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UNITED NATIONS INDUSTRIAL
DEVELOPMENT ORGANIZATION

# Regional Hides and Skins, Leather and Leather Products Improvement Scheme.

**US/RAF/88/100 & US/ETH/88/100**

**Ethiopia**

**Technical Report***

PREPARED FOR THE GOVERNMENT OF ETHIOPIA
BY THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Based on the work of A.Rongved, Expert in tannery machinery maintenance.

Backstopping officer: Juhani Berg, Agro-based Industries Branch

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## ABSTRACT

This was the second mission of the expert to Ethiopia. It was expected to be a follow up and continuation of the activities started during the September 1989 mission.

It turned out, however, that very little had been carried out of the recommendations of the first mission and that the re-blading courses to be held was not well prepared and therefore the results obtained during the mission is considered to be marginal.

It is important that the next mission of the expert will be better prepared and a work plan for the next mission to be well prepared from the side of the NLSC and the tanneries.

## EXPLANATORY NOTES

NLSC - National Leather and Shoe Corporation

UNIDO - United Nations Industrial Development Organization

EP & TF - Ethiopian Pickling and Tanning Factory

## 1. Introduction

### Purpose of visit

The mission took place from May 1st to June 3rd 1990 and was a follow up of the previous mission, Sept.89. The visit had been requested several times from the National Leather and Shoe Corporation (NLSC).

### Work Plan

After the mission , Sept.89, in which several spare parts were found missing, the impression given was that a follow up mission should concentrate on these issues. It was made clear in the last mission report that if training courses should be held, some work would have to be done prior to the mission to ensure the availability of the equipment needed and to allow for the preparation of hand-out materials.

It was in light of this background very disappointing to arrive and be asked to do a re-blading course without these elements prepared.

### Limitations

The mission started off very badly. There proved to be severe transport problems, partly caused by fuel shortage but also because the project vehicle was unavailable. As mentioned, the work plan not being prepared caused surprise in the tanneries in which the courses was to take place. This again led to difficulties in arranging proper classes as most of the participants were occupied in their normal duties. When we eventually got started things improved slightly but still it can be stated that roughly 50% of the time spent during the mission was wasted.

## II. Findings

### General

With so much time not spent on the matter at hand, re-blading course, some of it was used re-checking machines and conditions remarked on and recommendations made during the first visit. The findings were basically that nothing had happened.

### Addis Tannery

In Addis Tannery the conditions are the same, but for effluent it now seems worse. This because its at the end of the dry season and the rivers are now only small streams, far from adequate to remove all the solids being dumped into them.

### Awash Tannery

Awash tannery is running the rehabilitation program and had a new Mercier lime-splitting machine and a new Mercier hide fleshing machine both in operation. The lime-splitting result was as disappointing as the

result observed in Ethiopian tannery in september. The problems with shaving and excessive trimming remains the same.

Ethiopia Pickling and Tanning Factory

EP&TF had improved in cleaning up the place but this was mainly due to raw material scarcity, which more or less affected all the tanneries during the visit. For other errors pointed out and recommendations made there were no action taken. The wiring on the Aletti fleshing machine, an extremely easy job to do, was in the same mess as in september.

Ethiopia Tannery

In Ethiopian Tannery the beamhouse rehabilitation was now completed but due to raw material problems the capacity utilization is very fluctuating and far from at full capacity. The newly installed paddles, which were discussed at length during last mission,are now in operation. They all tend to bend out and should be checked carefully.

The same goes for the new drums which are starting to curve upwards. It is of vital importance, for this type of equipment, to take proper care of the hoops and bands during the swelling of the wood. If neglected it shorten the life of the equipment considerably. The same thing was observed in the Modjo Tannery. The tannery was visited very briefly and it was noted that some extra bars had been put on to prevent the paddles to bend further but apparently no contact had been made to the supplier to seek advice on how to correct it.

In Ethiopian Tannery cleaning and restarting of the effluent system was in progress. During the visit it was under repair due to broken pipes. It was said to be capable of operating at 5-10% of its capacity after the repair.

In connection with the re-blading course, most cylinders on the conventional sammying machines and the setting out machines were inspected. As these are Svit machines the blades are made of brass. All machines needed reshaping. In one machine new blades had been put in but the work was done very badly so the cylinder must be taken out again, corrected in a lathe and re-profiled before re-mounting and put into operation.

Modjo Tannery

In Modjo Tannery a new skin fleshing machine has arrived from the project. The machine, a Mercier, was set up but not connected to either electricity nor water. The set up was not correct as the machine was out of level. A meeting (briefly) with the sales manager from Mercier, who was visiting due to some problems with some of the newly installed Mercier machines, revealed that Mercier will send a technician for the installation. This should also include the machine for the Dire Tannery. This machine, also a skin fleshing machine, is however temporarily lost. The national expert is trying to find out what has happened to the machine and also to the spare parts, because the only spare parts that arrived with the machine for the Modjo Tannery consisted of some fuses and a grease gun.

Dire Tannery

This tannery was visited at request from the tannery, as they wanted some assistance with their newly arrived Poletto shaving machine. The problem was said to be uneven thickness. As they do not have any splitting machine this would most likely cause the problem. However, the machine, installed only three months ago and operated only a few times, was not properly installed. It was standing loose on the floor. After the last use of the machine no care was taken, so the grinding saddle was already heavily corroded. When erecting and starting up it also revealed that someone had been playing with the wheel for the manually feeding of the grinding pressure. The result was that the grinder was so hard on the blade that the grinding stone parted. As a new grindstone was not available no further work could be done on the machine.

In the tannery a new fleshing machine for hides (2400), also from Poletto, was installed. Also this machine stood loose on the floor, it was also practically soaked in water and fleshings. It is obvious that the installation of the machines has taken place not as a result of a properly prepared plan, but just been put in. The tannery is also extremely dirty. Outside they have four reconditioned drums. They are also receiving a 3x3 m drum from the project. At the moment there is no space for the installation of any of these drums. When the civil engineering work is carried out, better foundations must be prepared then provided for the two 3x3 m drums already in the tannery. These drums with their foundations put directly on the floor are vibrating so much that one can feel it far away from the drums. Also the alignment between drums and drive unit is inadequate. The first thing needed, however, is to clean up the place and to prepare a plan to improve the lay-out. At the moment everything happens everywhere and that can not continue.

III. Activities undertaken.

As earlier mentioned it was a surprise to learn, after the arrival, that the mission should consist of a re-blading course. It was also very unfortunate as I would have preferred to be able to prepare a handout to the participants after the sessions. As things turned out, this was not possible, even though a handwritten copy of the annexed text was given to the NLSC before departing. This annex is a compressed text of the theoretical side of the course which was held in all the factories excluding Modjo, as the people from Modjo was taken to Ethiopian Tannery in order to participate there. The practical demonstrations were held in all tanneries as well, and a special session was prepared in Awash Tannery. These demonstrations, however, was of little use as all the tools and equipment I had requested (report sept.89) was not available. Even the prepared session in Awash turned out very badly as it was impossible to achieve the accuracy needed. The only outcome of the mission was therefore the theoretical course, also reduced in effect because so many of the participants did not speak English and proper interpreter was not available.

It was a wish from the technical department in NLSC that I should recommend the purchase of an automatic re-blading machine. At present I would suggest that the attitude to the work and the accuracy needed have to be improved before there would be any meaning in buying such a machine. The machine will not do a better job than a qualified and experienced

worker, only faster, and it is therefore essential that operators are trained in the hand work before utilizing a machine.

## IV. Recommendations

As for the tanneries connected to the NLSC the recommendations made after the mission in September 1989 are still valid. The only additional comments will be that some of the work in connection to the rehabilitation program must be planned ahead better. It seems unnecessary to keep moving machines from concrete foundations hardly hardened and on to a new set.

It is important that the next mission of the expert will be better prepared and a work plan should be made well in advance by the NLSC and the tanneries.

NLSC and Modjo Tannery should seek the advice from the suppliers of the paddles how to correct the swelling of the paddles with extra bars.

ANNEX 1

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

# *Re-blading course**

## US/RAF/88/100

Hides and Skins, Leather and Leather Products Improvement Scheme

by Alf Tore Rongved, Tannery Machinery Engineer

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# Re-blading course.

RE-BLADING THEORETICAL PART.

This re-blading course is built up over eight sections. In addition comes a practical demonstration. The practical demonstration will be dependent on; A, preparations done; B, available equipment and; C, the local possibilities.

The eight theoretical sections are as follows:

1. Introduction talk over steel, steel qualities, to giv a better understanding of the later sections.
2. Why we get unbalance and how to correct.
3. Blunt (not sharp) blades.
4. Blade firmness not corresponding to the work.
5. The blades are not at the bottom of the groove.
6. Wrongly adjusted or worn out bearings.
7. Improper grinding.
8. How to re-blade.

Some of these eight sections are interlinked. This will bring subjects from some section in to the others. It can be stated that the knowledge gained by this course only will have an achievement if the work in re-blading and general machine handling is; a) followed up in accordance to this lecture; b) the quality of the work and the accuracy is performed to a high standard.

I can further add that between the three types of re-blading, by hand only, by the use of a pneumatic hammer, or in a re-blading machine, no preference in terms of quality can be given to either. In all cases the final result will be based on the preparations, the tools and the direct performance done by the operator.

## Section 1.

INTRODUCTION TALK OVER STEEL.

Note: The figures and diagrams shown under this section is only to illustrate and must not be taken as correct in all details.

Steel is available in many qualities and many compositions. This gives a range of possibilities which easy can be reflected upon in the subject we are now going to talk. Namely steel for blades and steel for cylinders. Ordinary trade steel has a quality which makes it mild, it can be heated, welded on and machined without causing any structural change. High quality steel can normally not take all types of treatment without some side effects. Here we shall

concentrate on two types of steel. Mild high quality steel and hardened high quality steel.

Mild high quality steel is what we want in the cylinder. It is soft enough to be easily machined and strong enough to take the pressure created under operation and also flexible enough to avoid breaking. Because it being a composed steel, that is, several chemicals are introduced in the steel, it does not take all kinds of treatment. We shall not weld on the cylinder nor shall we heat it up too much. This because the zones next to such an eventual treatment will change characteristics and can cause the cylinder to crack.

Hardened steel is what we would want in the blades, or we might prefer a combination, hard and mild steel in the same blade. There are generally three types of blades available. An all hard blade, a soft back and hard face blade and a hard back, hard face and soft center blade.

An illustration of these three types of blades are shown in fig.1

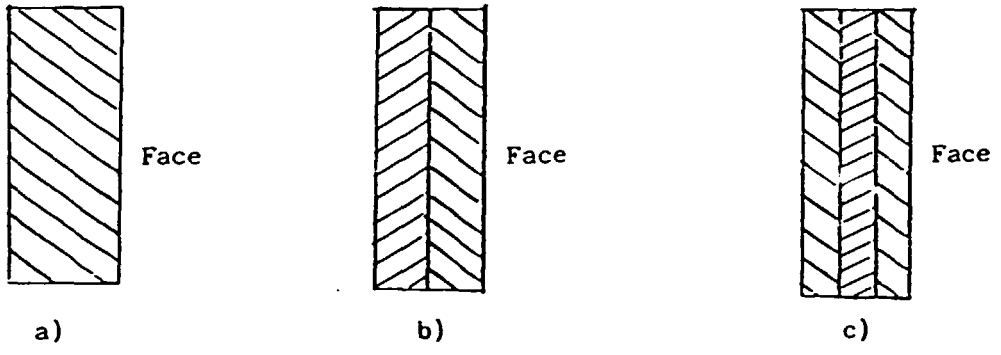



FIG.1

a) shows an all hard blade, b) shows hard face and soft back blade and c) shows hard back, hard face and a soft center blade.

The only essential chemical or component in steel to make it possible to be hardened is Carbon (C). If we have very little Carbon, less than 0,1%, very little can happen to the steel. If we have much Carbon, more than 2%, the steel becomes very course and brittle and will be referred to as cast iron. Taking a steel with 0,8% Carbon we can illustrate in a diagram the connection with Carbon content and temperature in degree C. The temperature needed to get this particular steel hardened is the lowest temperature needed but it also shows the area in which most hardened steel will be.

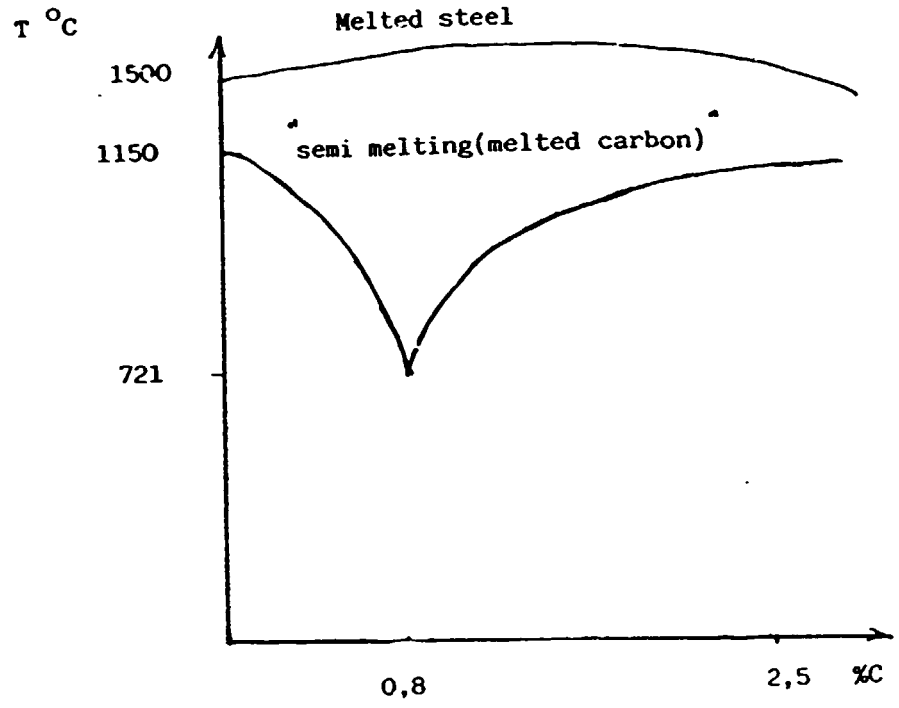



FIG.2

This particular steel, containing 0,8%C can be hardened at a low temperature. Heated up to this temperature, the Carbon in the steel structure, which originally was in particles, will melt and be distributed evenly all over in the structure. If then the steel is cooled directly in water, the Carbon will stay evenly distributed and not go back to particles, as it would do if allowed to cool down slowly in air. This change of structure as indicated in fig. 3 will change the steel characteristic from soft to hard.

