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Re-Tie Bangladesh: Reduction of **E**nvironmental **T**hreats and **I**ncrease of **E**xportability of Bangladeshi Leather Products

RE-BLADING MANUAL

Prepared for the Government of Bangladesh by the
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

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Explanatory Notes

Abbreviations used in the report should be mentioned in this chapter

BFLLFEA	Bangladesh Finished Leather, Leathergoods & Footwear Exporters' Association
BTA	Bangladesh Tanners Association
DCCI	Dhaka Chamber of Commerce & Industry
DGB	Diameter in the bottom of the groove
EU/EC	European Union/European Commission
OHS	Occupational health and safety
Re-Tie	Reduction of environmental threats and increase of exportability of Bangladeshi leather products
UNIDO	UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATIONS

1. ABSTRACT AND/OR (EXECUTIVE) SUMMARY

Previous reports made by international experts, have emphasized the need for improvement regarding OHS.
One element of OHS, which is contained in the knowledge and expertise of the workforce, is the skill of re blading.
Malpractice and lack of knowledge in this area, have initiated the manufacturing of the manual presented in this report. This report is prepared as a manual for re blading of cylinders, for the use in tannery industry.

2. Occupational health and safety – background information

In the various experts reports from their field missions, most have a section concerning Occupational health and safety (OHS).
The reports all state, and justifiably so, that in the tannery compound at Hazaribagh, the situation regarding OHS, is generally poor. Some tanneries are better than others in this field. In general it is the most advanced and modern that has the better performances.
Looking at the number of injuries that take place every year, unfortunately also including some fatality episodes, the situation can only be described as dramatic.
That being said, and based on the reports presented, one also has to ask what will bring the greater achievements towards improving the situation.

It has already long been agreed that the industry at present in the Hazaribagh area, shall be relocated to a new site; the industrial area prepared at Savar. It is also becoming more and more clear that not all of the tanneries in today's complex will take this relocating step.

To spend a lot of money and effort to rectify buildings that are to be abandoned seems not to be the best way. This will add to the already vast expenses facing the tanneries in the process of relocation. On the other hand, today's situation cannot go on indefinitely. While some aspects are too important to postpone, others can be delayed in order to avoid having to spend too much resources on a site that is to be abandoned.

What basically is needed is a "true" deadline for allowed operation at today's site. It is well known that a lot of deadlines have already been set, only to be disregarded when expired, and a new deadline is then put forward. If this is to be the situation also in the future, there is no alternative but to implement the stringent safety measures in today's premises.

Those tanneries willing and committed to relocate should start acting on their verbal commitment. Those not willing or incapable of, relocating should start the process of closing down their operation. To ensure that this will happen, a last day of operation at Hazaribagh, should be agreed upon within the end of 2011. If the date set is more than 2 years from now, there is no alternative but to enforce the real implementation of OHS measures at Hazaribagh.
If this were to happen, the tannery industry in Bangladesh will have lost a significant proportion of not only goodwill, but also in pure business in relation to its competitors.
Already, some European buyers are getting pressure from their governments, to ensure they purchase from factories where a minimum of safety standards, workers conditions and pollution are taken seriously. Equally important is the fact that today's crowded situation causes the tanneries to operate inefficiently. The majority of the competitors have new modern building enabling them to operate efficiently, and they operate at an OHS level that makes them more attractive to European buyers.

2.1. Knowledge versus physical environment

OHS is dependent on several factors. One is the physical environment – the tannery building, electrical set up, etc. Another is the human factor – the knowledge and attitude of the workers, including how to safely repair and operate machinery. The human factor is not tied to a location. One particular operation which is dependent on knowledge and the human factor is re blading. It is performed today, and will continue to take place also after relocation. This operation will as such benefit from

immediate rectification. Today's practise is in most cases hazardous, and unless proper action is taken will continue to be so.

Several experts have reported on the quality of work related to re blading. This operation is performed throughout the world's tannery industry. If performed wrong, with wrong or insufficient material or with no knowledge on the subject, it can, and will be, dangerous and outright lethal. As a direct result, the following manual on showing the key elements of proper re blading has been produced.

Re blading is generally performed on shaving machines at regular intervals, at fleshing machines periodically, and on setting out machines after years of operation. The principle is, however, the same, and performance will only alter as a result of cylinder size.

The manual is intended for the benefit of re bladers and their immediate superiors. Naturally, as correct re blading is closely linked to the safe running of machinery and performance of such, the management should see the benefit of its implementation.

2.2. What causes the risk

The blades in fleshing machines and shaving machines are grinded to obtain a sharp cutting edge. During the pressure obtained in the machines this edge shall remove either fleshings, or leather fibres from the hides. The blades are made in a spiral. This is very important to the leather, because the force created by the blade will open up the leather sideways. This will prevent holes from being made in the processed leather. The sharper the blade is, and the more uniform the performance is, the smoother and cleaner the cutting will be.
If the blade were to be blunt, the cutting ability gets reduced, and tearing off the removed material, becomes the result.

Given a situation where a blade is cracked, or has any object attached to its side, a very serious situation can emerge.
The cylinder will in most cases revolve at approx 1500 rpm. Grinding keeps it sharp. In the near surroundings of the machine, workers will have their daily occupation. The machine operation causes a stress on the blades, which can - if the blade has a defect – cause it to break. The result might be that the blades cracks completely, and pieces might be released from the cylinder. It goes without saying that being close to a spinning cylinder, from which, WITH NO WARNING, suddenly steel pieces comes like a grenade splinter, is outright lethal.

This has happened in the past, and can also happen in the future.
This risk has to be minimised, and the following manual, is an attempt to achieve that.

Figure 1 Foreign object used to cover a crack in the blade

3. Steel and steel structures.

Modern steel is manufactured from a base consisting of recycled scrap steel, mixed with new ore. During melting, analyses are made to determine what quality steel the melting will result in. The quality of the steel determines what it will be used for. Some steel will be used for reinforcement in building, while better qualities will end as construction steel.
Some qualities will end as bolts. These can be machined to among other things cylinders for the tanning industry. Higher quality steel with properties at a higher level can end as the base for blade manufacturing.

Simply put, the steel required for cylinders will be a soft but strong steel. This is easily machined, but strong enough to take the stress that will be put upon the finished product. The typical properties for such steel is firstly, as mentioned, that it is soft, and easy to machine. In addition it is flexible, and will take a relatively large length altering without having a structural deformation.

In short, steel that can bend without being permanently deformed.

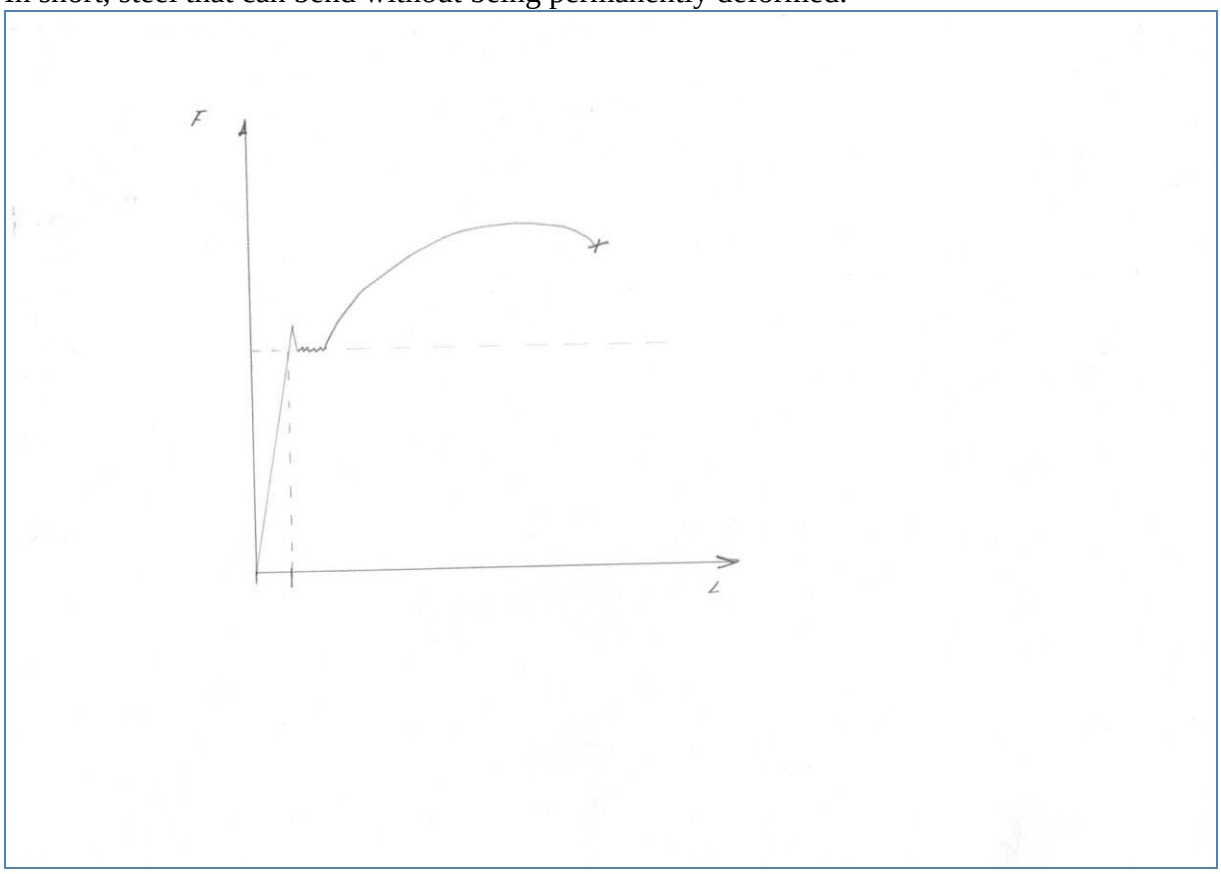

Figure 2 Diagram showing stress yield

Such steel has some significant effects, which we shall return to.

