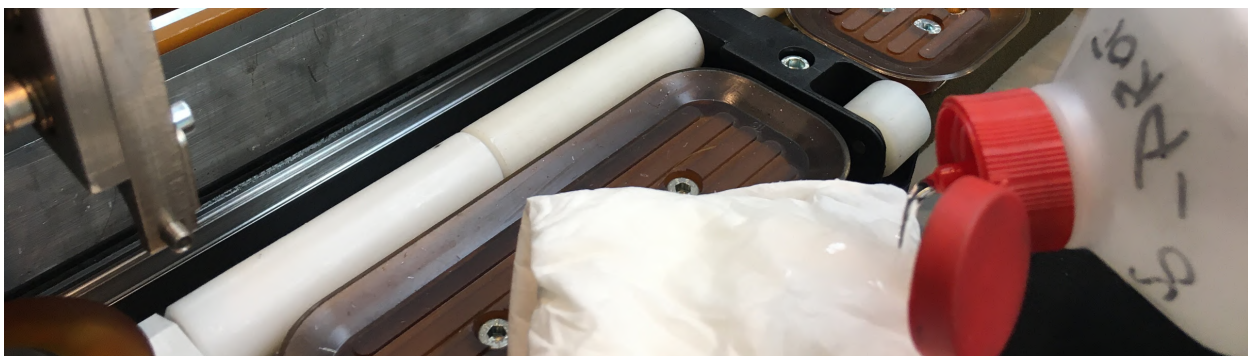
This leads to different vacuum levels for the individual suction cups, which can then no longer fix the glass properly. This not only causes the laminated glass sheet to slip during cutting, it also means that the gap necessary to cut the foil can no longer be opened wide enough.

However, this scenario can be avoided if the first symptoms are correctly interpreted and then acted upon. However, it is often the case that longer production times and inadequate gap formation are answered by increasing the force of the vacuum suction cups.

However, this also changes the parameters and the downward spiral takes its course - even more Lucite, cutting oil, dust and glass particles are sucked in and the performance of the machine drops further. Yet the problem could have been solved by simply cleaning the suction cups.

Tip:

Keep your hands away from water and conventional detergents. As a rule, these only cause the impurities to become smeared, which is even counter-productive. Simply use a cloth moistened with spirit to clean the vacuum suction cups. This makes it easy to solve the problem and compensate for the vacuum level. This leads to a stable gap opening process and reduces the cutting times of the glass, which ultimately also saves a lot of energy and increases the output of the system.



2. CHECKING THE RETURN VALVES

The second most important work step in maintenance is to regularly check the return valves, which are also part of the vacuum suction cups. They are located in the pipe through which the air is extracted or evacuated. The return valves ensure that all suction cups that do not rest on the glass surface stop sucking air.

They are therefore responsible for an even and strong vacuum, which enables a stable gap opening during the cutting process. Of course, they can also be contaminated with Lucite, cutting oil, dust and glass particles and lose their performance. For this reason, the return valves must also be checked accordingly, once per shift.

This is done with what is known as the return valve control device. This one looks like a stethoscope. Just like a doctor listens to his patients, you can listen to your machine's vacuum suction cups and thus detect and eliminate any blockages.



Tip:

In newer generations of machines, vacuum suction cups are usually no longer used. The gap opening for cutting the foil is achieved by means of clamping bar technology, which can be operated largely maintenance-free.

3. CHECKING PARAMETERS AND SETTINGS

Checking the parameters and settings of the machines is also an essential part of regular maintenance. It is particularly important to ensure that the reference values in which the recipe parameters for the respective system are located are recorded in a best-practice list. This is the only way to check whether everything is still running within the ideal range or - as described above - is already incorrectly parametrised due to contamination.

If this is the case, immediate action must be taken. All components should then be completely cleaned. When setting the parameters according to the best practice list, it is advisable to make a test cut and return to the ideal state step by step.