FIG.3 Structure change while heated to 721 C.

This change in structure and characteristics will also have a side effect. The steel goes hard but also very brittle. There is a high tension built up in the steel which eventually can crack on its own. Therefore we need

to remove some tension. We will have to heat the steel up again, but to a lower temperature. Keeping the steel heated in the region of 200-400 $C_o$ will reduce the tension, but also the hardness. So here we can, within limits, regulate how hard a steel we want. After the desired time, we cool the steel in water/and or oil again. The steel has now gone softer, with less tensions and also in most cases bluish in colour. Roughly we can say light bluish means still a hard steel and dark bluish a softer steel. To test the hardness there are three recognized methods, but they all need sophisticated equipment. An indication on the hardness can be to grind the steel lightly on a grinder. The colour and shape of the sparks will indicate the conditions. Dark yellow short sparks for a soft steel and light yellow sparkling sparks for a hard steel. This last thing about sparks can easily be detected in the shaving or fleshing machines during grinding. Especially when we grind as carefully as we should do. Another thing with hardness reduction which can give us an advantage is what is referred to as soft bottom blades. This is when the section of the blade, normally being in the cylinder groove has been softened more than the blade itself. The reason for this is that the blade will not brake as easy during de-blading. This again lead us over to the next step, being the other obvious difference between hard and soft steel, apart from hardness, which is flexibility. Hardness will not alone count for the next illustration as other factors related to steel qualities in general will influence, but we will concentrate on an easy example.

We assume that we have two test samples. One of high quality mild steel and one of a high quality hard steel. We put them in a testing machine and pull them apart as indicated in FIG. 4 A and B

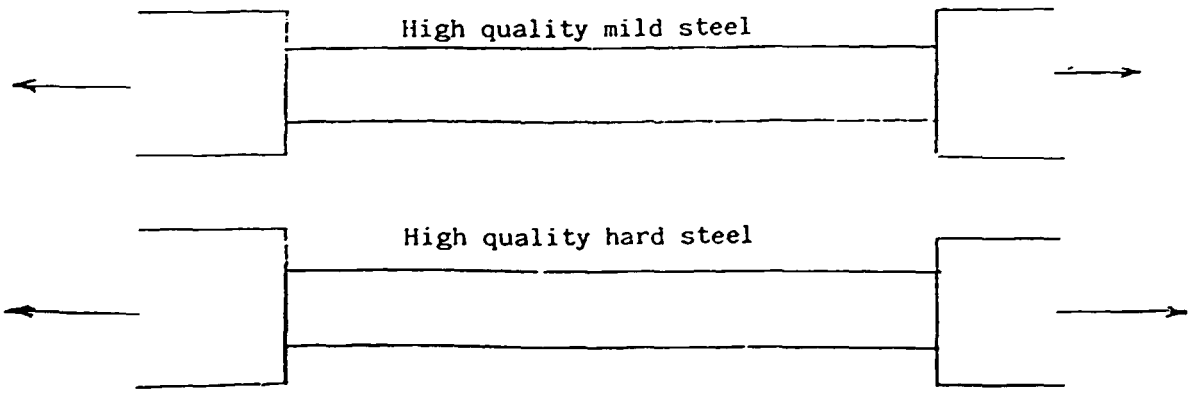



FIG.4 A

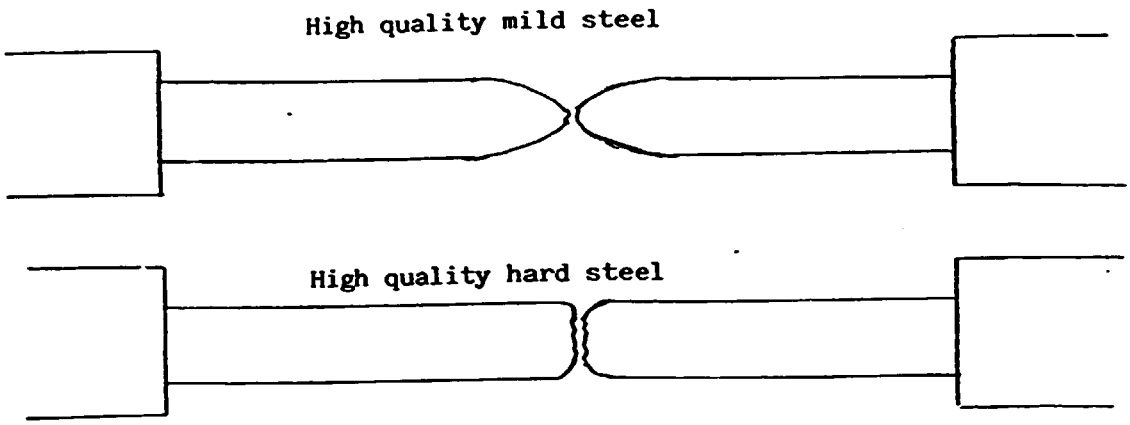



FIG.4 B

As we can see from the figure there is a considerable difference in behavior of these two steel types.

The difference can be illustrated in the two float diagrams which are shown in fig. 5.

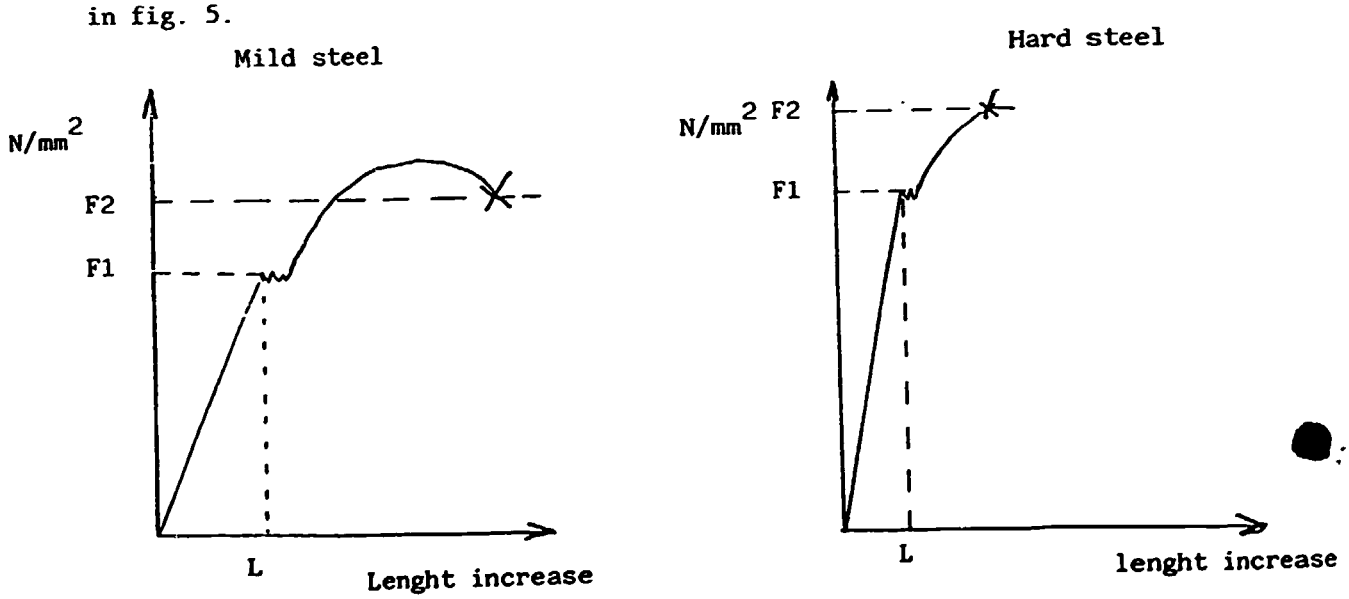



FIG.5

The same difference which was evident in fig.4 also comes back in fig.5. The forces F1 are the force needed / sq.mm to make a structural damage to the steel. All forces smaller that F1 will only affect the steel into stretching. As soon as the force is reduced or removed the steel, which for a mild steel can have been stretched considerably, will go back to its original length. As one can see, the length increase for the hard steel is much less, but the force F1 is also higher.

F2 is the force needed to actually pull the steel apart. But the major thing about the diagrams is that they can tell us when we will get a structural

damage. At all forces less than Fl the steel will act just like a rubber, go back undamaged to its original length and shape. This is a very essential point for the next section where we will be talking about "bent cylinders". It is important to understand that the bending is within the area below force Fl and are consequently a stress and not a structural damage.

The diagram in fig.5 also tells us that a hardened steel, as we want in the blades, have a small length increase before structural damage. To some extent this can be regulated with the pitch of the blade, or it can be tried compensated by using, as we have already talked about, laminated blades.

## Section 2.

WHY WE GET UNBALANCE AND HOW TO CORRECT.

When the cylinder is made it is made of a high quality mild steel which has been properly "aged" to allow tensions from the steel processing to be reduced. It is then machined in a lathe, and the grooves are cut with a special milling machine in the lathe. Then the cylinder is dynamically balanced. This means that while rotating the cylinder is checked that the mass (weight) is in equilibrium around the axis. If not , material is removed from the cylinder by drilling holes in the surface so to establish dynamically balance. This will be done down to an accuracy of 2-4 grams on each shaft end. If we now consider the mass of the cylinder to be perfect, the introduction of blades and caulking will not alter the equilibrium noticeably. When we still refer to a re-bladed cylinder as being out of balance it is connected to the fact that most cylinders after re-blading has been bent. In a bent cylinder the mass will be brought out of equilibrium and that is the cause of the dynamically unbalance. This type of unbalance SHALL NOT be corrected by removing material from the cylinder, but by straightening it. Wrongly , most believe that the cylinder becomes bent by the vertical force put on the caulking while re-blading. They believe that if you hammer more on one side of the cylinder, this side will be bent down. Just the opposite happens. That side will bend up. In order to explain, let us first imagine the cylinder as shown in fig.6 A and B.

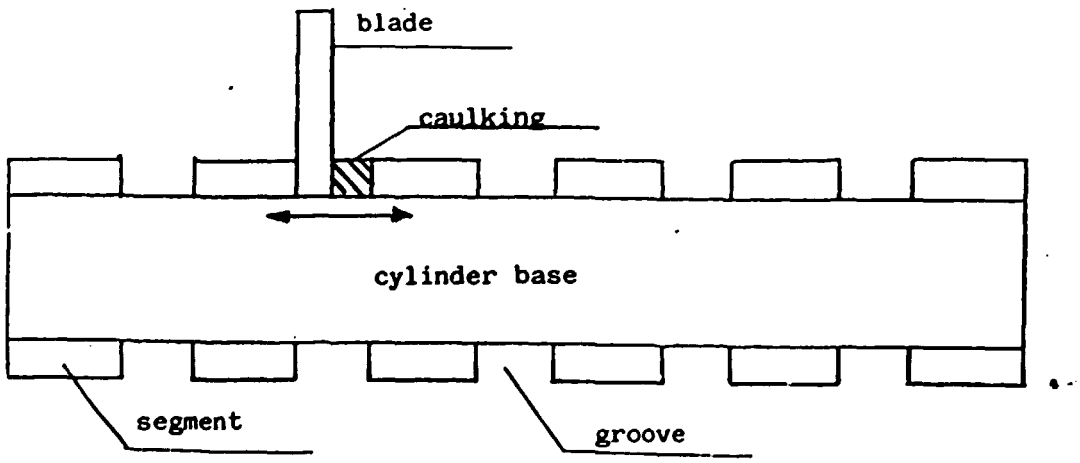



FIG. 6 A

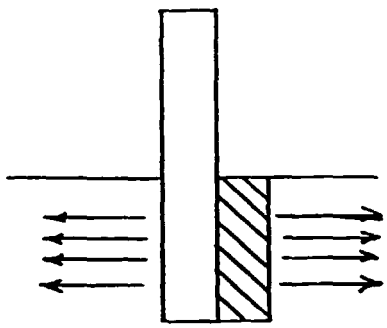


FIG. 6 B

The forces created on the cylinder by the caulking will go sideways. That is, on the wall in the groove and via the blade to the other wall. This means that the segments will be tried pushed sideways. If the segments go sideways they will try to pull the cylinder base with them and thereby stretching the cylinder base. Stretching the cylinder base makes it go longer, which again will make it go upwards as shown in fig.7.