Other steel qualities can be treated in order to change its properties and performances into something completely different.
The most common change is the change in hardness. But this change also gives other effects. Firstly, that the hardness later needs adjustment, and secondly a dramatic change in the steels ability to flex. This reduced flexibility results in an enlarged risk of the steel cracking and or breaking.
In effect, the steel gains in hardness, but suffers in flexibility.

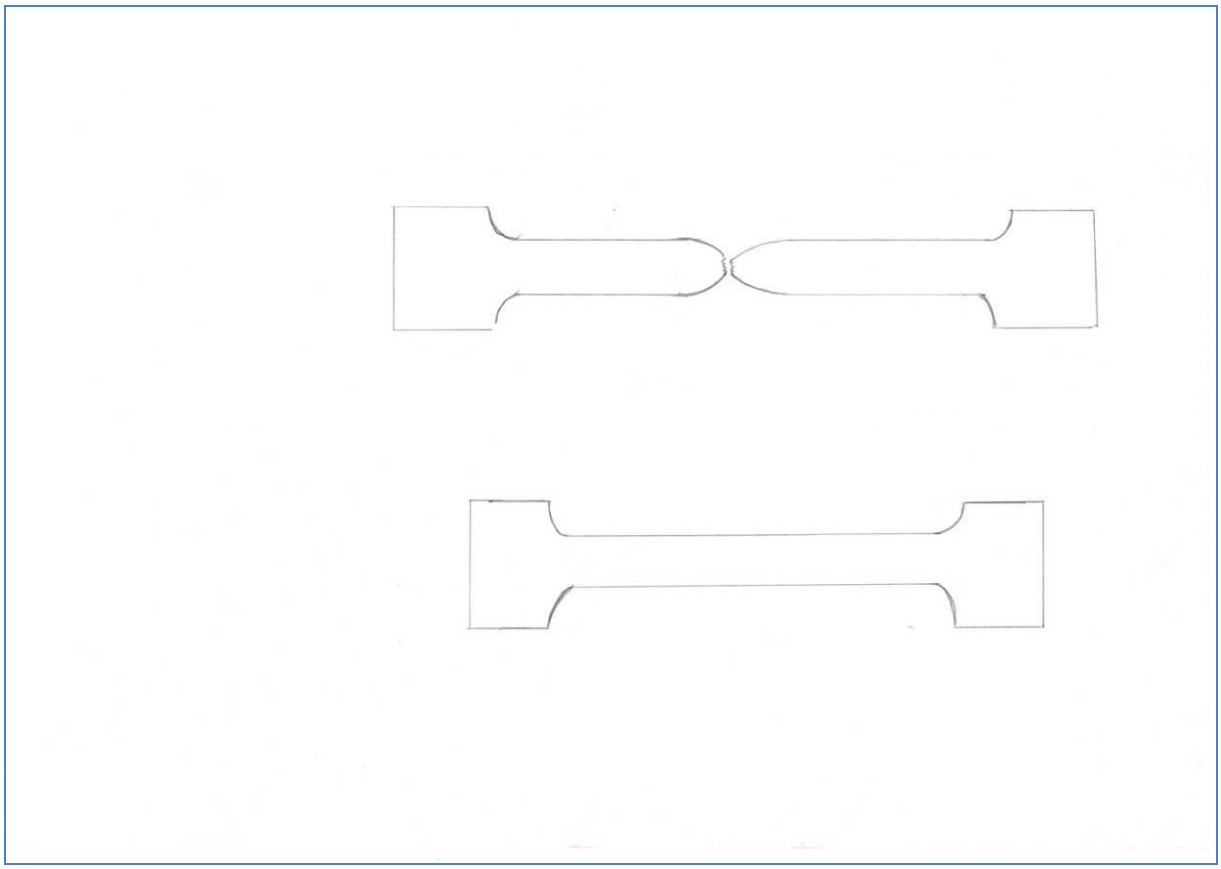

Figure 3 Illustration of sample rod being pulled apart

2.1. How cylinders are made.

The cylinder will be machined firstly in a lathe. One of the first things to be done is to make centre holes in both shaft ends. These centre holes are extremely important and must be preserved, as any future re machining or fitting in a lathe, will require the centre holes intact.
Therefore, while using pullers to remove bearing houses, always remember to have something between the pulley and the hole.
After making the centre holes, the cylinder is machined to the desired specifications, and when finished will be a smooth bolt with all dimensions as required.
Then a special milling unit is put in the lathe and a disk milling tool is used to cut the grooves.
The grooves will be made according to the dimensions and requirements set by the manufacturer and will have the following base selection:

- **Pitch**, which is the distance along the cylinder per one revolution.
- **Diameter in the bottom of the groove**, (DBG) which is the inner diameter of the blade.
- **Width of groove**, which is the total width of the groove. This shall accommodate the thickness of the blade, plus the thickness of the caulking.

All these parameters for the groove are vital for the correct re blading in the future.
After all machining is finished on the cylinder, it needs to be balanced.
This takes place in a highly sophisticated balancing machine, of far higher quality than what is found in an ordinary re blading machine.
If a correction of balance is needed, holes will be drilled into the surface (between the grooves). When the cylinder is correctly balanced, it is complete and ready to be bladed.

Blades will be made, as mentioned, from a different steel composition than the cylinder.
Here we want to achieve a hardness, which will give a cutting edge that lasts as long as possible.
To make blades from hard steel is not possible. Therefore the steel has a certain amount of Carbon in the structure. The amount of carbon needs to be more than 0, 8%. Any less, and the steel cannot be hardened. But on the other hand, if there is too much Carbon, the brittleness and coarseness of the steel will reduce its strength.

It may be relevant at this point , to explain briefly why steel can change its hardness.
When in a soft stage, the steel structure will, if studied in a microscope, show as course, with dots of carbon scattered in between. When heated, generally above 721 degree C, the inner structure will change to a finer structure, and the carbon will melt and distribute evenly in the structure.
If now allowed to cool in air temperature, nothing will happen, apart from what is commonly referred to as “normalising heat treatment”.
However, if the steel is suddenly cooled, from the heated temperature, the carbon will not have time to crystalline again, but will remain evenly distributed, maintaining the fine structure.
Now, if reheated to the same temperature, and allowed to cool in air, the original softness will reappear.
This is mentioned, as we later will see problems occurring from unwanted heat treatment.
Returning to the first heating and rapid cooling, we will have got a hardened steel.
If left alone, with no further treatment, the steel will be too brittle to have any usefulness. Further treatment is therefore needed, and it will take the form of what is referred to as tempering.
What is done is that the steel is brought up again in temperature, but less than first step. Approximately (because it will vary) 180-250 degree C. The length of time the temperature is kept, and the medium for cooling, water or oil, will contribute to the result.
In some cases, the action is repeated so as again to allow variations.
The blades will be made from a steel type, having the properties to fulfil the treatment described above, and will be delivered to the manufacturer as a steel band in coils.
Normally a first step will be to grind the coil on both surfaces so as to remove possible cracks from the manufacturing.
It will then be heated and while hot, be pulled into the shape, and dimensions wanted
As its being produced in “endless” spiral, it is cut off at intervals according to the “length of cut”.
Note that most blades will be a little longer (5-15cm) than final length. This is by two reasons.
Getting an accurate cut is difficult, but more important is the risk of the cutting leaving cracks.
These off cuts are therefore not to be used, in machines.

2.2 Caulking.

Caulking is the strip of metal used to fix the blade into the groove.
Traditionally, it was a soft iron strip, later to be replaced with brass and or copper.
It can be parallel or it can be tapered for an easier entry.
Normal now is a parallel copper strip, preferably relatively soft.

Its function is to while hammered, it shall be compressed, and while being so, also expands sideways, and thereby locking the blade in the correct position.
The reuse of old caulking is as recycled and not to be reused