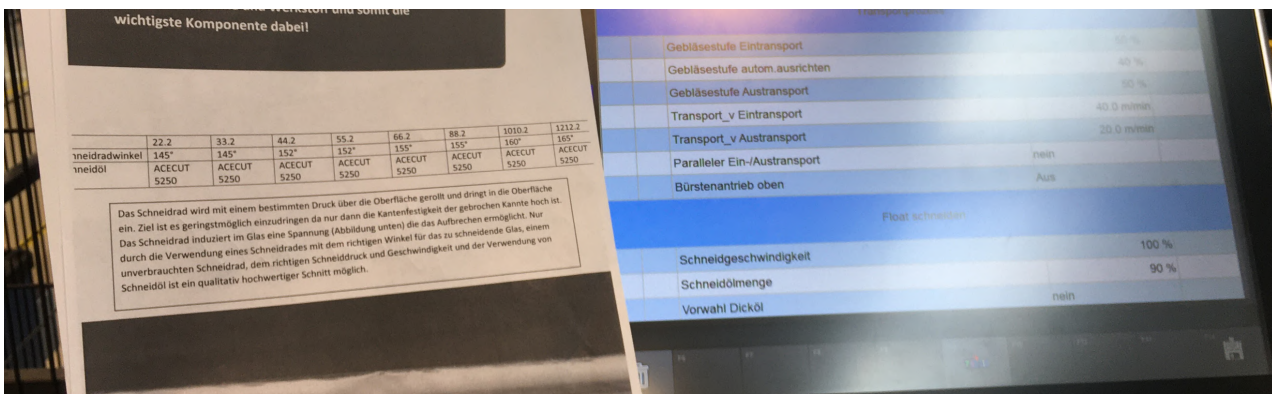
Tip:

Always pay attention to the best-practice parameters of your machines in the maintained state. An optimal reference point for this can be found in the "Parameters" document, which you can download at the end of this article. It lists the best practice parameter sets from the ranges 22.1 to 88.2 in detail.

Conclusion: Maintenance of laminated glass cutting machines

We at LiSEC observe time and again in practice that inadequate maintenance of vacuum suction cups and return valves often leads to contamination of these sensitive components, which in turn leads to sub-optimal results. Based on misinterpretations of the first symptoms, the parameters are then often changed, which not only reduces the performance of the machines, but can also lead to significantly more malfunctioning. The recipe parameters should also always be kept within the ideal or best practice range in order to achieve truly satisfactory results.

In the next chapter, we will look in detail at how improvements to the machine affect glass cutting.



CHAPTER 6

HOW YOU CAN BENEFIT FROM THE INNOVATIONS IN GLASS CUTTING MACHINES FOR LAMINATED GLASS

Chapter overview

The wheel of time also keeps spinning further and further in the field of laminated glass cutting. New, advanced solutions that promise improvements in production processes are constantly coming onto the market. Of course, this raises the question of whether a new purchase or an upgrade of the existing system is the key to success. After all, the objective is to interrupt production as briefly as possible, if at all.

The following important aspects will be addressed:

1. "Anti-stress" vacuum beam modification
2. "SIR Selective Infra Red" foil heater
3. Automatic cutting/crushing pressure control + "Cutting wheel monitor" HMI update (Human Machine Interface)

For 25 years LiSEC has been working at the highest international level with machines for cutting laminated glass. If there is one thing we have learned in this quarter of a century, it is the fact that improvements are always possible. And this is exactly what we - together with our numerous customers - have continuously worked on.

In keeping with the motto "Improving the tried and tested for lasting success", we have developed a series of optimisation and retrofitting options for our customers' systems that lead to a significant increase in cutting performance and significantly better results. In this blog post, we would like to introduce you to the major advances that have been available since 2001.

"If you think it is no longer possible, LiSEC will come up with the right solution."

Purchasing a new machine is not always the right answer to acute problems. This is because production sometimes has to be shut down for a certain period of time. Especially when you are in the middle of processing an important order and the deadline is mercilessly approaching, a quick and simple solution is usually required.

Even in such situations LiSEC has the right answers to ensure the economic success of its customers without interrupting or disrupting the production process. Among the most important innovations are the following three points:

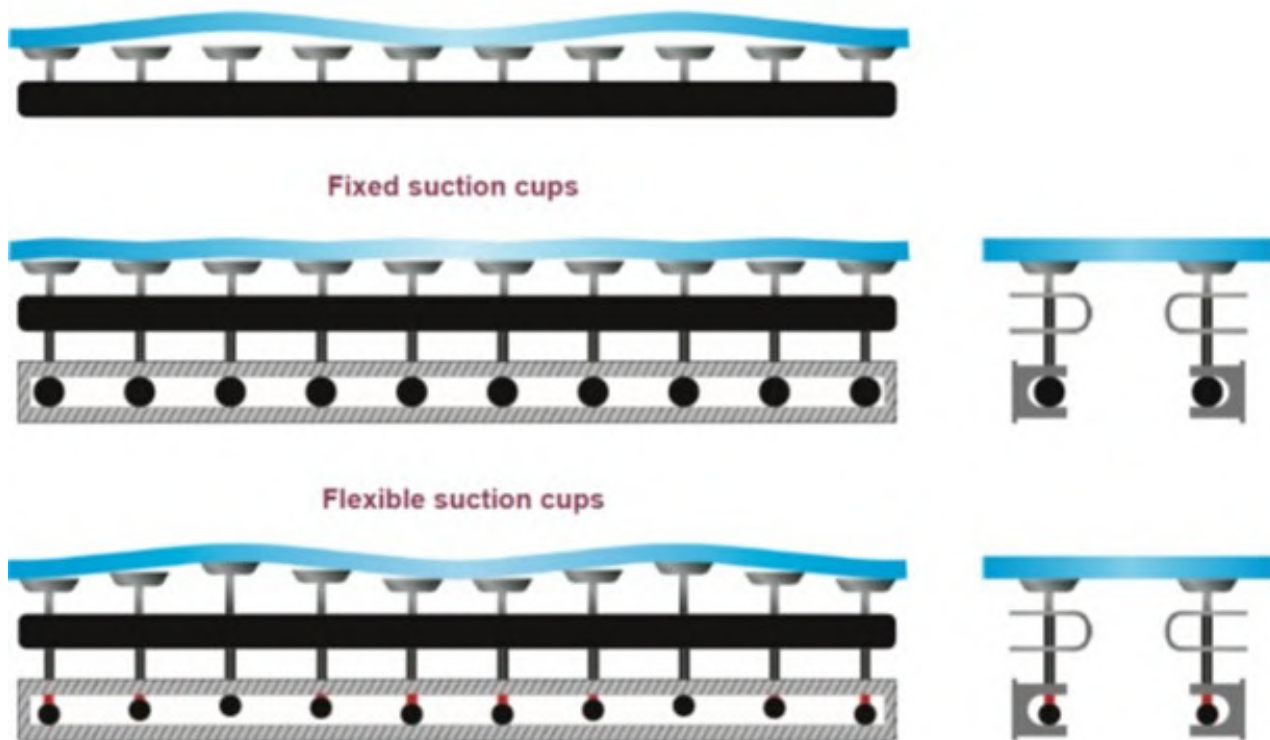
- “Anti-stress” vacuum beam modification - increases fracture stability
- “SIR Selective Infra Red” foil heater - increases cutting performance
- Automatic cutting/crushing pressure control + “Cutting wheel monitor” HMI update - simplifies operation and reduces errors

1. “ANTI-STRESS” VACUUM BEAM MODIFICATION

Laminated glass is already a very individual material. Very often, the individual sheets also come with a deformed or discarded surface, which can be traced back to production and storage. If these are then fixed to the flat working surfaces of the machines, this leads to tension in the glass, which in turn can lead to problems during cutting or crushing.

To prevent this phenomenon, the LiSEC “Long Life” department offers the “Anti Stress” vacuum beam modification, for example, which is suitable for systems from 2012. Each vacuum suction cup has a certain tolerance, which means that the machines adapt to the warp of the respective sheet so that no additional stress is applied to the glass.

The retrofitting process does not take longer than one working day. The pins of the suction cups are provided with a travel compensator to compensate for deformations in the tenth of a millimetre range. This significantly reduces false breakage.



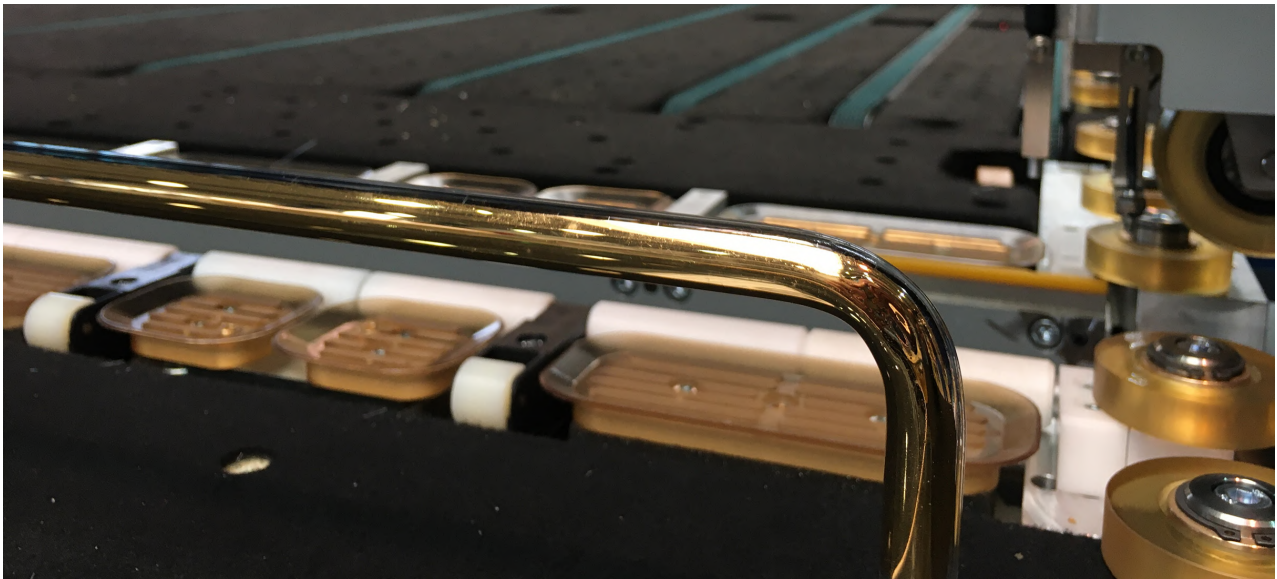
Tip:

If you have your machines retrofitted with the “Anti Stress” vacuum beam by LiSEC Long Life experts, then you will benefit double. This is because the technician not only carries out the modification, he also checks the parameters, adjusts them if necessary, supervises production and gives valuable tips for a perfect cutting result.

2. “SIR SELECTIVE INFRA RED” FOIL HEATER

When cutting laminated glass, heating the foil is the work step that most influences the duration of the entire process. This means that an optimisation of this procedure also makes the greatest increase in performance possible and thus the energy saving potential is greatest. The aim is to heat the foil as quickly as possible and the glass itself as little as possible. Since 2018 LiSEC has been using a segmented foil heater for this purpose - the SIR - Selective Infra Red foil heater - with which the heating time can be reduced to a 1/4. Depending on the cutting length of the system, heating modules up to seven 900 mm long are assembled in a row to form a unit. Compared to a continuous heating strip, this consumes significantly less energy.

In addition, the individual radiators are cheaper, much easier to transport and much less bulky to store. Moreover, only the module that is currently broken needs to be replaced and not the entire length.



Tip:

If you have an existing system (VB/VBN) in use, then the heating modification is worthwhile in any case, as it can achieve a lot of performance and also save operating costs.

3. AUTOMATIC CUTTING/CRUSHING PRESSURE CONTROL + "CUTTING WHEEL MONITOR" HMI UPDATE [HUMAN MACHINE INTERFACE]

As a rule, glass sheets of different thicknesses with different parameters are processed, cut and crushed on a daily basis. On older machines, the respective settings must be made manually. The automatic cutting/crushing pressure control provides a simple remedy in this respect.

With this optimisation, this happens automatically, which not only saves a lot of time, but also ensures smooth production. In addition, the number of operating errors, which are usually associated with additional costs, is reduced to a minimum.

In addition, an update of the visualisation can also be carried out as part of the retrofitting in order to update the HMI or the operation of the machine. This will make the numerous improvements that LiSEC has developed over the years fully available.

These include, for example, the cutting wheel monitor, with which each cutting wheel can be monitored and, if necessary, replaced in good time. In addition, the running meters are logged and the machine makes a recommendation for the optimum cutting wheel for the respective glass on the basis of the data stored in the recipe.

Tip:

Writing down the cutting parameters on a piece of paper was yesterday. Today, laminated glass cutting 4.0 is the order of the day - the machine regulates the parameters automatically and autonomously. This saves time, costs and nerves.

CONCLUSION:

HOW YOU CAN BENEFIT FROM THE IMPROVEMENTS IN GLASS CUTTING MACHINES

Improvements to existing machines always pay off and actually pay for themselves. The “Anti Stress” bar, for example, demonstrably reduces the false breakage, which also lowers the overall operating costs. Optimisation of the foil heater leads to shorter cutting times and a more productive system. Thanks to automation, any operating errors can be eliminated. Incidentally: A machine of the latest generation has all these functions as standard.

SUMMARY

LiSEC has been active in the industrial processing of laminated glass for 25 years now. Since then, we have been continuously working on improving the entire cutting process as well as on optimising the machines required to ensure that our customers always achieve the best results. This is because the processing of this special material is influenced by many factors. From production and storage through to handling machines and tools - every single work step within the production chain must be carried out professionally to ensure a clean cut. And of course the expertise and experience of the users also play a major role when it comes to avoiding misinterpretations of symptoms in the quality control of finished products and the associated incorrect measures.

What questions now come to mind after reading this white paper? An expert would be more than happy to take the time to find a solution for your individual challenges.



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