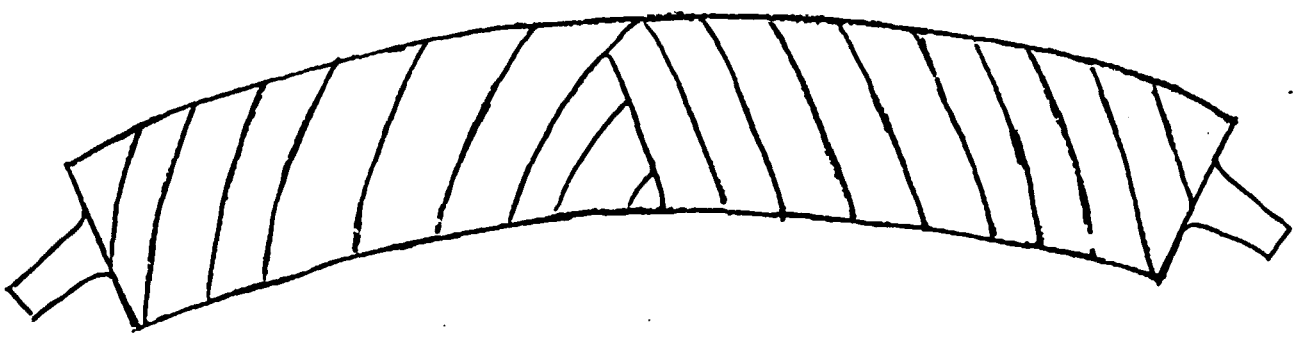


FIG.7 Bent cylinder, excessive force has been used on UPPER SIDE

This situation is not too difficult to accept if we think of stretching the cylinder instead of bending it, even though it is the same thing. If we go back to the float diagram in fig.5 the difference can be explained. Bending the cylinder while stretching the material means that we are still in the elasticity area (force less than F1), which means that either we remove the stress or equalize it the cylinder will be straight again. Whereas if the cylinder should have been bent by force we would have been above the force F1 and the cylinder would have been permanently damaged. This is why we can straighten the cylinder by using more force on the caulking material WHERE THE CYLINDER IS LOWEST.

The force needed to straighten the cylinder will normally be surprisingly low. To do this in reality we do, however, have a few obstacles. These are mainly connected to the fact that we need to be able to measure the cylinder with an accuracy of 1/100 of a mm. Normally we will find that not even the surface of the segments will be able to meet such requirements. Therefore, on older cylinders with damaged surface we will have to prepare measure zones.

This is to machine one or three (depending on the length of the cylinder) zones where the surface is perfect. The reasons for making only zones is to avoid reducing the depth of the groove more than necessary.

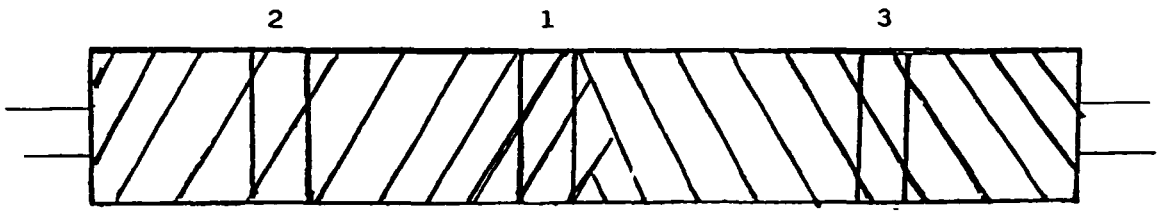



FIG. 8 Cylinder with prepared zones. Nr. 1 for cylinders up to 2000 mm, nr 1 , 2, and 3 for cylinders above 2000 mm.

When these zones have been prepared and the cylinder surface is clean we must be able to revolve the cylinder by hand in a lathe or in a specially made equipment where the accuracy on the shaft ends can be measured not more than 1/100 of a mm out of line. Most often one will find that the center holes on the cylinder have been damaged, and if this is the case they must be redone, or we must use other areas on the cylinder as our reference point. Finally we need an indicator, which either has so long measure area that it is more than the height of the blades, or we must be able to lift the indicator out from the surface of the cylinder and put it back in with the same 1/100 mm accuracy. IF WE FAIL TO MEET THESE REQUIREMENTS WE CAN NOT CHECK FOR STRAIGHTNESS. If we now want to measure the cylinder surface at a given point in between the blades all around the circle and coming back to the first measuring point we MUST have the same reading on the indicator as the first time. Fig. 9 shows this measuring in a lathe.

Other alternative fixtures is shown in fig. 22 and 23

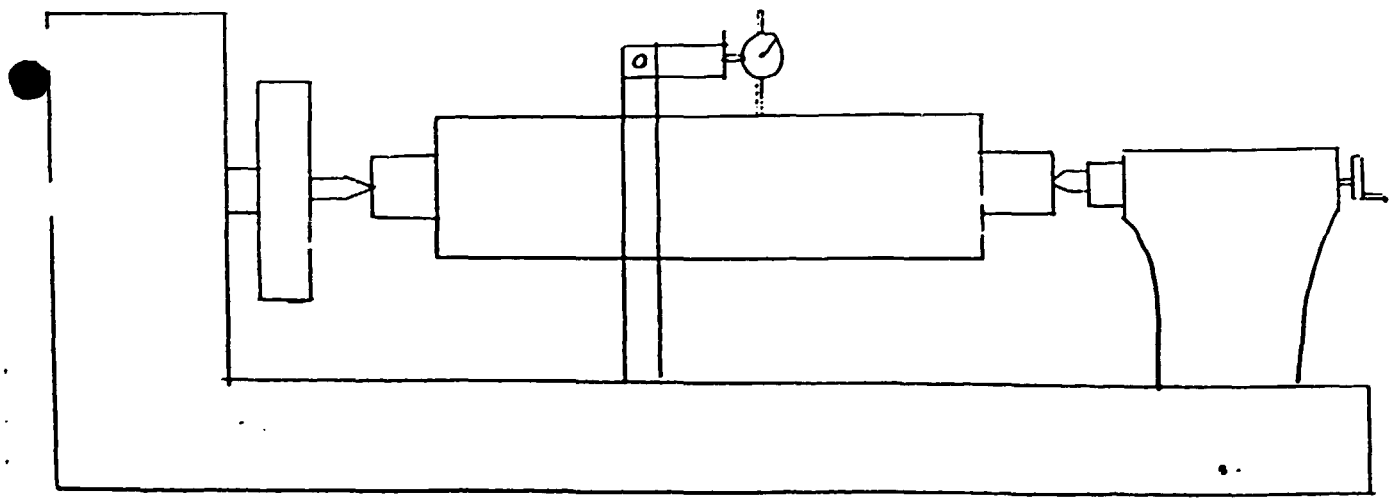


FIG. 9 Using a lathe to check for straightness.

# Section 3.

BLUNT BLADES.

We have now been speaking about the need for straight cylinders as to avoid unbalance. It is obvious that if the cylinder is vibrating then the grinding will be uneven. We will have a oscillating blade and if lightly ground (which is what we want) we will only be grinding the blades being closest to the grind stone. This is illustrated in fig.10

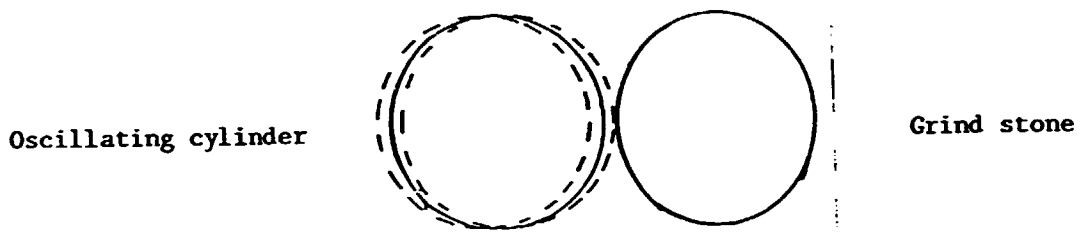



FIG.10 Oscillating grinding picture

This will force us to grind harder, too hard, and cause the problems in that respect which we shall talk over under section 7.

If we, however, assume that we have straightened the cylinder we can still get the same picture, but from the grinding stone (only machines with rotating grindstone). This because the new grindstone as supplied from the producer is not in perfectly circular shape, nor is it in good dynamically balance. The result for us is that both subjects has to be dealt with if we want a perfect grinding. To a large extent the correcting of grindstones can only be done on the newer machines because we need some tools, some delivered with the machine and some we have to make. Fig.11 shows two examples of needed tools.

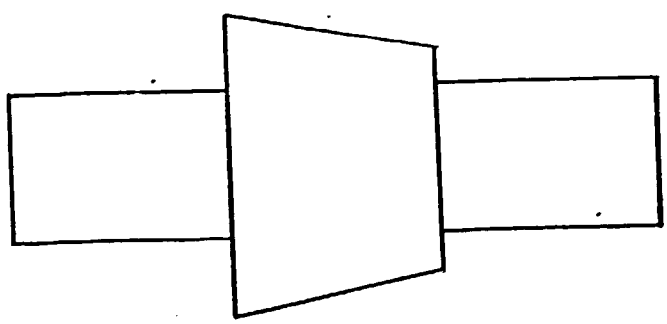


FIG.11 A. Centre shaft

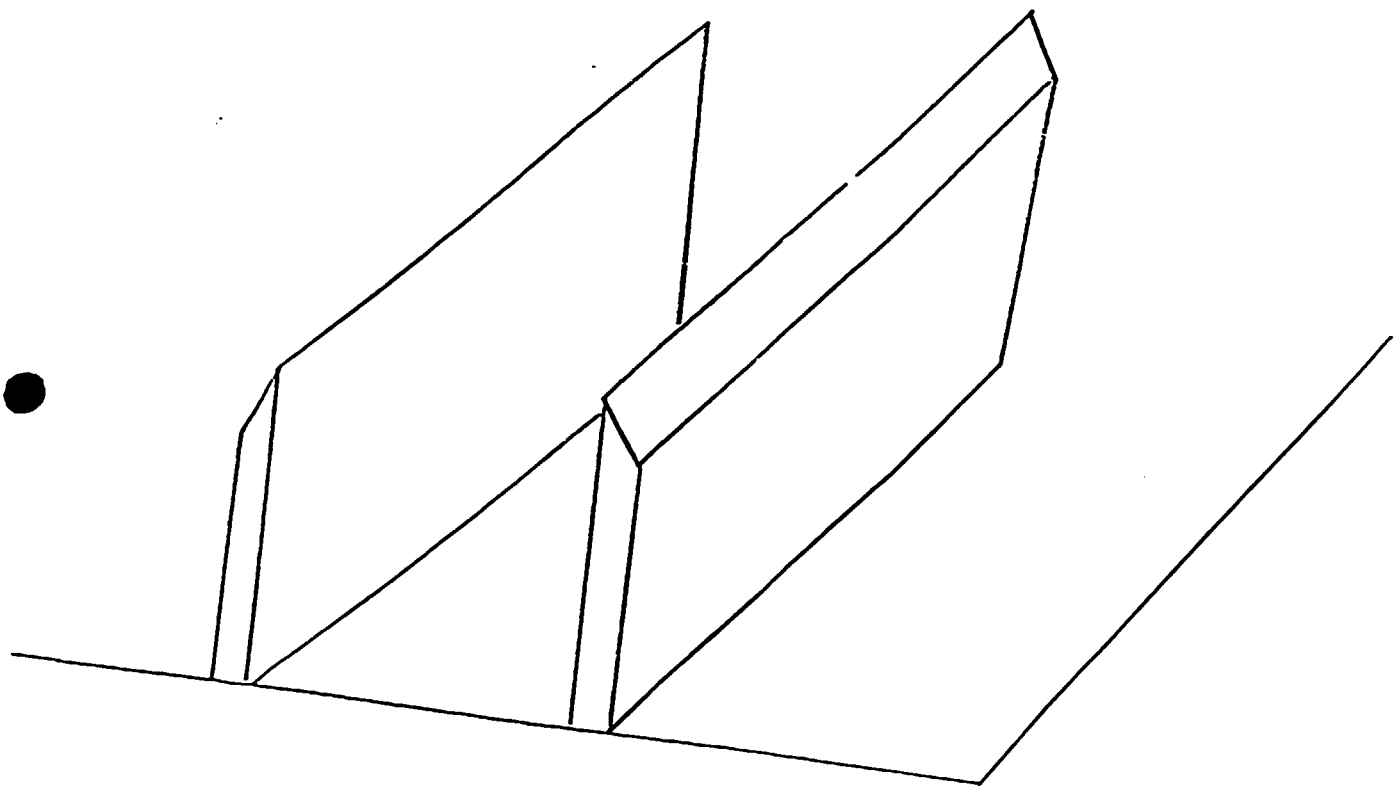


FIG.11. B. Levelled track made of old jaw plates

The centre shaft is used in the grindstone carrier in order to fix it in the lathe for surface correction. To correct the stone we would need a special carborundum block or an industrial diamond. With the stone slowly revolving, remove material until the stone is circular. Remove as little as possible. When the surface is correct and the stone is circular we need to dynamically balance. Make a track as indicated in fig.11 B and put it on the lathe for getting leveled. Put the grindstone carrier with the centre shaft inserted on the track for balancing. Use the small weights which are inserted in the weight track on the carrier to balance the stone so that in whatever position it is put, it will always stand still. See illustration fig.12 A and B.