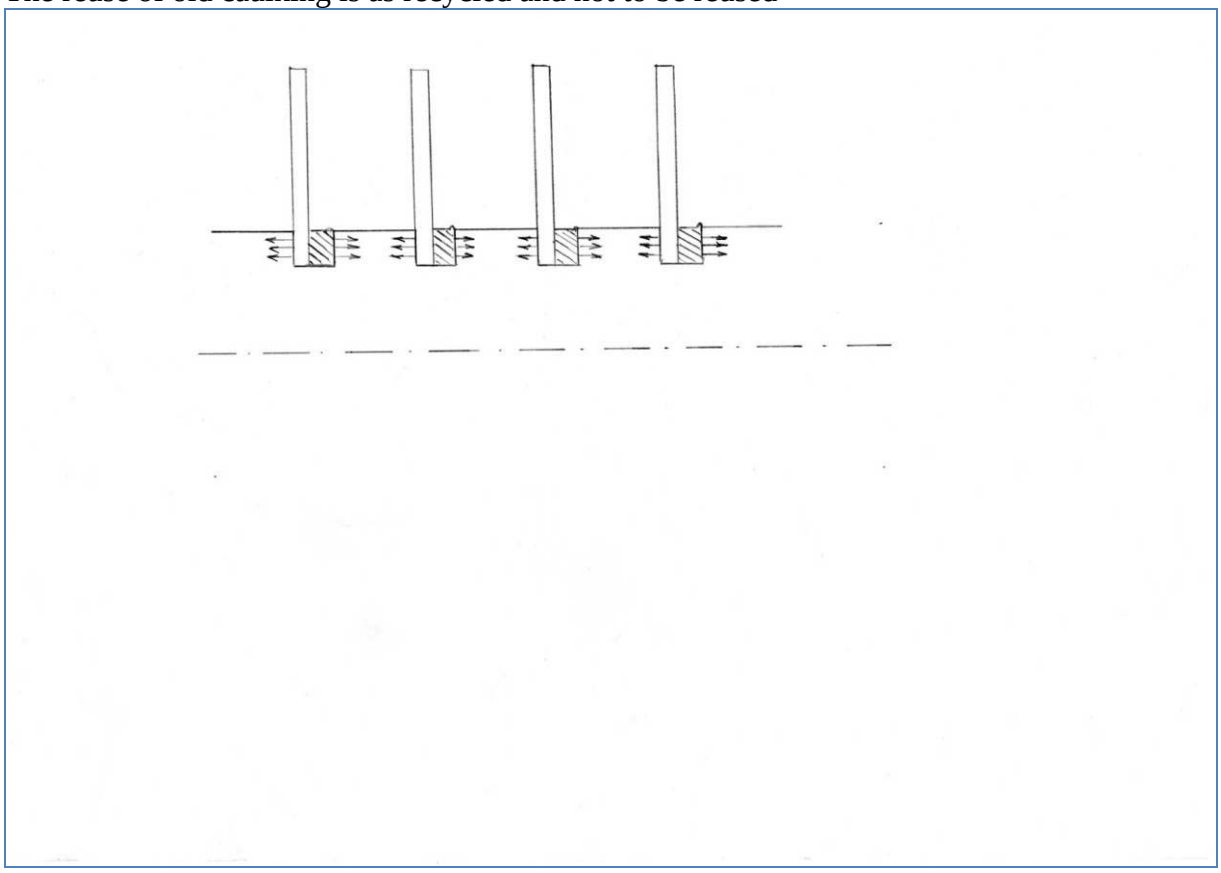

Figure 4 Direction of forces from caulking

3. Manual - The re blading process

De- and re blading of a cylinder is a skilled operation that must be carried out in sequences and with great attention to detail and precision. This chapter will describe the process in detail, and will emphasize the key factors for a good result.

3.1. Tools

For de blading we need a thin chisel. Not wider than the caulking, so not as to damage the groove. This is the chisel that shall enter the groove.
Then we need a flat but blunt chisel. This shall try to lift the blade out of the groove, when we first start on a fresh blade.
We need a hammer.
We need a pair or several pliers or tongs.
A tube of approx. 30 mm diameter connected to a turning handle, a ratchet tool, or fixed to a drive unit.
For re blading we need a blunt chisel where the point is slightly thinner than the caulking, some old screw drivers (flat), a pneumatic hammer and a clamping device.

Figure 5 Tools needed for re blading

1. Special chisel to go inside the groove
2. Thin groove chisel, and curved pneumatic chisel
3. Pliers
4. Copper headed hammer to be used on blade tops
5. Ordinary hammer
6. Chisel to be used with hammer to be used in fastening caulking
7. Chisel for pneumatic hammer
8. Hand file
9. Pneumatic hammer
10. Micro meter with 500 mm measuring span, to be used between blades to check cylinder straightness
11. Noise protector
12. Safety goggles
13. Sturdy leather working gloves

3.2. De blading

Lifting the worn out cylinder from the machine.

A very good rule is that the first thing we do is to turn back the grinder, and adjust the machine to the utmost retracted position. This to avoid that we forget, and run the machine into contact when restarting.
Dismount all necessary screens, lower down the fan and disconnect the cylinders connecting point.
Strap in the cylinder preferably using some old splits or similar, to protect the cylinder, and the lifting strap from damage.
Make certain that the lifting gear has sufficient strength to carry the weight of the cylinder, and that the lifting gear is stable enough. The cylinder is heavy and can easily cause damage both to humans and machine.
Take care not to let cylinder ends (bearing section) hit any obstacle either while being removed, or while “landing” on the floor or on to a pallet..
Because the mass of the cylinder in proportion to the thinner ends is relatively huge, it takes surprisingly little to knock one end out of line, and thus render serious damage to the cylinder.
Bring the cylinder to the re blading section and put it in your bench, machine, or the fixture where you normally do your re blading.
On the floor is a very bad position, as the working position is awkward and the chance of a professional job has already diminished.
Make certain that the cylinder can rotate and is securely fixed so to avoid any hazards.
Try to have the installation towards a wall, or area where no people will be. The reason is that when we start working, steel pieces might be coming from the blade at high speed, and we do not want anyone to be hit.
A good way to start is to use the flat and blunt chisel to hit on the end of the blade. The blow, naturally, has to go lengthwise, in relation to the blade. If the blade starts to lift, then the caulking will become free, and can be lifted out of the groove with the thin groove chisel. When enough has come out to be reached with the plier or the tong, drag out more caulking, so as to have a 2-4 cm out over the top of the blade.

Figure 6 How to start removing the caulking by using chisel

Figure 7 Be careful to loosen chisel on regular intervals to avoid damage to cylinder

Figure 8 Lift enough of the caulking that you can grab it with pliers

Figure 9 Use of pliers minimizes the risk of breaking the caulking

You can then insert the pipe, which will have a hole drilled approximately 100 mm from the end. Put the caulking through the hole and twist the pipe, thereby locking the caulking inside the hole.

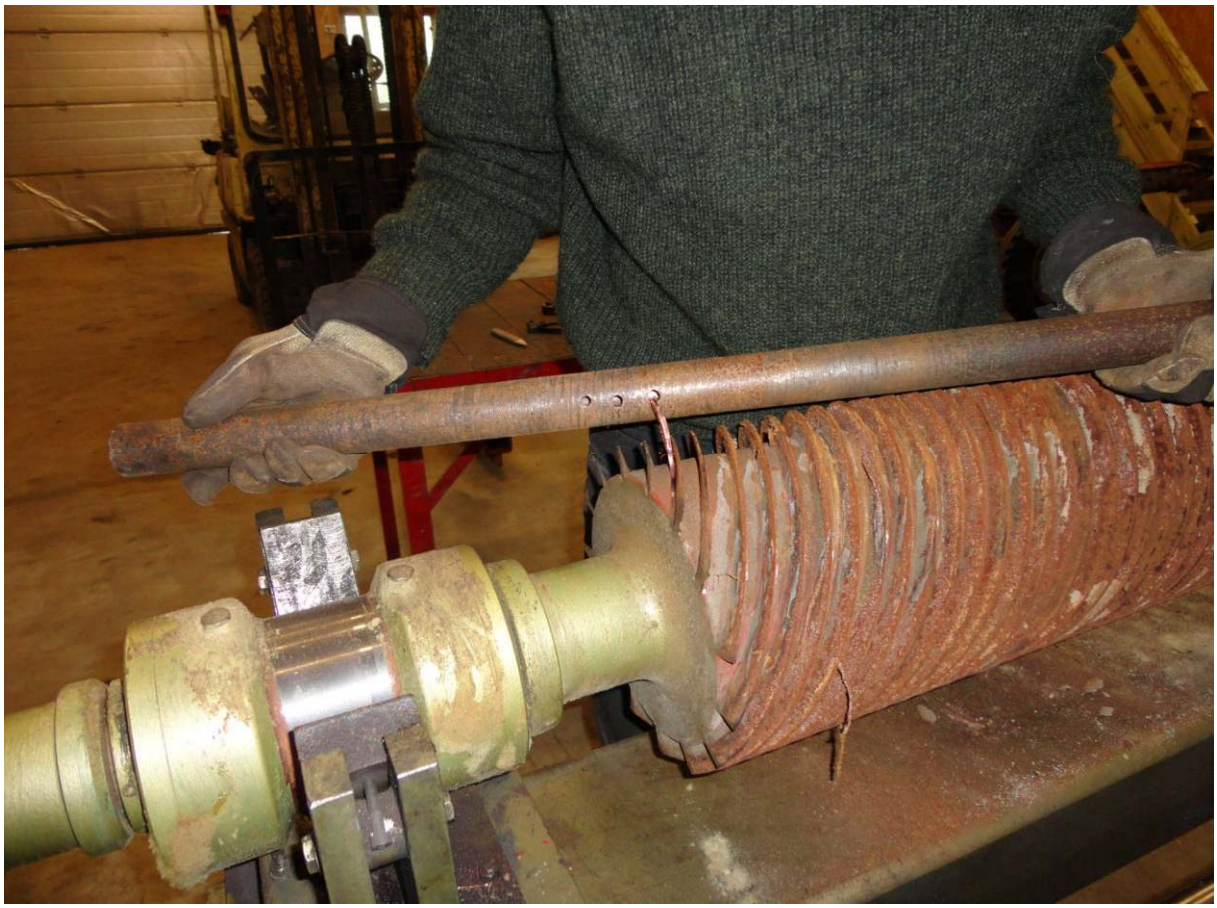

Figure 10 Insert the caulking in the pull off pipe.

Now use the handle, put the ratchet or apply the drive unit and keep turning the pipe.

Figure 11 Connect the pull off pipe to the pulling device/motor

If the previous blading was done properly, if the caulking is of good quality and if the grooves are undamaged from previous work, the caulking will now slide out of the groove with an even resistance.