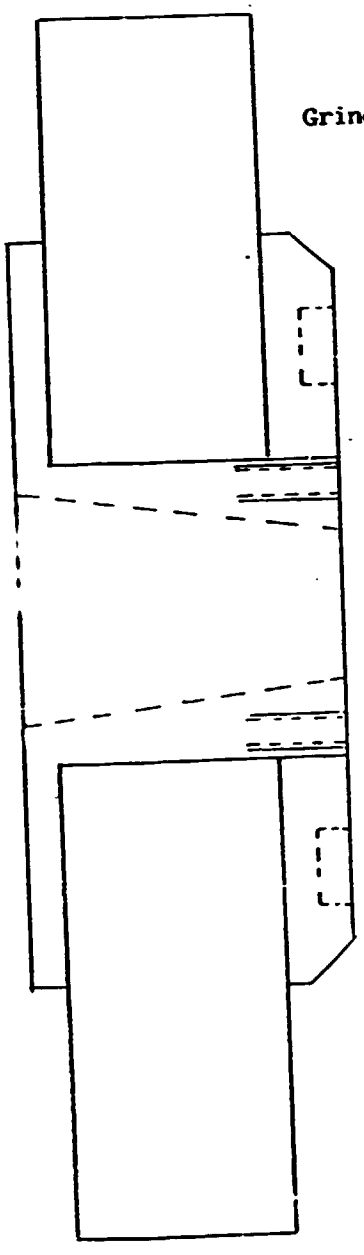



FIG.12 A. Grindstone carrier with grind stone

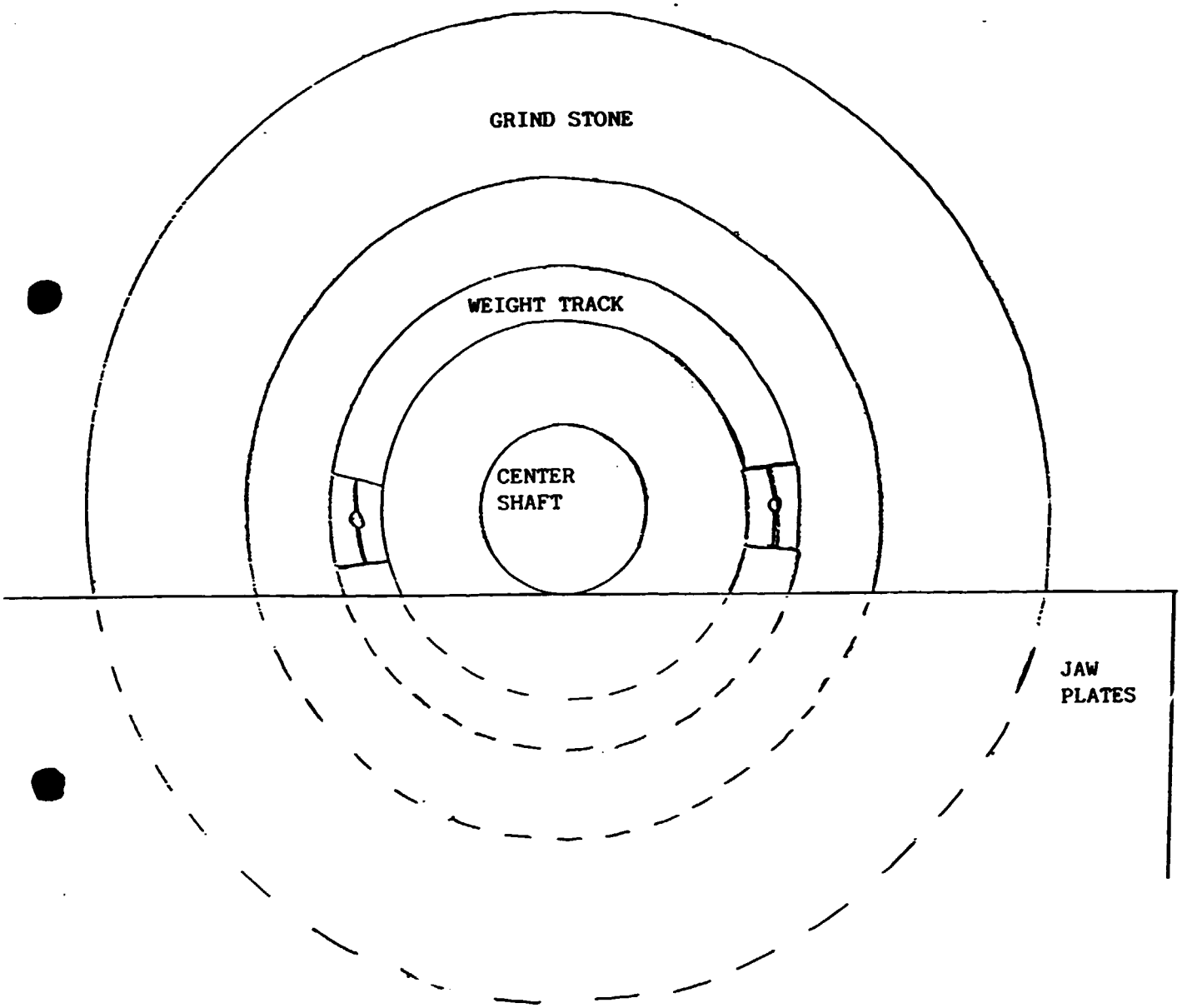



FIG:12 B. Grindstone carrier with grindstone on jaw plate track

The other problems connected to grinding will be dealt with under section 7.

## Section 4.

BLADE FIRMNESS NOT CORRESPONDING TO THE WORK.

As mentioned under section 1 the hardness and flexibility is linked together. A very hard blade can flex or bend very little before it cracks. The various producers of shaving and fleshing machines all more or less vary the pitch of their cylinders. With a low (small) pitch the horizontal component on the blade will be small whereas the opposite, a high pitch, will lead to a high horizontal component. This could basically lead us to say that a low pitch cylinder should be more likely to use an all hard blade and that a high pitch cylinder should require a laminated blade. This, however, does not go directly, the work to be done needs consideration. The work elements we can include can be listed as follows:

1. How much is to be shaved off?

2. Do we have an even moisture content?

3. Dry shaving.

On the whole we can not list a blade to a cylinder and say this is the best one. Only the experience in the factory with the leather, machine and various blades can give the answer of which blade is most suited in this particular case.

## Section 5.

THE BLADE IS NOT IN THE BOTTOM OF THE GROOVE.

This is a typical re-blading problem. Normally it is caused by the operator who is moving the vice or clamp too long a distance in between each time of locking the blade. Very few blades are having a perfect fit to the diameter being the bottom of the grove. The blade will tend to be slightly bigger. This in many cases gives us the picture illustrated in fig.13 A. The correct picture is shown in fig.13 B.

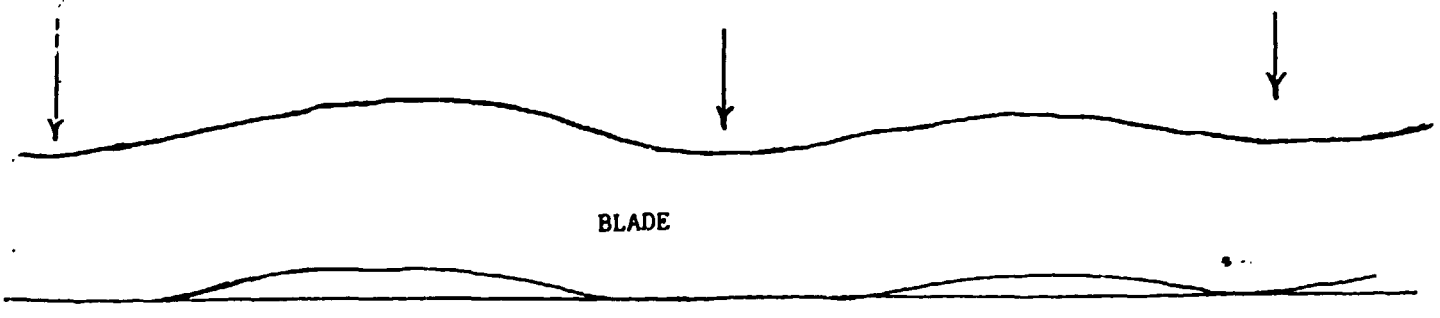



FIG.13 A.

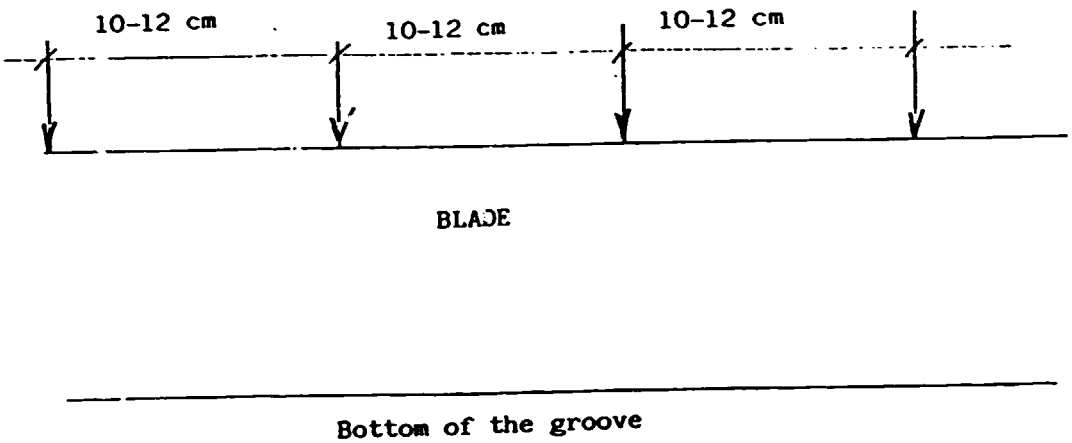



FIG.13 B.

The length of moving the vice (along the blade) should not be more than 10-12 cm if we want to be certain that the blade is in the bottom of the groove. If the blade fails to be in the bottom we can imagine one of two results. Both shown in fig.14 A and B.

In the case of A , there is nothing underneath the blade which can start acting like a spring and work itself loose. In the case of B the blade is supported by the caulking but the distance X will be lost in terms of support for the blade. The same distance X will also have to be ground away before the cylinder can be used, because the blade will have the same distance above the other blades being properly fixed. Tapping on the top of the blades after re-blading will immediately reveal if any blades fails to be in the bottom as they will give a dead and dull sound.

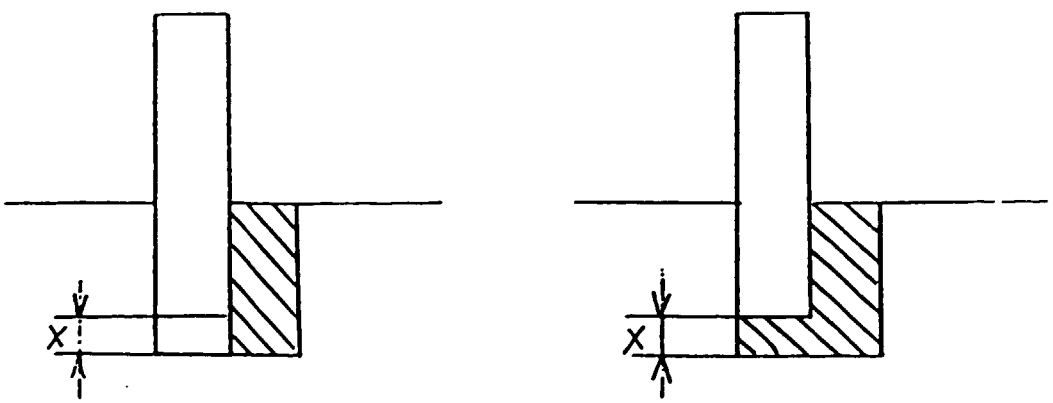



FIG.14 A B

## Section 6.

WRONGLY ADJUSTED OR WORN OUT BEARINGS

All the effort we have done so far, proper re-blading, straightening of cylinder and correcting the grinding, can be wasted if the bearings are bad. We can list two good reasons for dismantling the bearings every time we re-blade.

1. When we re-blade, whether using an ordinary hammer, pneumatic hammer or in a re-blading machine, we transfer the shocks from the hammer to the cylinder via the caulking. From the cylinder it goes through the bearings into the support on which we have the cylinder mounted. Nobody would start to hammer directly on the bearings, because that would destroy the bearings. But, if we do not dismantle the bearings before re-blading that is exactly what we are doing, and the bearings would eventually be damaged.

2. If we do not dismantle we can not inspect the bearings nor can we change the grease. Furthermore it is impossible to check the adjustment of the bearings as it is full of old grease.

Someone will probably think that inspecting a bearing during the life of a blade is too often. The target we want to achieve is a life of the blade to be 2-3 months. In fleshing machines 1-2 years. Experience tells that the work taken in dismantling the bearings pays very well off.

## Section 7.

IMPROPER GRINDING

With everything done well we can still grind ourselves to a bad result. The most common error in grinding is simply that we are grinding too hard. Going back to section 1, we were speaking about softening temperatures for hardened steel. We said that temperatures in the area of 200-400 C° would turn the steel soft even if it will be cooled afterwards in water. If we grind too hard, we will be around 400 C° in the spark flow occurring between the blade and the stone. On top of it, we do not cool in water but in air, so that the softening process becomes even more accelerated. Because this goes very fast, not much of the blade gets soft. Only the top, but we have the edge on the top and the edge shall do our cutting and a soft edge goes very quickly blunt so we have to grind again. Whether we are using continuous, intermittent or periodical grinding we must always grind as lightly as possible. We only want a light trickle of sparks.

During normal work we will normally prefer to run the grindstone the same direction as the blade cylinder as this gives the best edge. While grinding up a new cylinder or while cleaning the stone, we would run the stone the opposite direction from the cylinder.

Most shaving machines have an automatic feed to readjust the pressure between grindstone and cylinder. On the older machines this device is normally placed in the centre of the machine. Most cylinders in these machines will be ground concave. The reason for this, as we also shall return to, is that the grindstone wears off. When always adjusted on the same spot, that spot will be ground more, because the grindstone will always be smaller towards the ends of the machine. The harder we grind the bigger the problem.

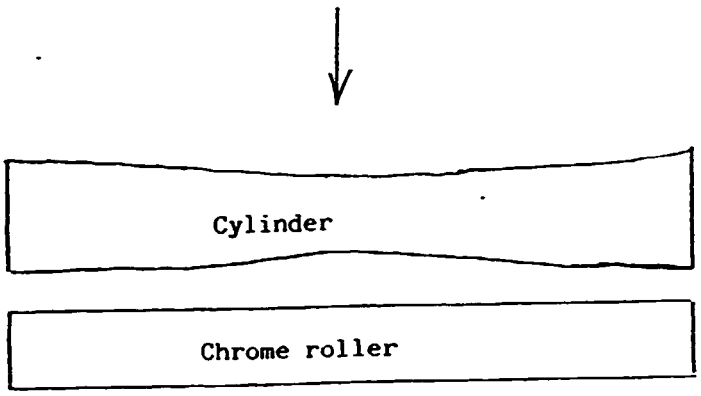



FIG.15 Shows the cylinder shape after centre feed only.

The bad shape of the cylinder shown in fig.15 will also be the shape of the shaved leather. Newer machines have solved this problem by having feed adjustment in several places.

Most grinding errors takes place in fleshing machines. By any unknown reason fleshing machine operators are never happy with the grinding unless the sparks are illuminating the entire machine. As to what we have just said about the stone wearing off, in fleshing machines the cylinder will look like the illustration in fig.16.

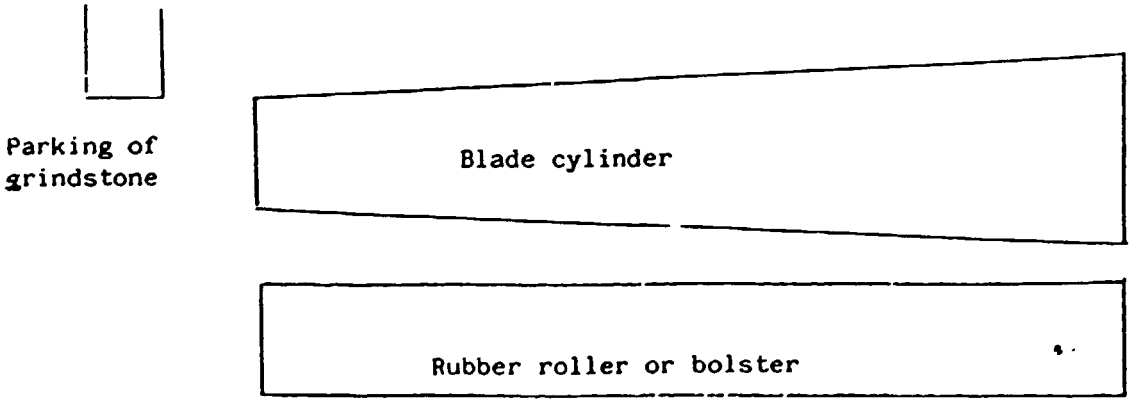



FIG.16. Blade cylinder ground conical

This happens because the operator always feeds the stone on the same side (parking side) and also because the grinding is too hard. When the blade gets conical and we are fleshing whole hides the result will be that the left belly and right shoulder (fig.16) will be fleshed insufficiently whereas the right belly and left shoulder will be over fleshed. When such results occurs in production, always check the cylindrical shape of the cylinder before readjusting the parallelity of the machine. Normally one will find that all that is needed is to grind the cylinder carefully back to shape.

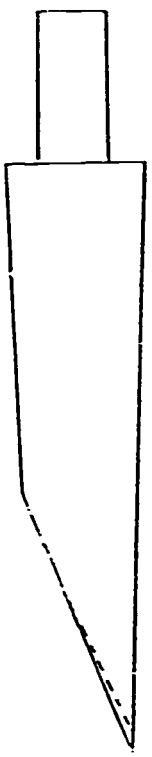
The second alternative of too hard grinding in fleshing machines is that the cylinder becomes oval in the centre section. This as a result of the high pressure from the grinder which will bend the cylinder. Ground oval, chattermarks will be the result on the hides. As for the other grinding errors it can only be corrected while carefully grinding the cylinder back to shape.

## Section 8.

HOW TO RE-BLADE

We need to re-blade when the blade is so short that we either reach the soft bottom area or there is not enough room to transport the removed material away. Average blade height when due to re-blade will be; shaving: 1-6 mm, fleshing: 10-12 mm.

When the cylinder is dismantled from the machine, clean it properly and remove the bearings. Then remove all the blades from both sides so that the cylinder is totally clean. The chisel used to lift the blades out of the groove must be flat on the side touching the cylinder surface and wide enough as to avoid damaging the groove. If the blade cracks and we have to go into the groove to lift it out again, we must use a chisel which is THINNER than the groove in ALL areas of the chisel going in the groove. Remember that destroying the groove means destroying the cylinder. Fig.17 A and B shows two de-blading chisels.



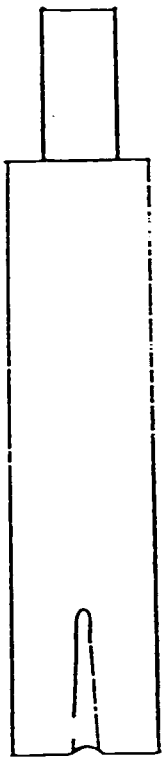
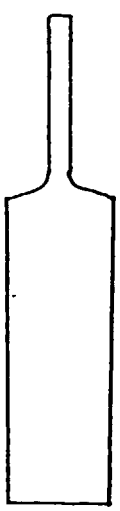


FIG.17 A To lift the blade off the groove



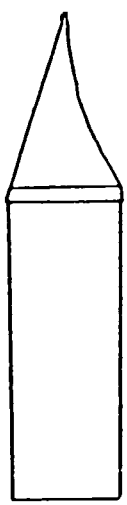


FIG:17 B To go into the groove in case the blade cracks

If the blade keeps cracking it can be better to pull out the caulking material and leave the blade. This can only be done when the caulking has the sufficient strength.

When all the blades are out we need to clean the grooves. Due to damage done in earlier re-blading or during de-blading we often find grooves shaped like those in fig.18 A,B and C.


FIG.18

The worst of these grooves are groove B. This as we want to repair the grooves and the only way we can do so is by removing material. We have to file the groove back to shape. Groove B can only become bigger so we either need a thicker caulking or we have to scrap the cylinder.

When all the grooves have been corrected we are ready to fit the first blades. As we said under section 1, the blades might have different qualities on the two sides. If there is a cutting side it will be marked either with a sticker or with the manufacturers name on that side. If there are no marking or signs we can pick any side. Clean the blades from the oil or grease in which they are protected and insert one blade on each side so that they meet. Lock one of them temporarily and shape the other blade to meet. Shape to a perfect fit by removing material from the blade on a grinder. When the fit is accepted lock the blade with the vice and put in the caulking 3-4 cm. Then move the vice, not more than 10-12 cm, and lock again. Hammer in the caulking and repeat until the entire blade is fixed. It can prove easier to cut the caulking in strips, 2 or 3 per blade, as to keep it straight. The chisel we use must be thinner than the caulking and must always be held perpendicular to the cylinder. See fig.19.

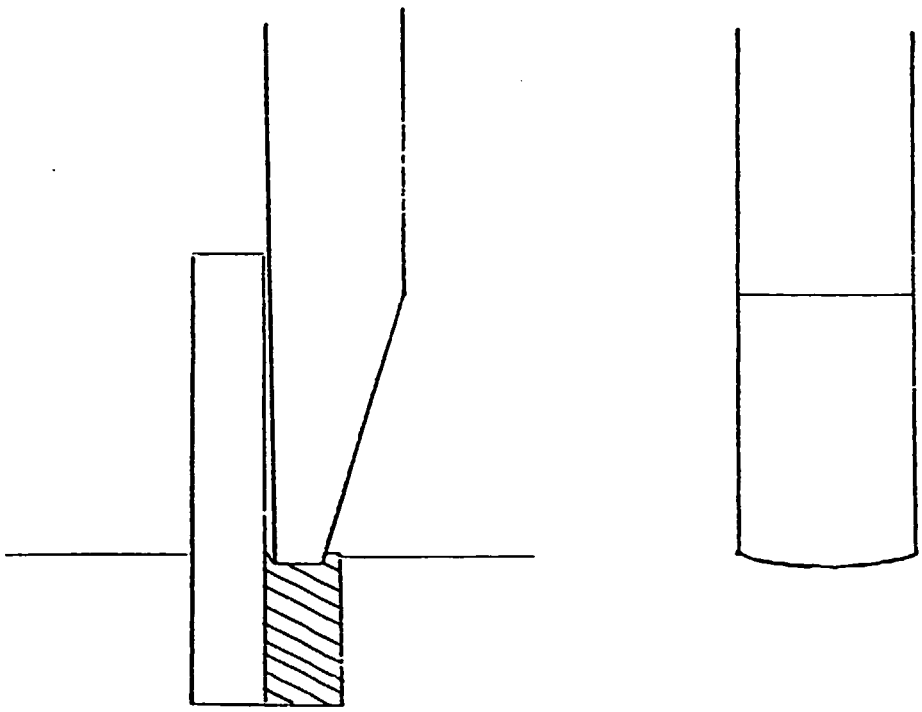


FIG.19 Re-blading chisel

The chisel shall be slightly rounded on its end because we want a smooth movement of the chisel on the caulking. The blade will normally be too long. To remove the surplus blade, make a tool as shown in fig.20 and break of the blade at the cylinder end.

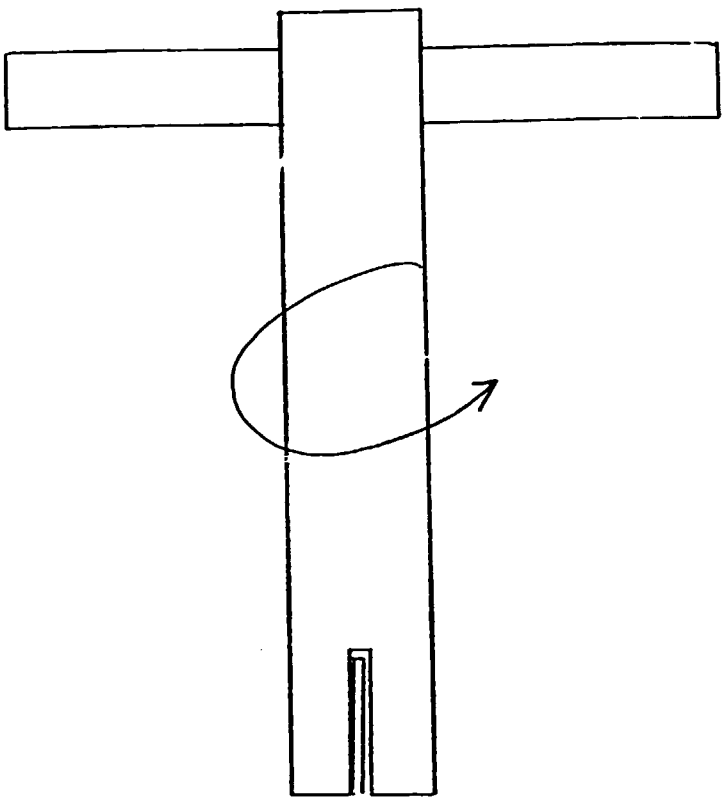
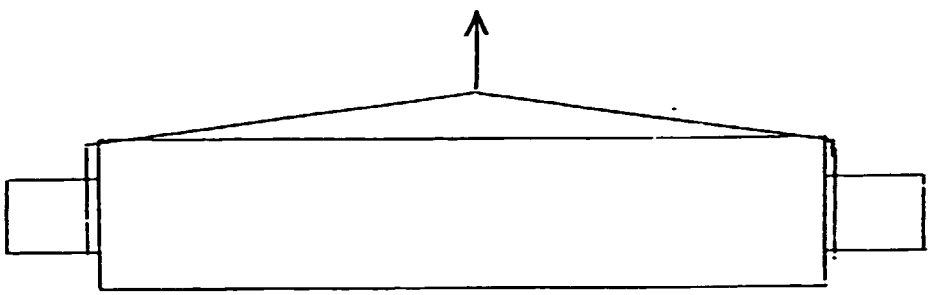


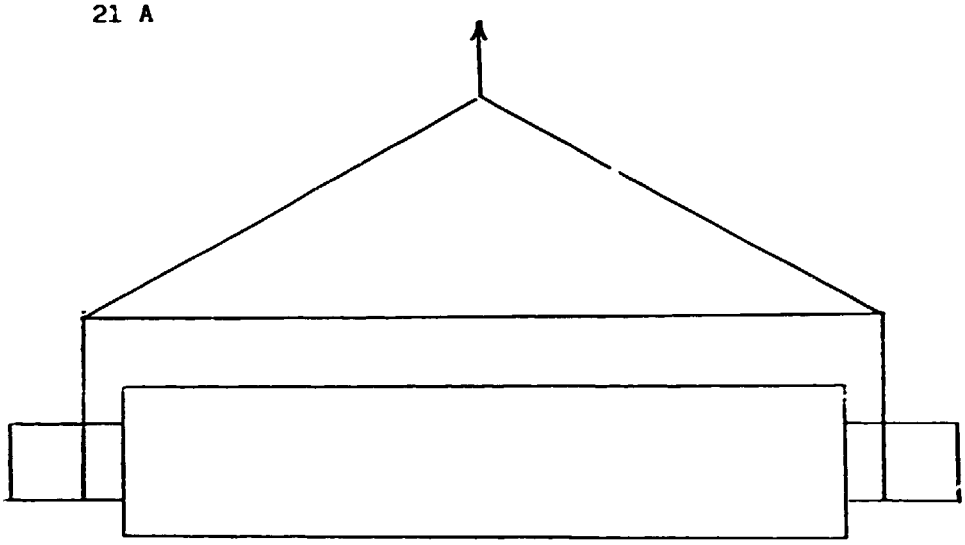
FIG.20.

Then put in the corresponding blade on the other side of the cylinder. When alternating like this, the tension which eventually will bend the cylinder will be kept at a minimum. When all the blades are fixed, straighten the cylinder as described under section 2 and paint between the blades. Put on the bearings and adjust. When transporting the cylinder take care not to drop it and avoid resting it with the shaft ends on the floor. The cylinder is heavy and the ends could bend.

During lifting take care not to damage the blades. Use either fig.21 B or C. 21 A is not to be used.