Figure 12 Caulking being rolled on pipe

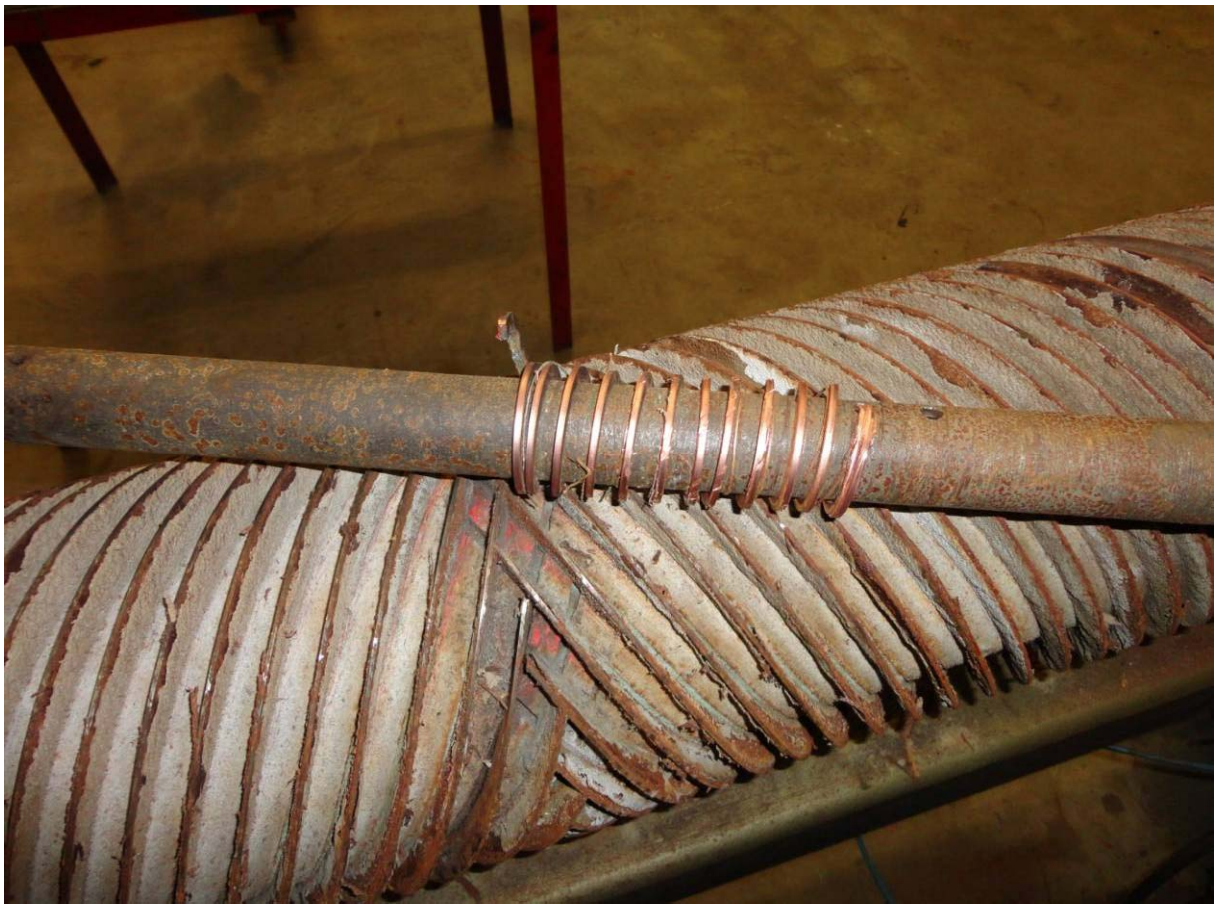

Figure 13 The caulking has been removed from one blade.

Given areas where loose, or very hard, it gives a picture of the unevenness of the previous performance during blading.
If this works, keep working until all blades on one side has been taken out, before changing side, and do likewise on the other side.
If the caulking tears apart, you have to dip into the groove with the groove chisel, to start again.
If this happens all the time, we change the approach, so as to avoid damaging the groove.

Figure 14 Special chisel for blade removing

One solution can be to use a curved chisel and get this one under the blade. The blade will now slide on top of the curved chisel together with the caulking, or the caulking might be left in the groove.
The inside curve of the chisel will slide on the cylinder surface. Better performance in this is given if a pneumatic hammer can be used.
Remember, when putting a new blade in, it shall also come out again. Excessive hammering while mounting, will lead to excessive problems getting it out again.
This is one of the main reasons why re blading is considered an experienced work.
The blade shall be fixed securely, but not overdone.

3.3. Inspection and preparing the cylinder for re blading

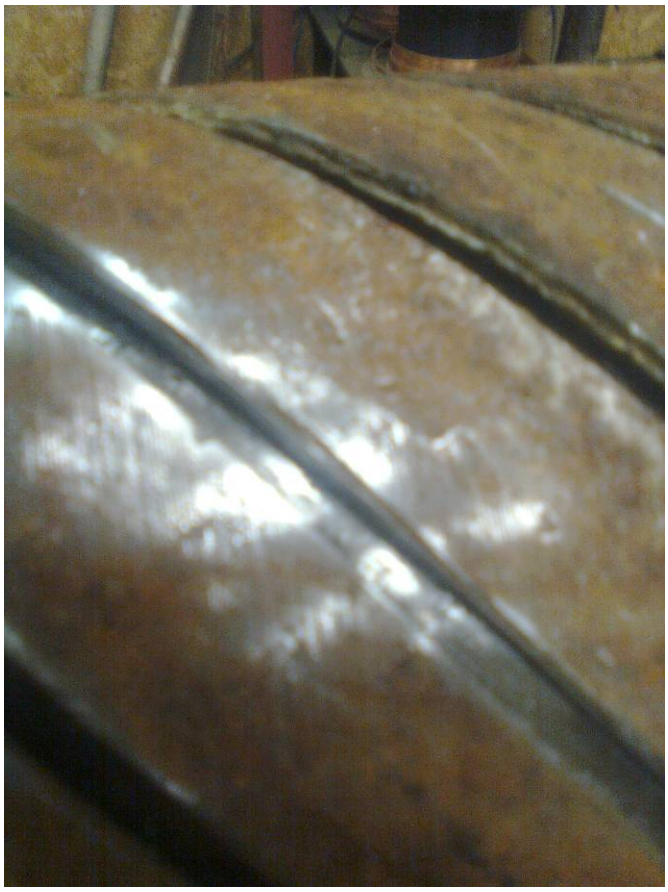

Figure 15 Typical example of damaged and repaired groove

When all blades are out, thoroughly clean the surface of the cylinder to remove remaining shavings, dirt and rust. Inspect the grooves for damage

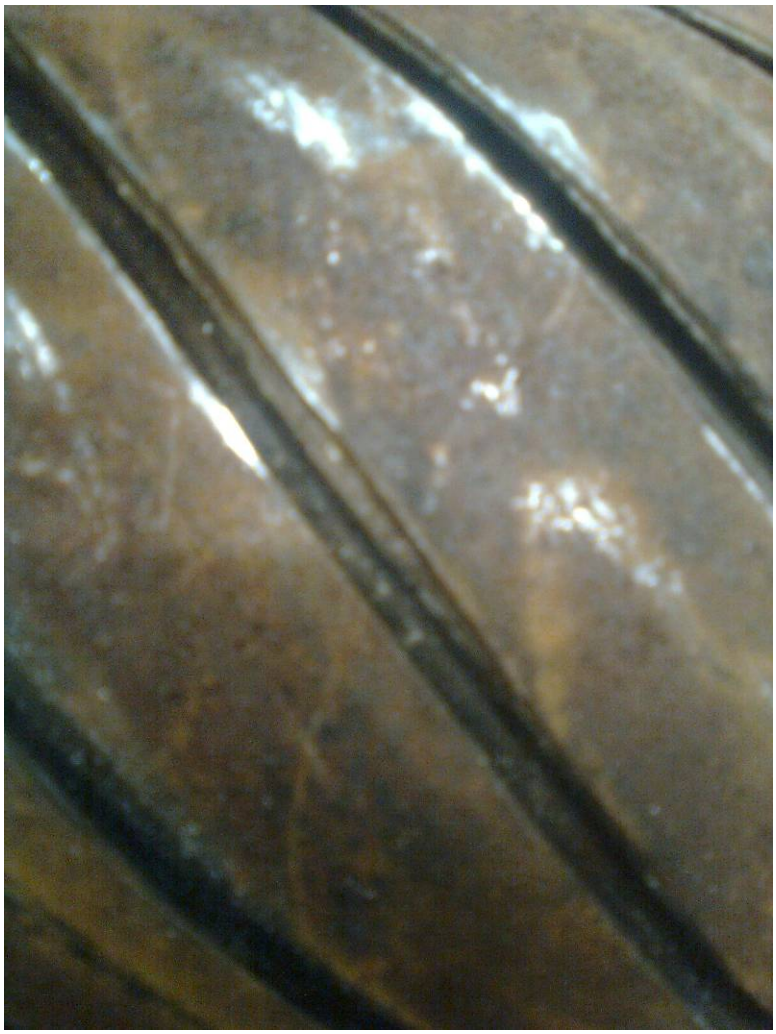

Figure 16 Groove damaged by the chisel hitting the cylinder instead of the caulking.

The pictures above show a cylinder where severe damage is done to the grooves.
It also shows the only thing we can do to correct, is to repair by hand file as best we can.
NOTE: This kind of repairs has a very limited possibility. Eventually, the groove will become too wide, and the cylinder is basically destroyed.

Figure 17 Undamaged grooves after removal of blade and caulking

When the cylinder is ready, cleaned and checked, we paint the surface. This to avoid corrosion and to have an easier job next we need to change the blades, because cleaning becomes easier.
We will also want to try to avoid spot corrosion which will make it difficult us to measure on the cylinder surface.

Figure 18 Freshly painted cylinder

3.4. New blades

The new blade will have a face side, and a back side.
On most blades, there is a marking, either in the form of a paper sticker, or at times we can identify the producers stamping in the steel. On some blades, there is a significant “tilt” on the blades clearly indicating which side is the cutting side.
In the case of a paper sticker, this will normally indicate the cutting side. If there is a producer’s name, this will normally be on the back side.