21 A



21B

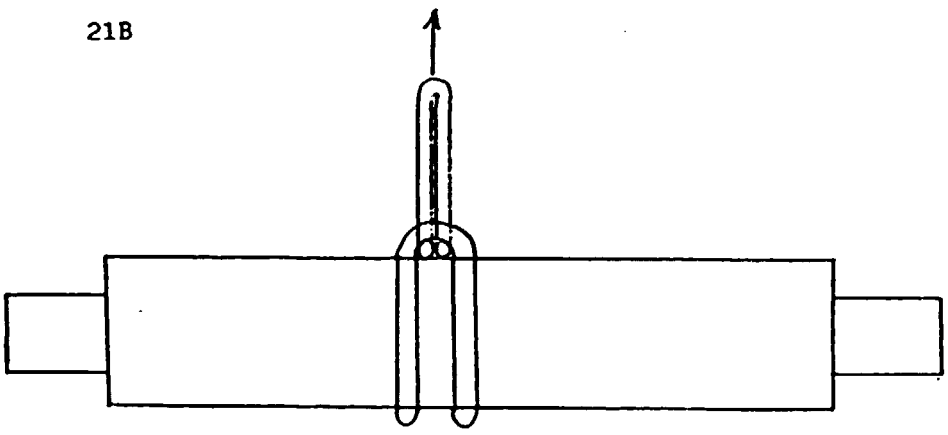
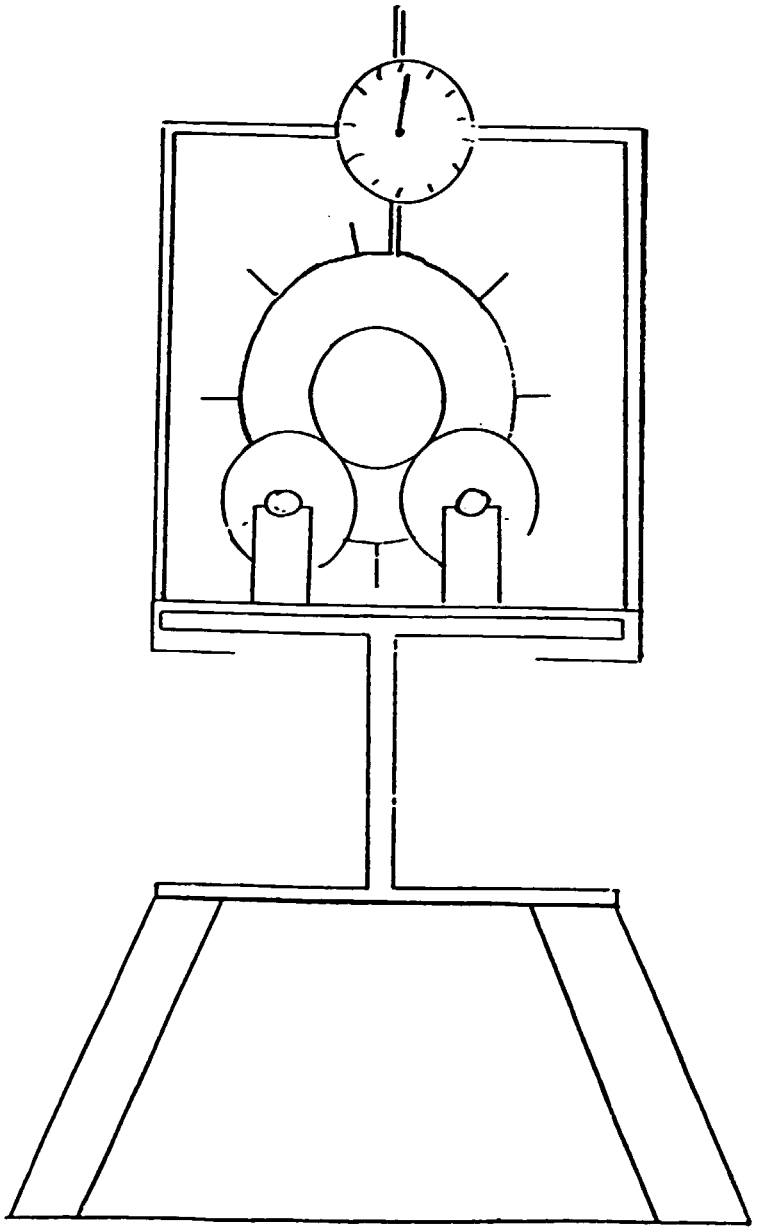


FIG 21 C

When the cylinder is in the machine, let it run for 10-15 minutes before you start grinding. Then grind carefully, as mentioned under section 7. When the cylinder is finished ground, stop the machine and check the parallelity. This must be done on most machines every time the cylinder has been taken out. When everything is checked and found to be correct, then the machine is ready again.

FIG.22 and 23 indicates a bench in which both the re-blading and straightening can take place.

FIG 22



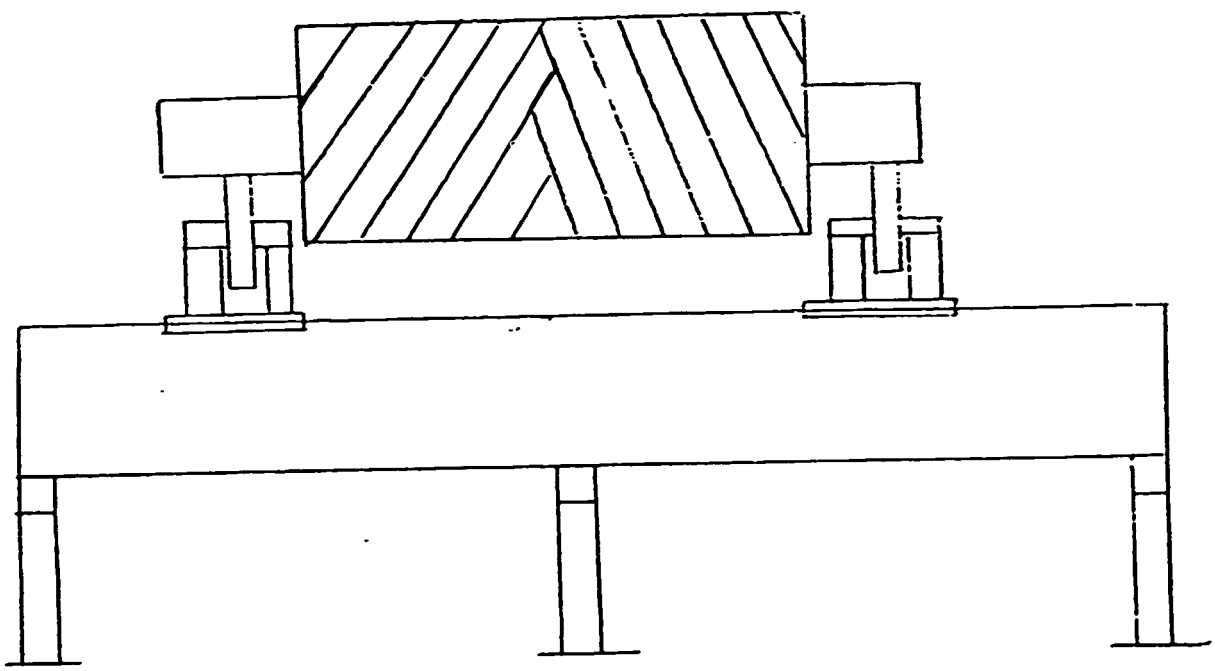


FIG.23

8.REBLADE.ALF

# A N N E X 2

## ETHIOPIA

Mission Report (*)

Hides and Skins, Leather and Leather Products Improvement Scheme

US/RAF/88/100

From 02-30 September 1989

Prepared by: Alf Tore Rongved
Machinery Maintenance Expert 11-06

(*) This report has been reproduced without formal editing and sent to the NLSC as a working paper on 30 October 1989

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## PURPOSE OF VISIT

To visit five of the tanneries, connected to the NLSC, the National Leather & Shoe Corporation, and give technical assistance and comments on their maintenance control.

## WORK PLAN

The work plan was prepared prior to the arrival, by the national expert, Mr. Seyoum Hailu, and consisted of an introduction visit to the technical department of the NLSC, and to the five tannaries. Then, later to return to the tanneries for a working visit.

## LIMITATIONS

The time in Ethiopia, 28 days total, proved to be very short considering the number of tannaries to be visited. This explains for limited practical works which was enabled.

## TANNERIES TO BE VISITED

Addis Tannery, located 5 - 6 km from town centre.
Ethiopian Pickling and Tannery Factory, located 4 km from town centre
Awash Tannery, located 4 km from town centre.
Ethiopian Tannery, located 90 km from town centre.
Modjo Tannery, located 75 km from town centre.

Capacity of the tanneries, figures from NLSC 88-89.
Hides - Approx 4200 pieces per day
Skins - sheep/goat approx 45000 per day

## NUMBER OF EMPLOYEES

These tannaries employ close to 3000 workers, included approx 330 maintenance members (all included).

## GENERAL FINDINGS

There are a few things general for all the tanneries visited. The NLSC has with UNIDO assistance during the past build up a preventive maintenance system. This system is now incorporated in all the tanneries and also the shoe and leather goods factory, all connected to the corporation.

The system is build around inspections, small repairs, medium repairs and overhaul.

The intervals in between each categories is set by experience and partly by the complexity of the machines. The complexity factor also comes in for the time set for the individual aspect. To make this work every machine has its number, identity, and its own history file.
The only machines excluded from this system is the "long lasting" machines, i.e. parralell plated embossing machines. This type of machines comes under brake down maintenance.

Thsi system should be fully capable of giving the inspectors the intervals and the background for each machine to be inspected, especially as it also includes an inspection list prepared for each type of machine.

With all this in mind, it is sad to observe and to find so many errors. Wrong adjusted machines and machines with technical problems and, the worst, a lot of machines very dirty, badly greased and showing other signs of negligence.

Another general problem for the tanneries, that do hides, is thickness. Splitting and shaving. At the moment the three tanneries doing hides, Addis Tannery, Awash Tannery and Ethiopian Tannery are all having problems connected to these two operations. This inspite that for Addis Tannery and Awash Tannery the splitting is at wet blue state, but as for Ethiopian Tannery, it is at the timed state. The only difference is that those who split in wet blue has a higher split recovery than the one that split in time. In both cases the splitting is uneven to an degree of giving the shaving to much to remove.

The last general problem is effluent. None of the tanneries visited has a effluent system in operation. This in spite that for one Ethiopian tannery, the effluent system is already build, and for one other, Modjo tannery, the equipment for the effluent system has been on stock for the last four years.

## ADDIS TANNERY

The Addis Tannery with its 65 years is Ethiopias oldest tannery. It is located 5-6 km from Addis Ababa, at the end of a road which is in such a condition that ordinary cars just about can make it. The location of the tannery is at the bottom of a narrow valley, with one river going at the back side of the buildings,and another almost parting the actual tannery from the boilers, workshops and office building.

Three weeks prior to the arrival this last river suddenly increased and almost totally flooded the tannery. The water level in the factory was 60-80 cm, on the floor. The water carrying a lot of mud, did a lot of damage to the leather, also carrying some of it away, and also completely soaked every electric motor under the given levels.

This is not the only natural problem the location have. Located in the bottom of the valley it is also threatened by landslides. A few years back a landslide destroyed half the limeyard. This treat is by no means over, as one could see a very recent one almost touching the road in its final bend.

The capacity of the tannery is about 750 hides per day. This is partly processed to wet blue, crust and finished leather. The finished leather is mainly for army purposes. The wet blue and the crust is both very dirty, partly because of the flood and partly because the water treatment of the muddy river is insufficient.

SOAKING LIMING

Soaking in four pits. Liming in paddles, temporary out of function due to the flood, but shall in all cases be transferred into drums. So at the moment liming is taking place in three second hand drums and one new 3 x 3.25 m drum.

FLESHING

A combination of green and lime fleshing. In both cases done on sides. For green fleshing an old Svit machine, for lime a two - three year old Aletti fleshing machine. The fleshing is generally bad in both cases. This is mainly due to the fact that there is no selection into weight classes before fleshing, but also that the operators is not taken proper care to see that the entire skin is fleshed before reopening the machine.

TANNING

Tanning is taking place in three Vallero 3 x 3 m drums. This is at present sufficient for the todays approx. 9 tons. All drums have some door leaks, and there are very few hoopes on the drums, only 8 hoopes per drum. There are no compressed air available so therefore the brakes are not operating. This causes a lot of strain on the gearboxes, which in respect, for two of the drums

not any longer were properly anchored. There is no water meter for the drums.

SAMMYING

There are two sammying machines. One old Svit machine, temporarily out of function due to the flood. This is an 1800 mm working with machine. The other machine is a Mercier machine, 3000 mm working with and thereby originally designed to same whole hides sideways. Since they sam side sideways, they don't achieve a very good result. The machine has a major slack in the main bolt for the top arms carrying the top pressure rolier. Considering the age of the machine, approx. 5 years, this is very soon, especially since it once already has been repaired. This indicates lack of greasing or some other mistakes. The output from the machine is small, two sides per minute, which at the present stage leaves them to do two shifts.

SPLITTING

Chrome splitting on two machines. One, a Moenus splitting machine is generally not in a very bad condition. When the result still is bad it is by the fact that the skins arrives creased, some minor adjustments and that the operators tenders to either lift the bridge or lower the rubber roller to ease of feeding the skin. Also some problem occurs because they do not frequently enough bring the table back to remove pieces of leather stuck to the segment roller and the segment guide.

The other, an old mechanical turner splitting machine is in a bad condition. The machine has a number of faults and needs basically a total overhaul if it is to be considered further use.

They still work on it, but it does basically more damage than acceptable work so it should not be used.

SHAVING

Three machines. One Scit flat tabled, mainly used for splits. The machine does not hold the split which leaves to the operator a task they do not cope with. A lot of damage. No thickness control with measurements except fingers. The machine has a vibration and the grinding is very bad.