Figure 19 Blade displaying colour patterns from hardening and tempering.

Back side is what will rest against the groove wall, while cutting side will be the side for the caulking. Before inserting the new blade, clean it, if it is greased. The greasing is only to avoid corrosion during transport and storage. Shape the end going for the middle, to make certain it will have the correct shape. The correct shape has been reached when the blade meet the blade from the other side at a perfect fit.

3.5. Re blading

Figure 20 Shaping of blade end

Figure 21 A good fit in centre of cylinder is achieved by proper end adjustment.

Take care to avoid unnecessary stress in the blade in the meeting point. Such stress can make the blade crack.
Now fix the blade lightly but firmly with a little strip of caulking, approx. 5-7 cm long.

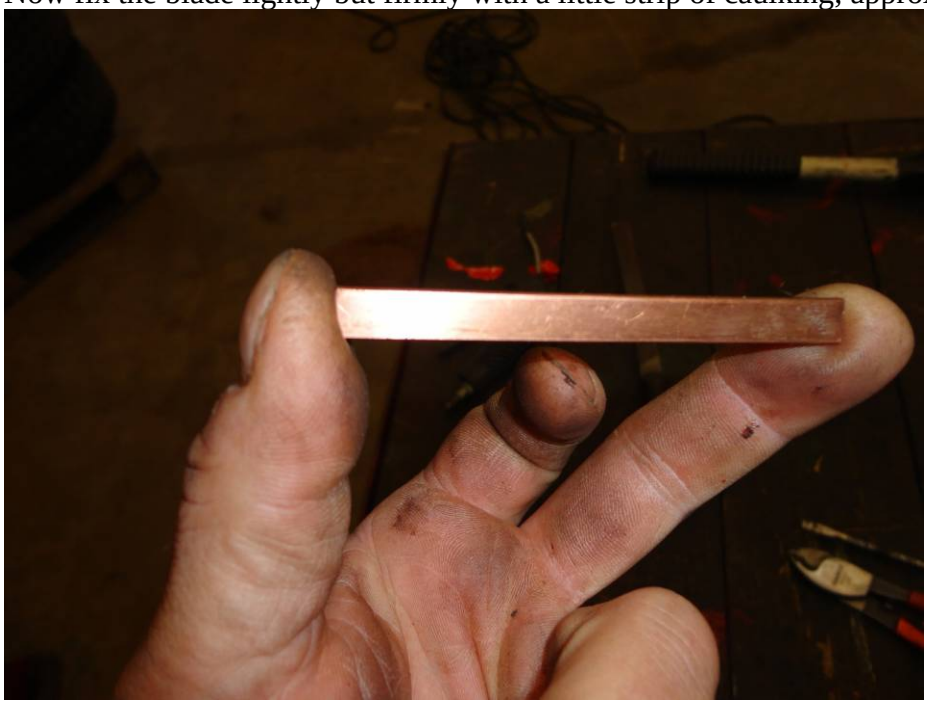

Figure 22 Strip of calking for initial fastening of blade

Tap on the blade top with the use of a COPPER hammer, to ensure that the blade is in the bottom of the groove.
Take a corresponding blade from the other side, in the same way.
Continue till all blades are mounted, and fixed, but only partly, in the centre of the cylinder.

NOTE: Some cylinders are cut to have a wider overlap in the centre. This is to reduce the pressure in the line, as this can be transferred to the leather, and on delicate leathers be visible.
Therefore some cylinders are made to have an overlap on every second blade, while on some you can find that 3 plus 3 blades will overlap.

When all blades are fixed, in the correct position, it only remains to hammer in the caulking over the entire blade length.
While doing this, it is very important that the blade is held down in the groove.
This can be done by a clamp, or as shown in the pictures in this manual, by the use of a wheel that will roll on the blade top, while the cylinder is revolving. The wheel is again pressed on top of the blade by a pneumatic cylinder. This is very important, as without this pressure, the caulking can go under the blade, and actually lift the blade from the bottom of the groove.
This would cause unbalance, as well as leaving the blade not properly supported.
The force used on the caulking to hammer it in, shall be enough to compress the caulking into expanding, and clamping the blade, but not so high as to inflict unnecessary strain in the cylinder.
A good measure for what is enough, is when one can see that the caulking gets "pushed" forward, in relation to the groove.
Also remember, the blade shall come out again, and if excessive force has been used, difficulties in de blading, with risk of groove damage, are the result.

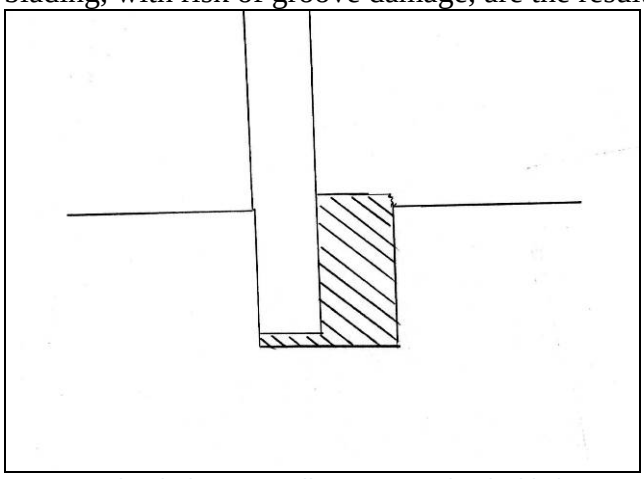

Figure 23 Sketch showing caulking going under the blade.

Figure 24 Blades meeting in centre of cylinder

4. Key factors for ensuring a proper re blading

Re blading is not simply a mechanical process. It requires a wide understanding of different types of steel, and how they will react to stress. This chapter will describe how stress and the equalizing of stress will be a part of re blading, and how to use these forces in a controlled fashion.

4.1. Steel – a changeable material

Now we shall talk a little over a few simple and elementary issues around steel that are familiar items to most engineers.
That steel can stretch we have briefly talked about already. Now we shall look into the difference between a stress that will cause a permanent and a temporarily shape alternation.
If a steel piece is hammered in one side only, this side will grow longer as a result of the stress and permanent deformation caused to the steel. It will bend. This deformation can in principle be compensated, by hammering the same amount on the other side.
The steel might turn straight again, but will be permanently longer. We have got a deformation that we cannot repair.
If you look at a cylinder, it looks difficult to bend. And yes, it is difficult to bend, if seen from a permanent point of view
However, as mentioned steel can stretch on load, and if the load it removed, the length increase will disappear.
The diagram below shows this yield stress where if a stress higher than the maximum, a permanent deformation will occur.

If the stress however is reduced, or removed, the original shape and length will reappear.

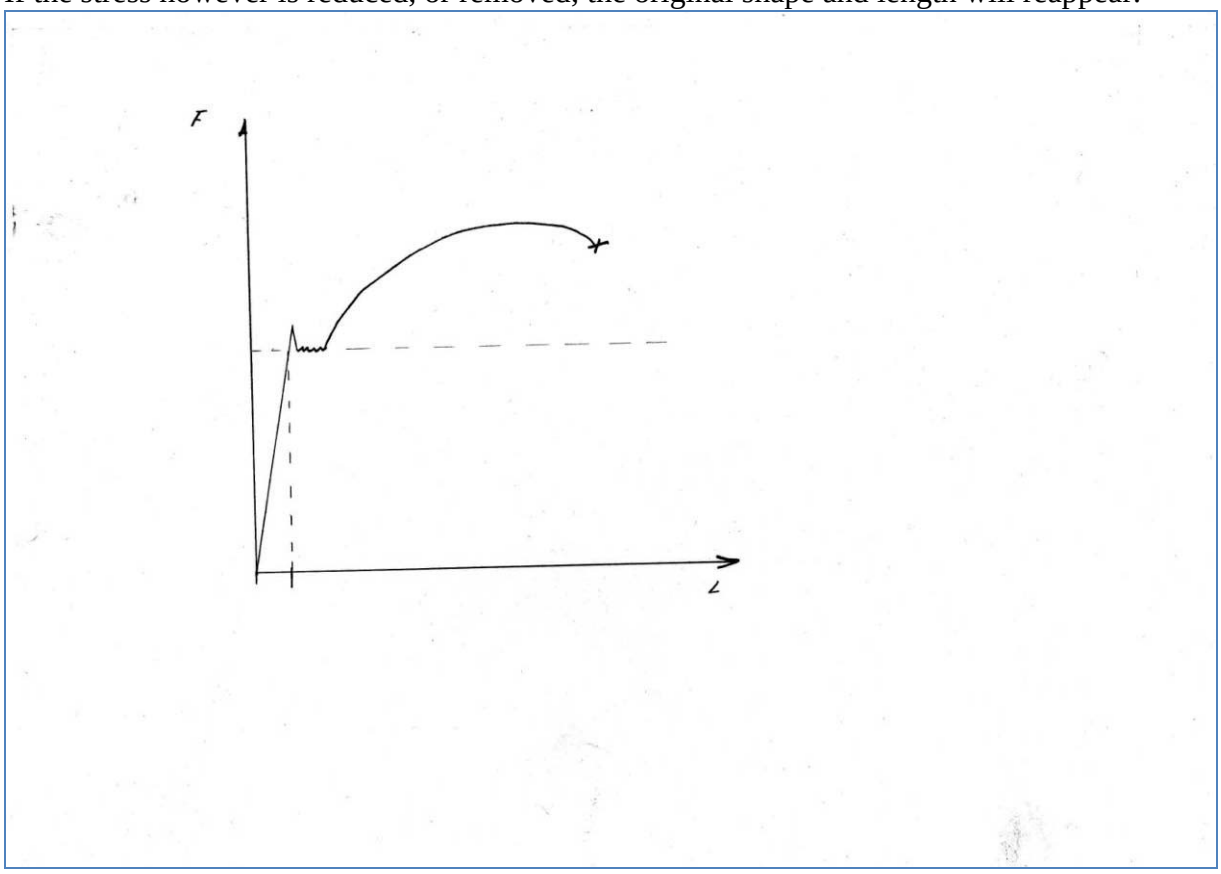

Figure 25 Stress yield diagram

It is very important to understand that while re blading, we can inflict a stress to the cylinder, which will cause a deformation. It is equally important to understand that this deformation is not permanent. The outcome of this is the fact that if this stress is equalized (even on the cylinder) it will stay straight. Now, it may seem strange that the relatively small force inflicted on a big cylinder, by a small hammer, can cause a deformation.