One Aletti, approx. 5-6 years old. Fully hydraulically machine. Some vibration, unbalanced cylinder and also grinding wheel. The covers for the support saddle of the grinder keeps coming loose and blocks by this the grinder movement. According to history card of the machine this is a common problem, which in spite of countless repairs, keeps on reappearing.

The results from the machine is better that one would expect in light of these informations. There ofcourse is chatter but less than one should think. As for the Svit machine, not thickness control except by feel.

One old narrow Turner machine. The type rebuilt to have hydraulic closing and hydraulic traversing of grinder. This machine was the one that we worked on. By the time Addis tannery's time was out, the motors still had not reappeared from the electrical shop where they had been taken for drying, cleaning and changing of bearings. How the machine worked, is by this reason unknown.

TRIMMING (Wet)

After shaving the skins were literary thrown in a heap, to be later placed on tables for trimming. The trimmers used razor blades (for beard) rapped in cloth and tape, as knives. This could be some of the reason while the trimming is very hard. When you are in danger of cutting your fingers you tend to take a bigger piece of leather than normally would be necessary.

RETANNING

Retanning drums, two Vallero 3 x 3 m. Working speed 8 to 12 Rpm. Minor oil leaks on gearboxes. All door locks needs replacement. As for tanning drums, very few hopes. There is no tempered water, and no water meters. For the last drum there is a severe misalignment between the gearbox and the drum. This has happened during the foundation building, as the same misalignment occurs from the drum foundation to the gearbox foundation. This must be rectified or else is the big crown wheel on the drum going to be destroyed.

SETTING MACHINE

An old Svit plain setting machine. There is no dewatering except piling before setting. This makes the setting very bad as the skins are much to wet for a plain setter. The fact that they also, unknown by which reason, puts two sides on top of each other in the machines, more or less explain the bad result. The machine speed is also to high.

DRYING

Three means. A Gozzini doublematix vacuum dryer. Has a lot of minor leaks, a vacuum reading of 45-50 cm Hg and has due to the boilers a very variable temperature. The machine is as the leather, very dirty. These facts, and mainly the temperature and the low vacuum reading, gives a very poor result. There is hardly any evaporation.

Heating plates. Three tables all connected directly to boilers. The sides are slicked on the plates and removed when they have dried for a while.

Hangdrying from the roof. Two holes are made in the butt. A piece of wood is put through the holes and the skin are hanged on hooks attached to the pin.

STAKING

Three very old slocum stakers. Belt driven from central motor. Are all in a bad condition and needs if still continued work is wanted, to be overhauled. Leather band is missing for all which also makes them difficult to operate.

CONDITIONING

Non existing.

BUFFING

One Aletti and one Fulminosa. The Aletti had its motor soaked and also the underlay paper was destroyed, by the increased humidity under the flood. The Fulminosa operated without bigger problems.

DEDUSTING

Rizzi airblast. Is not doing a good enough work so there is a repeated operation on an old turner rotary brush machine.

PADDING

Handpadding. Also includes hand application of dye. After padding carried to drying on poles. No air heating. The dye solvent, betylacetat, is very present.

SPRAYING

Hand spraying. The compressor for the spraying is placed close to the spray places. It has no pressure reducer and there is not any dewatering system. Drying after spraying in chamber heated, though not very much with small floor ovens.

EMBOSSING

Two Svit embossing machine. Two different sizes, and the smaller placed to far away. Beyond this there is no problems.

MEASURING

Two machines. One Selin, an electronically operated machine. This machine was soaked quite heavy under the flood. They claimed it to function, but did not use it since the absence of compressed air leaves out the stamping function.
One Turner pinwheel machine. Also soaked under the flood but did not seem to have taken any damage. Was in use.

OTHER EQUIPMENT

Due to the narrow buildings and the uneven floor at several levels, the internal transport is, for wet blue on heavy carriages,

for crust and finished, on horses and flat trolleys. There is a lot of dirt and damage on both levels due to tilting and slipping. There is one curtain coating machine which has been out of function for more than a year because the pump is destroyed. New pump is on order.

Boilers. Two old wood fired boilers. No pressure gauges and the situation can only be described as dangerous.

Workshops. Very small and equipt with machines of low quality and low accuracy. The access to the work shop is difficult for bringing in things for repairs.

EFFLUENT SYSTEM

Non existent. All waste water goes direct to river. This also includes all solids, such as flashings, trimmings, nonuseable splits and shavings.

## RECOMMENDATION

The tannery and in particular the buildings is in a bad condition. The location bearing in mind the flood risk, danger of land slide and the fact that there is no space for any expansion in most unsuitable. This also includes that there is not possible to build any kind of effluent treatment.

In the light of these facts, the best would be if the tannery could be moved to another place. if there could be found ground area within reasonable distance, the workers could remain and the present area could be used, the better part of it, to build an effluent treatment system on.

The cast of such an operation should in any case be put up against the cost of rehabilitation of the present factory. There can be little doubt that a rehabilitation would mean building almost an entire new factory, and one would still be stuck be the natural problems as flood and landslides.

As a matter of safety, the boilers should in any case be equipt with pressure gauges, and if possible be equipt with safety valves.

## ETHIOPIAN PICKLING & TANNING FACTORY

Located 4 - 5 Km from Addis Ababa. The factory is at present pickling and wet blue tanning sheep and goat skins at a rate of 8000-8500 per day. The amount of wet blue-pickled various as the upper gradings is pickled and the lower gradings chromed. The NLSC is preparing a rehabilitation program for the factory, including a further expansion into crust.

The present working staff is 250 workers including II maintenance members.

### SOAKING

Soaking is done in paddles, 8 paddles which each has a capacity of 1500 skin.

### PAINTING

One painting line. Hair removal by hand rubbing.

### LIMING

8 drums. Mostly Olcina but also some Vallero drums. Same measurements 3 x 3.25 m. The drums work at 4 Rpm.No water meters.

PICKLING/CHROMING

8 drums. Olcina/ Vallero, measurements 3 x 3.25 m. Capacity per drum said to be 2500 pieces.

All drums, liming, pickling and chroming suffers from smaller door leaks. Some has oil leaks gearbox. Generally bad cleaning. In the process they include hand scudding.

FLESHING MACHINES

Three machines. One old, approx. 15 years, Gozzini fleshing machine, working with 1500 mm.

This machine is a bit weak, has slack in cranks for closing mechanism and tends to bend on heavy skins. The machine is to be replaced.

A Rizzi 1500 mm working with Approx. 10 years old. Has a heavy slack in main bushes/pins for support feed roller. Grinder fixture is damaged and one brass strip is missing or totally worn out. Chain for grinder traversing is broken. Blade cylinder has heavy damage on blades right side. It is so far out that it only affect heavy skins. The damage must have happened during transport after reblading or by mounting in the machine.

Rubber roller has reduced diameter right side. A Aletti 1500 mm working with 3 years old. This is the most modern machine. It is also the one machine which is most sensitive towards mishandling. The electrical foot switch is broken down, most of the electromagnetic valves has been changed, in such a way that all wires and connections is more or less damaged and needs overhaul. There are heavy slack in frame and support arms for feed roller. This is caused by insufficient or no greasing.

The pins we tried to rebuild to reduce the slack, but in the absence of spares and bad machining, it only became a 50% quality repair.

All the machines are very badly cleaned and also greased work shop/mechanical, electrical.
Almost as non existing. The tools, a grinder and a drill is both of a quality hardly sufficient to do anything. Both workshop is in a big mess. Has to be rebuild totally. Spares is almost non existing.

MAINTENANCE SYSTEM

In spite of the condition of the machines the annual preventive maintenance system is prepared to every detail.

EFFLUENT SYSTEM

For water to be used in the factory there is a settling tank. For waste water there has been some pits mainly for airration but this was not in operation. There is available space for effluent treatment but this matter will be touched later as a separate subject under general recommendations. (Page 30)

## RECOMMENDATIONS

The Ethiopian Pickling & Tanning Factory needs to make an effort into making the already established preventive maintenance system, to move from only paper and into reality. This means that the workshops needs rebuilding, there must be established some spare part system and the most important, the quality and attitude from the maintenance members must be uplifted.

If the present situation continues, and the factory installs more machines to move to crust as planned, these new machines will last only a short period of time.

The two fleshing machines which not is to be replaced, the Rizzi and the Gozzini should both be taken for a overhaul while there still is something to overhaul.

The ways of doing such an operation will be listed under general recommendations. (Page 30 ) 50

## AWASH TANNERY

Located very close to the EP&TF, but slightly down the river so 4 - 5 km from Addis Ababa.

As one of the oldest and biggest tanneries in Ethiopia Awash is producing both skin, sheep/goat semi processed and hides. The hides is partly done finished.There present capacity is approximately 10000 skins and 850 hides per day.

They employ 800 workers including 72 maintenance. These 72 includes mechanics, electricians, wood workers and inspectors. As for the other tanneries within the NLSC Awash has a good theoretical maintenance system. As also for the other tanneries the quantity of errors and wrong adjustments is to high.

In the history card one also finds some error or some repair done over and over again.

Main purpose of visit is to check effects and quality of maintenance system and to maintain a turner chrome splitter.

Workshop mechanical work has reasonable equipment but none to high quality standard. It is a bit unpractical being spread over more than one room.

Wood workshop is well equipt and they make a lot of their own things. Several smaller home build drums indicates high quality work. They will also if high quality wood could be provided try to build drums in 3 x 3 m sizes.

DRUMS

Most of the drums for both liming, tanning and retanning are Olcina drums. Particularly the soaking liming section made a very good impression. The oldest drums are 8 - 9 years but good cleaning and lubricating of bearings, bushes and door slides and locks, proves what can be achieved when one takes proper care of the equipment.

FLESHING

The fleshing is done on sides and is to variable. When the grading into weight classes is missing or done improper the fleshing suffers. This is mentioned because it comes back as a big problem at a later stage.

TANNING

There is no water meter for the drums. When the drum is emptied, the sides is more or less thrown in a pile awaiting the following days sammying. Because of this bad piling and also the delay, the skins inparticular in the lower lays of the pile gets very heavy creased.

SAMMYING

A through feed Aletti machine. The machine problems is mainly that the rubber coating of the pressure roller comes of in bits. This eventually gives patches with improper sammying, but it also

destroys the felt bands. For a country like Ethiopia, in which it is not possible to have a rerubbering made it is also very expensive from that point of view.

Since it is a machine designed for whole hides and at present used in sides, already heavy creased, the result from the machine is very bad. It does not help that by capacity reasons they are forced to run two sides at the same time, next to each other. This gives big difficulties in using the spreader cylinder, which as a consequence in most cases are not used.

SPLITTING

After sammying the sides is left so long before splitting that the above mentioned creases dries out. This explains for some of the problems in splitting and also explain most of the damage done. Some of the other problems in splitting comes from the inadequate fleshing. Since some of the sides are very "raggy" on the fleshed side to much of this comes of and clogs up the segment roller and keeps it from operating properly.

The history card for the splitting machine tells that the machine had a check last 7 months back. Since then there has been inspections. The last inspection stated, dust on collector and bad shape of a grinding wheel. The real condition of the machine is a totally different picture.

The machine is a Turner 1800 mm working width built in 1980 as a conventional chrome splitter. The check of the machine produced the following list of worn out parts and wrong adjustments. The substance roller (feed roller) was heavy damaged due to the wrong adjustment of the left magnet. The

magnet had been touching the substance roller and both should be replaced. The nose stips on both back and forward covers was worn out, allowing the substance roller to move with the side. The bearings for the substance roller was worn totally out. The support rollers were wrong adjusted. The support nose (edge) of the table was hollow with about 6 mm. The segment roller was wrong adjusted and as stiff as solid.

The ring guide was wrong adjusted, allowing the segment roller to climb. The jaws was totally worn out and gave variations from 0,1 - 0,4 mm. They were also cracked.
And finally, the level of the blade was set for dry splitting and not for chrome splitting.
To restore this machine most of the above mentioned items would have to be changed. While checking the store, only about 50% of the spares was available. To avoid destroying those parts by running against worn out parts it was decided to set up the machine with only the old parts, and read just as good as possible.
After this work was completed and the machine was back in operation, a simple test, while a good side was selected, all the heavy creases was trimmed away was done. the result of the side and the split was not as good as one would have liked it but acceptable. The average splitting however, was not as good due to above mentioned reasons.

As Awash tannery in the near future will shift from chrome to lime splitting there was a wish to rebuild the splitting machine to be capable of do lime splitting. This is not a good idea. The

machine will not last as a lime splitter and being only 1800 mm wide nor will it be capable of splitting whole hides. Considering a whole hide sammying machine, to lime split sides can not be recommended.

SHAVING

Two Aletti machines and one Rizzi machine. Only the two Aletti machines were in operation, during the visit. In both machines there was made a lot of damage. Partly because of to high working speed and partly because of the damage already done. The fact that they also tend to split to a too big distance from desired shaving thickness forces them to shave twice, which also contributes in destruction.

QUALITY OF WORK

As already mentioned there are made to many errors on various stages in the process which all in their way contributes to destruction of leather. The amount of trimming needed to remove all the errors results in to many trimmings and end leaving the sides almost shapeless.

EFFLUENT SYSTEM

Non existent. It is disappointing to find that a tannery this size have no effluent system. Before, when the tannery was privately owned there was build an effluent treatment system according to the size of the factory at the time. Since then, the capacity has increased and as the effluent system was to small to treat all the water no nothing is treated.

For the water coming to the factory there is two tanks to separate solids from the polluted river.

## INSPECTION

As one of the findings in Awash is that there is a gap between stated condition and real condition there was set up an inspection of a shaving machine to check what happened during an inspection. From other inspection reports one can read that the time actually used on inspection, as good as always was much lower than the given time for inspection. To enlighten this the splitting machine can be taken as example. According to the plan the inspection should take more than two hours. Actually spend time was 25 minutes. Bearing this in mind, the inspection of the shaving machine started. The inspection was performed by one mechanical inspector and one electrical inspector.
The result was totally different from other inspection. Carrying the check list the inspectors covered everything and missed out only the few points that was not mentioned on the list.

To their defence can be added that the things they missed out, only better basic knowledge and more experience can help out. This indicates that with better knowledge, more experience and a improved attitude towards work much will be achieved.

## RECOMMENDATIONS

Awash is generally doing a good job, but as one will have observed there are a few things which needs improvement. The education of maintenance member must be better. The quality of the preventive maintenance program does not reflect in the condition of the machines. The errors made in production must be removed to increase the yield. This includes human errors in terms of bad training, neglactance and also that routines which

today causes problem must be changed so to avoid or at least reduce the side effects.

The tannery will have to realise that effluent treatment must come sooner or later and that the step in one good direction can be to seek possibilities to reduce the water volume. Not all water coming from a tannery necessarily needs effluent treatment.

## ETHIOPIAN TANNERY

Ethiopian Tannery is located 90 km from Addis Ababa and is the biggest and most modern tannery in Ethiopia. At present they employ 1000 workers including 101 maintenance members. (figures from NLSC 88/89). They have a present capacity of 10,000 skins, sheep/goat and 1,200 hides per day.

The NLSC is running a rehabilitation programme in the tannery which consists of rebuilding soaking/ liming for both skins and hides and will when it is completed early next year increase the capacity to 1,500 hides and 14,000 skins per day. The tannery was built 15 years ago with assistance from Czechoslovakia. Most of the machines are consequently Svit machines. The tannery is the only, so far, in the corporation which does lime splitting. According to the production heads, the split recovery for the new machine, is between 5-10% from the higher weight class.

The Ethiopian tannery is about to receive four overhead dryers, two for sides and two for skins. They are also on their own, rebuilding the total three old pasting units from pasting to frame toggling. The factory has a very nice set up with factory buildings stores service arrangements and everything in separate buildings.

HIDE SECTION

Soaking in four new paddles. All lifted from the floor with gallery in behind.

LIMING

12 new drums.. All set up in lines to the side walls allowing floor space for forklift handling and with gallery on the back.

Fleshing on 3 Svit machines. One already built up on platform, the others to follow. Since this tannery selects the dried hides in weight classes the flashing is more even. Only the green ones go in one lot of practical reasons.

SPLITTING

One Mercier machine for hides. Only one year old but from a mechanical point of view the machine is already to show signs of minor problems. This emphasised by the result which is uneven splitting. Still this machines gives a split recovery on crupons from 5-10% on the heavies. The Svit machine has no split recovery at all, and the splitting is very inaccurate.

TANNING

10 belts pulled tanning drum. They have a very wide inside door which in addition to bad wood quality weakens the drums. The drums are as a next step in the rehabilitation programme going to be replaced. Two drums at the same size is for sole leather.

SAMMYING

On a one and a half year old Rizzi through feed machine. Since the hides come direct from tanning, and are sammed whole this

machine gives a good result. The operators are also good at preparing the hides on the felt. The machine has however, been running the same felts since installation and they are overdue for changing.

SHAVING

One almost new Rizzi RLA 10 machine and one a few years old Aletti. Then 5 flat tabled old Svit machines. The Svit machines are not much in use, so the two others take the load. Apart from some chatter it is not bad, especially considered that they remove 1-1.2 mm as a result of the uneven lime splitting. They also shave twice as the amount is so high, but due to good sammying the damage is reduced.

RETANNING

12 retanning drums. All the same shape and size and with inside sliding doors. No water meter.

SAMMYING

Three narrow conventional sammers. All Svit works all right.

SETTING

Three plain Svit setting machines. Operates very fast. Could look as if almost over doing but that was the way they wanted it.

PASTING

Two complete Svit pasting units. However since the glass is breaking up, they have decided to rebuild to toggle drying.

SOLE LEATHER

Sole leather drying is on bars from the roof. The setting of the sole leather is very insufficient, leaves a lot of creases which gives a lot of damage during rolling.

VACUUM DRYING

Two Gozzini Doublematic machines. One modified by been lifted 50-60 cm from the floor. This gives at least the maintenance a chance to go under for repairs. In addition to the normal water leaks, both machines suffer from low vacuum reading. Some (10%) can be explained due to pump cavitations due to altitude, but as the reading is not more than 50-55 cm Hg, and no detectable leaks could be found the rest must come from reduced efficiency of vacuum pumps. The effect is better than one would expect under the present readings.

CONDITIONING

So far there has not been much, but a home built machine will soon be ready.

STAKING

The Svit Molissa through feed operating with no problems.

BUFFING

Five machines all 5 feet wide. Two airblast dedusting machines which as normal does not clean sufficient. Manually blowing with compressed air to compensate.

PADDING

Two manually operated padding lines. Pigment added by pouring to the side and then manually padding. Both lines have drying

tunnel. In connection with one of the lines a curtain coater is set up.

SPRAYING

Two complete lines with two times spray and two times drying. Four gas spray units is to be replaced by new spraying units. A similar unit has been dismantled and a roller coater is set up in the end, so that the drying tunnels are in use.

EMBOSSING

Six Svit embossing machine. On one of these machines there took place an overhaul. The problem was basically that while pressing with time dwell the pressure dropped.

According to the producers manual this problem could be caused by only one valve. After a total pump overhaul this inspite several attempts did not solve the problem. It was finally after also having to overhaul the main valve that the problem was solved. The bypass channel indicated on the valve drawings was not were it should be, and thereby allowing yet one more valve to be the possible cause. After modifying the manual the other machines was checked and found to have some problems.

IRONING

One Aletti through feed ironing machine, not much in use as little of the production is ironed.

MEASURING

Two Svit pinwheel machines and one Carrara electronic machine.

SKIN SECTION

All the old pits for soaking is to be replaced by 4 new paddles at present under installation. When this is completed and the 9 new liming and 9 new tanning drums are in operation the capacity should increase to 15,000 skins per day. At the moment, due to the building activity they are down to 50% of originally capacity.

FLESHING SECTION

Svit machines and ten year old Aletti machine. The Aletti machine is getting close to having the same mechanical problem as the one in Ethiopian pickling plant, but here after 10 years of operation.

SAMMYING

One line of sam/setting machines. Working without any bigger problems. For the skin section approx. 65%, goes to finished 15% to pickled and the remaining 25% to wet blue.

The amount of finished shall increase and a line of shaving machines is ordered to assist in this.

DRYING

One tunnel dryer and one pasting unit, which shall be rebuilt to toggle dryer as for the hide section. 2 overhead dryers is also expected.

STAKING

Four slocum takers and one vertical staker.

FINISHING AREA

Spraying in one spraying line with two times spray and two times dry. Three Svit embossing machines and one Mercier finiflex. Two small vallero dry milling drums and finally one electronically bases measuring machine.

## RECOMMENDATIONS

The Ethiopian tannery has one of the best possibilities to make a good quality leather among the tanneries visited. Nevertheless even for this tannery there is still a lot that needs improvement. As for the others quality of work must be improved. Better training to avoid errors and better understanding about the importance of yield. If the waste is to high, an increased number does not necessarily mean that productivity is higher.

The Ethiopian tannery has a very well developed maintenance system. It is complete down to spare part ordering and other details. Still one can find to many errors and wrongly adjusted machines. This again asks for better training and higher qualifications. The finishing area of the hide section has a good set up. As a result of this concentration of heated machines the air in the building gets very hot, this in a part of the country where the natural heat can be high in itself. This heat in combination with the presence of organic solvents used in finishing, leaves a poor working climate. From the roof a few propeller fans should solve this problem to a very low cost.

The effluent treatment plant which has been allowed to stand still the last 10 years and for this reason partly has broken

down, needs to be cleaned up, repaired and put back into operation.

## MODJO TANNERY

Located 75 km from Addis Ababa, Modjo tannery is a small tannery doing sheep and goat skins to pickle, wet blue in the region of 8000-9000 per day. As for Modjo tannery the NLSC is planning a further developing into crust. This is partly in process as they have some dry machines and the lower gradings in a small scale already goes to crust. The Modjo tannery is originally a small crocodile tannery and as a part of the future this might come back in a small scale. The tannery employ's 265 workers including 18 maintenance members.

Soaking in Modjo takes place in 10 small paddles, each with a capacity of 300 skins. These are to be replaced with bigger paddles of which three were installed a few years back. These new paddles are inspite of their young age already showing bad signs of cracking in the top beam and also in leaving parallarity. The worst is already given 12 cm in the sideways direction. These two errors can only be caused by improper installing or by negligence of the expansion of the wood during swelling. The paddles are as for the rest of the tannery very dirty and this does not help to the situation.

## FLESHING MACHINES

Three fleshing machines of which one, an old Gozzini machine was under overhaul. The problem which had been tended to as recently as three months back, was worn out bushes for the feed roller.

The only three months old repair was already worn out and the cause for this was bad repair, improper check of the feed roller and not enough accuracy in machining.

After dismantling the second time the cylinder was checked for straightness and found to have been bent on one end. The workshop in Modjo tannery is not equipt with bid enough lathe to cope with such a problem. The cylinder had for this reason to be sent to Ethiopian Tannery for the machine work. Due to the limited time we were not able to do any further work as the time was up when the cylinder in the workshop.

EFFLUENT SYSTEM

Modjo Tannery has for the last four years had all the equipment for an effluent treatment plant on stock, at the factory land. Due to the high civil works cost, it has not been possible to build and get the system into operation.

The Modjo tannery has the same maintenance system as the rest of the tanneries visited, but as for the other tannery of the same size, Ethiopian pickling, Modjo is having bigger problems, than the bigger tanneries. They also claims to claim to have spare parts problem, which most likely is due to the limited number of machine and thereby no system or procedure in spare parts ordering. When you experience a delivery time as in Ethiopia of between six months and one and a half year one has to be prepared.

## RECOMMENDATIONS

The maintenance quality must be uplifted. As for the other tanneries visited the lack of accuracy brings the same repair over and over again. Modjo tannery has to seek advice from the bigger tanneries of what spare part system they prepare to be reasonable safe. The improper cleaning of both machines, equipment and surroundings in general can not continue.

The supplier of the new paddles should be contacted in order to seek advice on how to repair the paddles which are damaged. The tannery being the possession of all the equipment for an effluent treatment plant should seek the necessary funds for it to be completed.

## END COMMENTS

*The National Leather & Shoe Corporation has done and are still doing a good job for the leather industries in Ethiopia. The rehabilitation scheme partly under operation also indicates that the industries will continue to grow.*

*From a maintenance point of view there are however a few things that need more attention. The number of trained and experienced engineers should be higher. This problem results in to many breakdowns, to many errors, to many badly done repairs and to much destroyed leather because of wrong adjustments. If nothing happens this problem will increase as the new machines gets more complexed and complicated.*

*Effluent is for all the tanneries a big problem. The fact that all the waste water goes to rivers or lakes, leaves this issue as a very important matter.*

## RECOMMENDATIONS

Within the tanneries connected to the NLSC there are a lot of machines that needs a thorough overhaul. This would make them capable of still work at a very good level for many years.

None of the tanneries has the workshop equipt to do such, to the standard required. If one could imagine one such workshop established, fully equipt to as a professional workshop, it would be capable, run by the experienced enqineers available, to do such overhauls and also act as an education center for untrained and inexperienced maintenance personnel. All the smaller machines and parts needed attention from the bigger ones, can be transported to such a place for qualified work to be done.

This does not mean to reduce the standard of the local work shop. On the contrary, as knowledge improves, also the local workshops will increase in quality and standard.

In effluent, the amount of water to be treated is connected to the costing. If one can seek to minimise the water that needs to be treated also costs can be reduced. For tanneries close together, one joint plant will be cheaper than to separate.

## PROPOSAL FOR NEXT VISIT'S SEMINAR

Since thickness adjusting, splitting and shaving is a common problem for most of the tanneries visited this subject could be a reasonable basis for a seminar.

With proper preparation, there could be arranged checking and readjusting of splitting machines and shaving machines. As

chatter is a problem within the same machine category and since, a lot of this comes from improper reblading, also a reblading course could be be held at the same time. In the later matter including the introduction of more rational tools than pure hand work. If this proposal is generally accepted, some work will have to be done prior to arrival to ensure the availability of spares and other materials needed. The time would have to be set reasonable, less than 7-8 working days would be pointless.

As for this visit leaving only a few days in each tannery the time is to short to do a real working visit. The danger of leaving a track of dismantled machines becomes to big.

## PEOPLE MET IN ETHIOPIA

National expert Mr. Seyum Hailu

He had everything prepared prior to arrival and proved very efficient with all problems that surfaced.

From NLSC

General Manager Mr. Yilma Adamu

Technical department head Mr. Asnake Erqou

From NLSC's technical department Mr. Tamiru Bogame whom I spent a lot of time together with and who really knows about tannery machines.

From Awash Tannery.

General Manager Mr. Mesren

Chief maintenance head Mr. Belete Debaba

Chief production head Mr. Abdulahe

From Addis Tannery.

Chief maintenance head Mr. Alula

Chief production head Mr. Mulat Mamo

From Ethiopian Tanning & Pickling Factory.

General Manager Mr. Leule Berehane

Chief maintenance head Mr. Hayele Mekael

Chief production head Mr. Haylu

From Ethiopian Tannery

Deputy Manager Mr. Kidanu Chekol

Chief maintenance head Mr. Mekonen

Maintenance members Mr. Medehene Baheta, Mr. Alemayehu Abebe and Abedeza

From Modjo Tannery

General Manager Mr. Zeweg G/meskel

Chief maintenance head Mr. Getachew Tesema