It is important here to emphasize that these Figures are for illustrative purposes only.

The force from the caulking will affect the cylinder as the next Figure shows

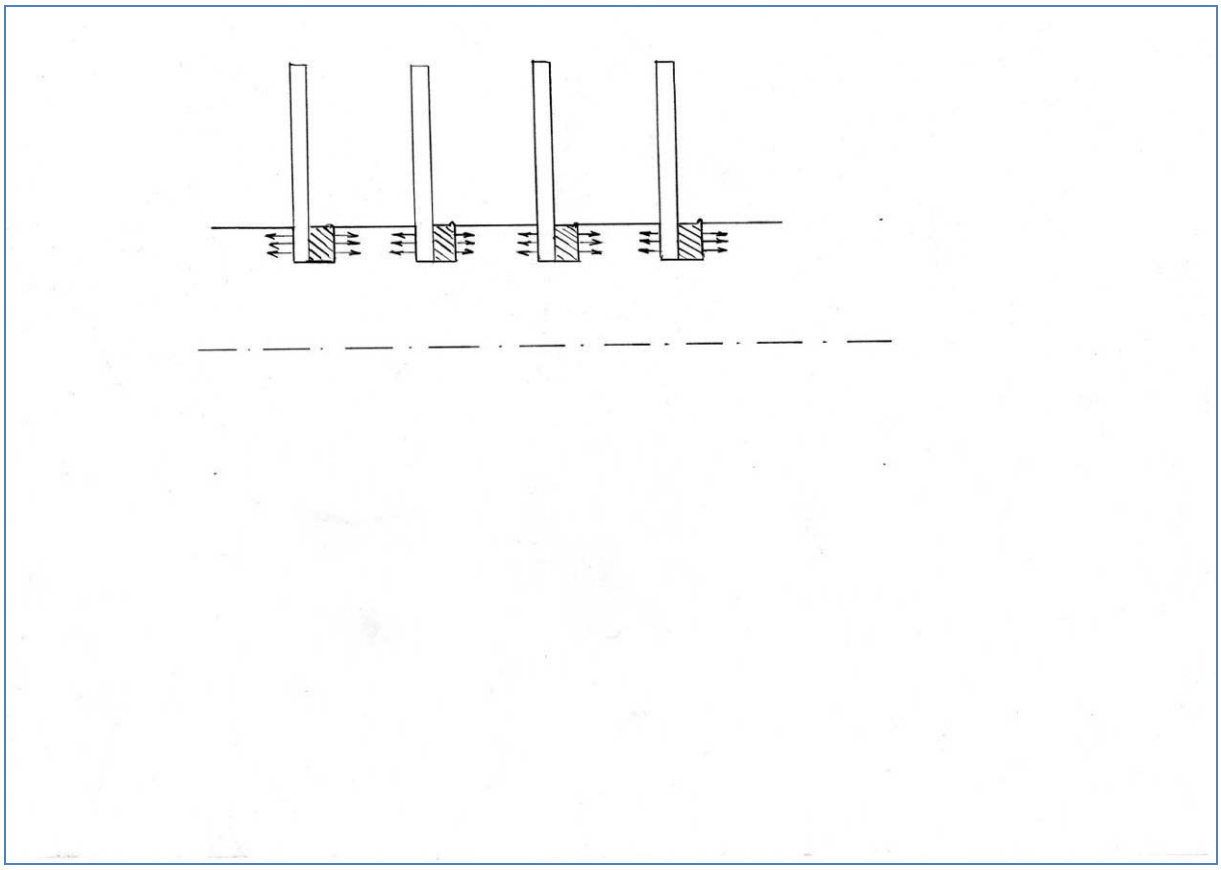

Figure 26 Direction of forces from caulking

The force applied to the caulking will almost entirely go sideways in the groove. On the groove wall on one side and via the blade, to the other groove wall.
If we do not manage to distribute the force to the caulking evenly all over the entire length, as well as keeping the same pressure all around the circle, chances are great that the cylinder will bend.
Now, here is a key element.
This bending is not a permanent deformation, but a stress causing the material to flex.

4.2. Uneven stress causes problems

The stress bending caused by unevenly applied force is not a permanent damage. This bending will however, have brought the cylinder out from its centre line.
This will again result in the cylinder being out of balance.
This unbalance shall however not be corrected in a balancing machine, because it is a result of the cylinder not being straight anymore, and is as such, not a true unbalance.

The solution to the problem is to straighten the cylinder, and thus re-establishing its true centreline.
This is done by first measuring the cylinder and then applying more force on the correct section, so as to equalise the force applied to the cylinder.
In order to achieve this, it must be possible to measure the cylinder surface, between the blades, at a given point, on the full circle.
If the deviation is more than 3-5 /100 mm. then it is fair to say that the cylinder is out of line.

Figure 27 Checking if the cylinder is straight

The correction will be done in the following way.
While measuring, a pattern can appear from highest to lowest point.
Select the lowest point and hammer more on the caulking, a section of 5-10 cm.
Do not apply very hard force, but more a “normal” blow to the chisel.
The caulking will now press harder on the groove walls and the cylinder will lift upwards, as this side will turn longer.
Re-measure to see if this was enough. If so, the blades are fixed, and the cylinder is checked and found to be correct.

4.3. Bearings.

Most cylinders now will have roller bearing, although still some will use the old sliding bearings.
A cylinder will generally, depending of use, need new blades every 2-3 months.
This is in bearing terms a very short life span. Therefore bearings will normally be checked (inspected) every third or fourth blade change.
This inspection will normally be to check that the clearance is within the limits given by the supplier.
Excessive heating, and gradually noise increase will be signs of a bearing nearing its life span.
To give an average life span will be impossible as quality of the bearings, quality of the grease and naturally the quality of work performed while installation will be crucial in this respect.

4.4. Grinding.

It has been elaborated that the proper balance and general quality of work performed is crucial for the re blading.
As important though is the grinder system.
If returning to the section where hardening and tempering was a subject, it needs to be understood that excessive grinding, can in itself produce a temperature, locally, on the cutting edge that will in fact temper the steel. In short, it is possible to grind the blade soft.
Another and as important issue is the balancing of the grinder wheel. When delivered most wheels are corrected on surface, but not being mounted on the hub, it will have during work.
Most new shaving machines will have a grind wheel hub, being detachable from the motor shaft.
When a grind wheel in the shaving machine is to be replaced, take of the entire hub and not only the worn out stone.
Then replace the stone on the hub, correct its outer surface, and perform a static balancing on the unit.
Counterweights normally mounted in the hub, is used for this correction.
Grindstones will be as the blades, be produced by several different suppliers. Always check with your blade supplier, what kind of brand grindstone, they will recommend.
The grit, the binder, will vary and wrong hardness can make the grindstone give a bad performance on a particular blade.

4.5. Pre grinding.

In some cases a pre grinding can be preferred. This is however mostly where the re blading is done by experienced persons and performed in a good quality re blading machine. Still, to obtain the identical parallelism as for the particular shaving machine, will be impossible.
Some grinding will in all cases have to be done in the machine, the specific cylinder is intended for.
One side effect of pre grinding is that handling of the pre ground cylinder becomes more difficult.
The blade needs to be protected from the lifting strap, so as not to cut through the strap, and as such drop the cylinder.

4.6. Assembly in the machine.

Before fitting the re bladed cylinder back to the machine, always take the opportunity to clean inside the machine, concentrating the effort in fixing points, (bearing blocks) and around the grinder system.
Take care to clean the sliding section for the grinder, as the dust from grinding, will in fact be as abrasive dust, which mixed with oil becomes a grinding paste.

5. Common errors

- De blading. The chisel used to lift the caulking out of the groove, is too thick. This will cause damage to the groove, both sides (walls) and bottom.
- The chisel is too sharp. This can easily Cause the chisel to dig into the bottom of the groove and leave a track, as well as higher flanks, next to the track.
- The blade has been fixed wrong in the groove. It has not touched the bottom, so that the caulking has gone under the blade.
- The force used on the caulking has been too hard. The cylinder will be put under a very hard stress, and the blade and caulking will be extremely difficult to remove.
- The chisel has been hitting the cylinder surface and damaged the groove. It will be very difficult, without the use of excessive force, to get the new caulking into the groove, as well as getting the used one out.
- Welding has been performed on the cylinder. The cylinder should be scrapped.
- Cut offs, have been used to “create “a blade. THIS IS DANGEROUS AND SHALL NOT TAKE PLACE.
- Cracked blades have been welded. THIS IS DANGEROUS AND SHALL NOT TAKE PLACE. IF SUCH A SITUATION APPEARS, THE BLADE SHALL BE REPLACED.

NOTE:
The revolving cylinder spins at 1500 rpm. If ground steel pieces where to come out during work, it can be lethal to the person(s) hit. This has happened and individuals have been killed.
Working in a tannery, should be no more dangerous than in any other workplace. It is the responsibility of all involved to ensure that this is the situation.

Finally, a very common error is that a cylinder is out of centre line. This will cause vibration. Excessive vibration will cause damage to the leather, the cylinder, the bearings and can in extreme cases cause the cylinder itself, over time to break.

6 Step-by-step re blading illustration

A complete picture sequence showing a complete re blading

Figure 28 Lifting caulking from the groove

Figure 29 Rolling caulking on pipe

Figure 30 continues rolling of caulking

Figure 31 Cylinder with blades removed and cleaned

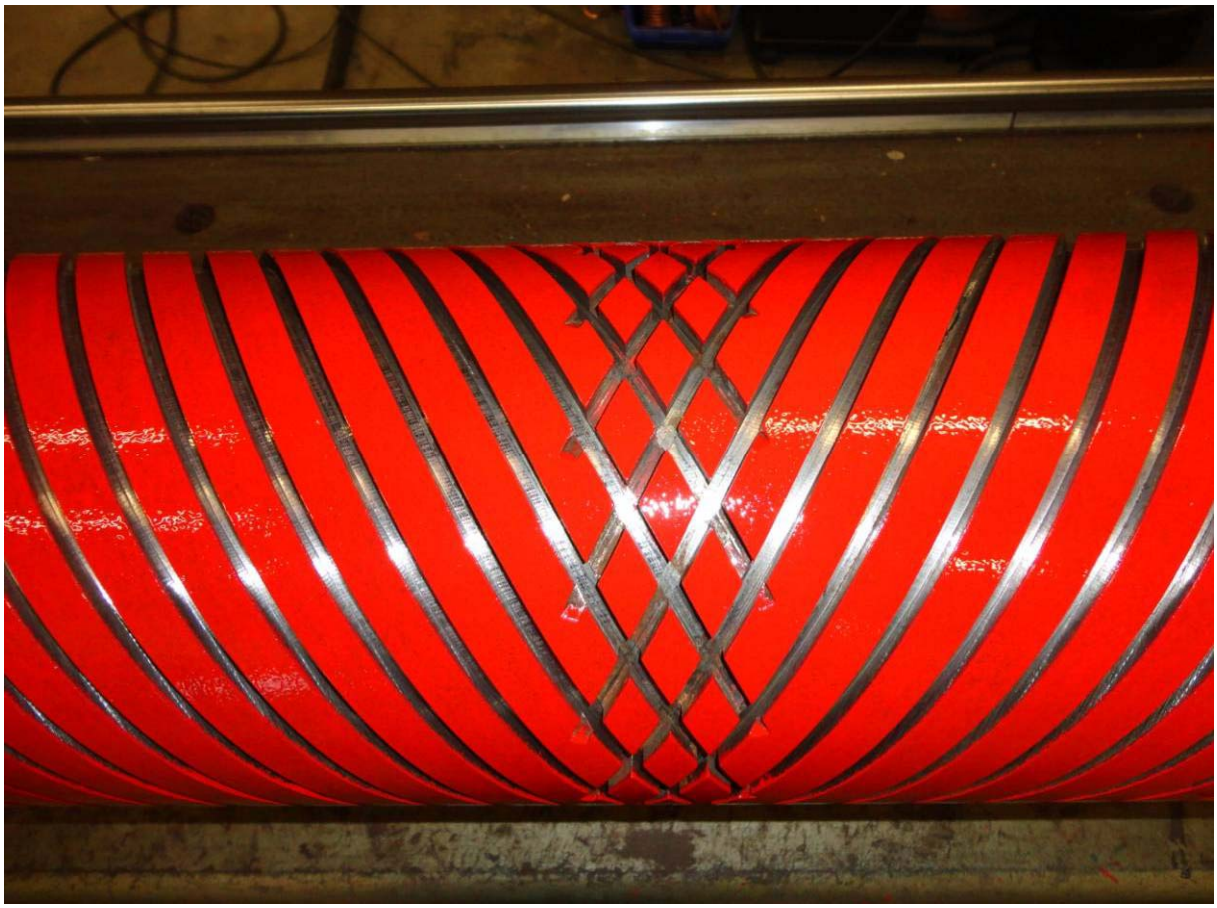

Figure 32 Inspected and painted

Figure 33 Shaping of blades "meeting end"

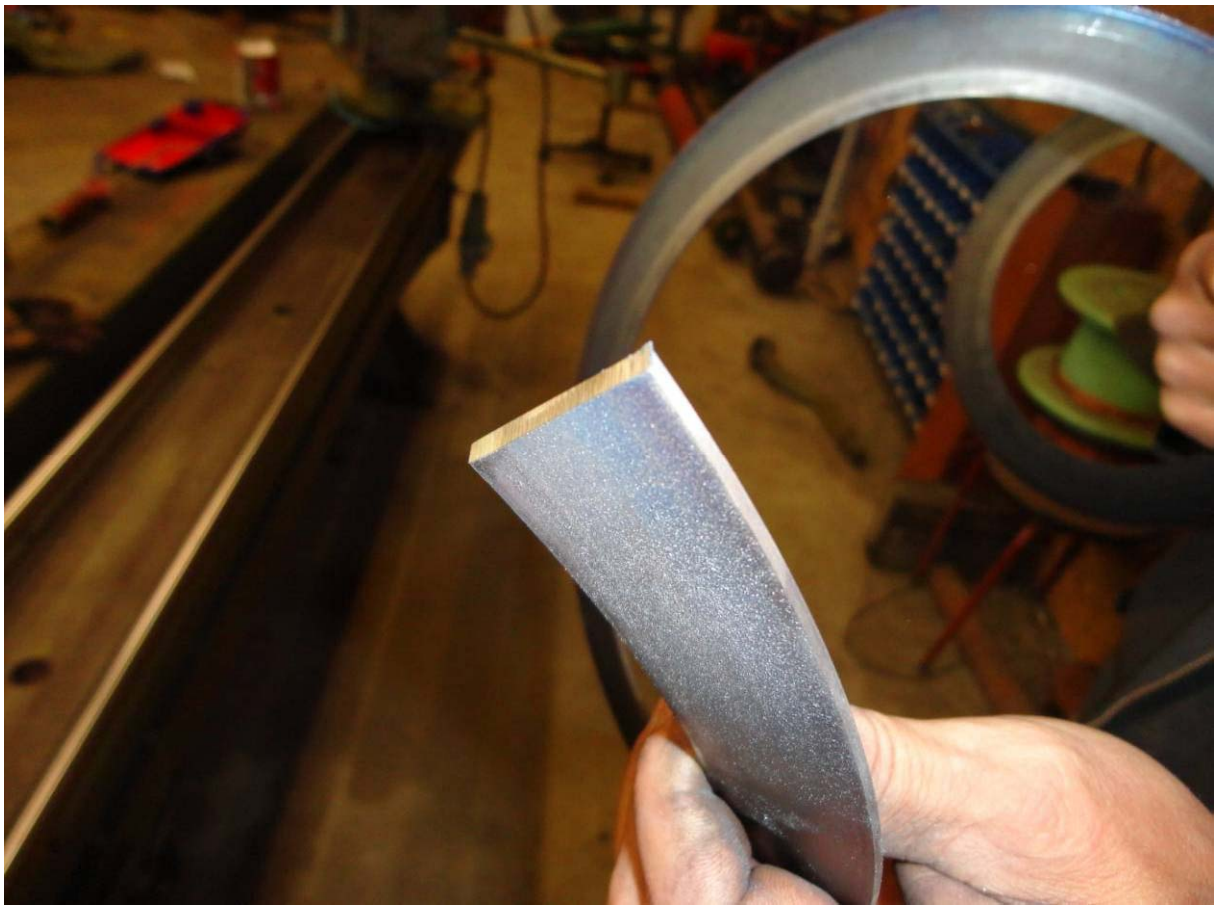

Figure 34 Blade end grinded to meet profile of other blade

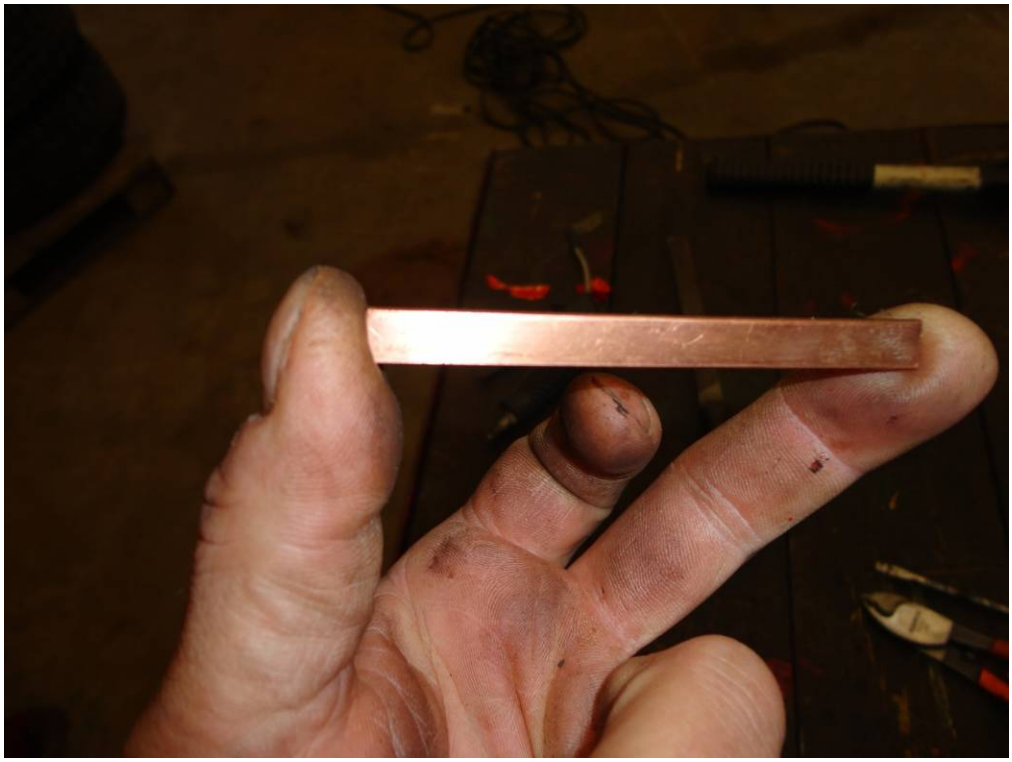

Figure 35 Piece of caulking for initial fastening

Figure 36 Blades shaped and ready for fastening

Figure 37Two first blades are aligned and fixed

Figure 38 Fastening of blades with pneumatic hammer. Note steel wheel on the blade top, holding the blade in the bottom of the groove

Figure 39 Pneumatic pressure on hammer, 7 bar

Figure 40 Pneumatic cylinder and wheel for blade clamping

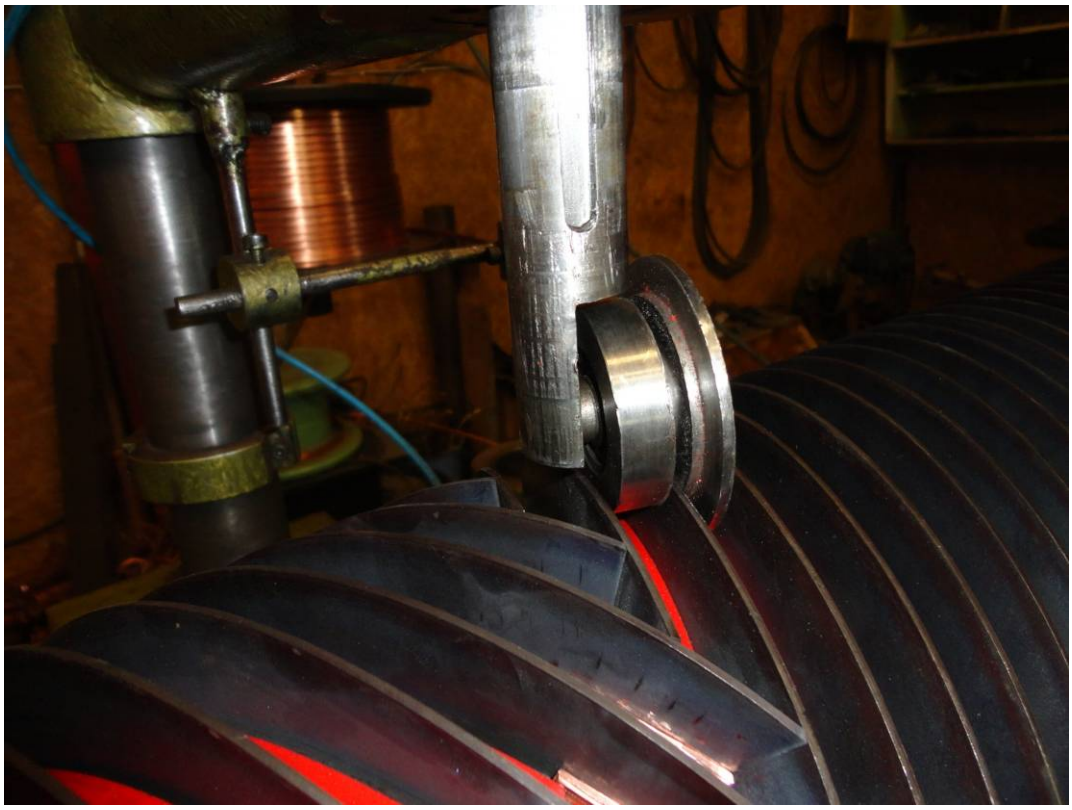

Figure 41 Clamping wheel. Caulking and guide for caulking seen in the rear

Figure 42 Continues hammering on caulking, while cylinder rotates. Fresh caulking fed automatically

Figure43 Caulking in correct position. Note that hammer has been hitting the caulking only with an even result

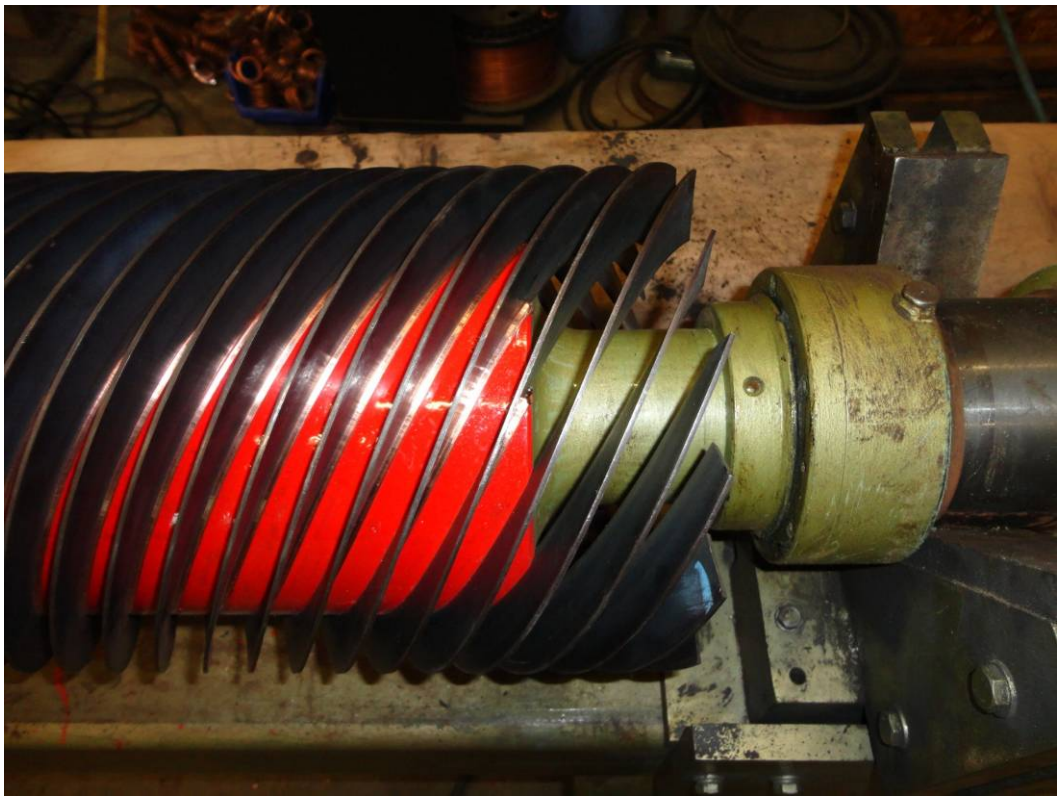

Figure 44 New blades are a bit longer than the cylinders length

Figure 45 Disk grinder to be used for cutting excess blade length

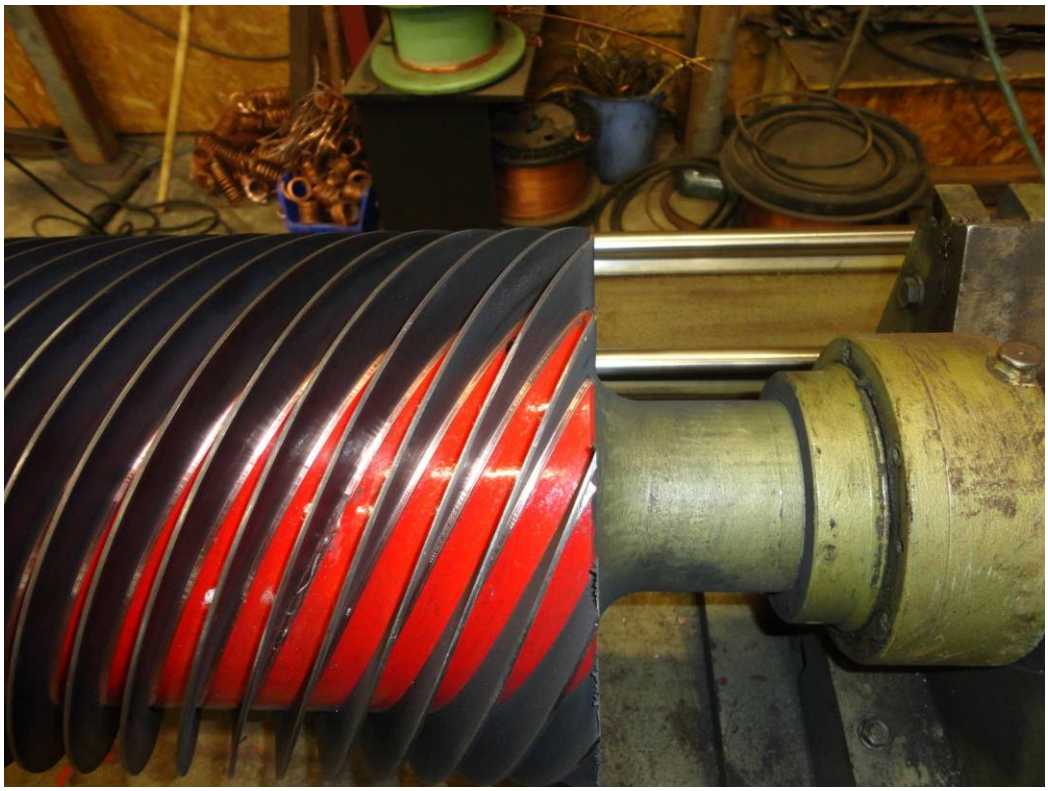

Figure 46 cylinder after cutting the blades

Figure 47 Use a micrometer on cylinder surface. Measure between all the blades to check the "true" circle