



Goatskins being air dried after crust retan/fatliquoring, and dyed suede leathers for shoe upper leather.

Tannery of the Year: Elico, Addis Ababa, Ethiopia

Proud of its status as Ethiopia's only tannery currently exporting only finished leather, Elico has plans in place to increase every area of its output and double sales. It is optimistic about the future.

Addis Ababa is one of Africa's fastest growing cities and it won't be long before the cranes and construction teams are within touching distance of the Elico tannery, founded in 1957 in what used to be countryside, close enough to the Akaki River to make leather production possible.

It was the brainchild of Armenian tanners who had fled to Africa after World War II and won the approval of Emperor Haile Selassie I, who presided over the official opening ceremony; the commemorative plaque still has pride of place at the entrance to

one of the main production units. Yes, units in the plural because there are separate lines for processing bovine hides (around 200,000 a year) mostly to make shoe upper leather for the domestic market, for turning skins from Ethiopia's unique and highly appreciated highland sheep into glove and garment leather (1.2 million skins a year), and finally for processing goatskins to make suede for shoe uppers (around 1 million skins a year). Elico's sheep and goat leather mostly goes to high-end clients in Italy, Germany and Japan. Demand is strong.



From a technical point of view

(1) Overview of operations

Ethio-Leather Industry PLC (ELICO) is a 54-year-old company that commenced manufacturing as Darmar tannery in 1957. As part of nationalisation in 1975 it was known as the Awash Tannery until it was privatised again and took its current name in the 1990s. There are now three tanneries and all are located in Addis Ababa.

The largest manufacturing unit processes sheepskins from the raw to finished state mainly for dress and golf gloving for export, although a small volume is manufactured as clothing and shoe upper leathers. Bovine leathers are also manufactured on this site in an adjoining building from the raw to finished state, although this is supported by wet blue purchases from within Ethiopia. These leathers are mainly for local footwear manufacture, but about 30% of the output is for leathergoods manufacture - belting, wallets, cases and bags.

There is also a goatskin tannery manufacturing high quality suede from the raw state for shoe upper leathers located about 4-km distance from the sheepskin tannery. Finally, there is a workshop dedicated to the manufacture of leathergoods. About 1,300 people are employed in total, about 40% being women.

(2) Manufacture and processing

There is a skin and hide store at the sheepskin/bovine site. This can contain up to 200,000 salted pieces as slaughter is spasmodic due to periods of fasting and feasts, and holding times can extend up to three months as the temperature is moderate. Deliveries are both from abattoirs within the region that have been graded to national standards, but also from long established small scale collection routes. If national standards are not met, then the pieces are pulled out and sent back to the dealers. In addition to trimming and selection to four weight grades, the sheepskins are segregated according to hair colour – black, brown and white. Although skins are bleached before tanning using both chlorine dioxide (*generated in situ*) and permanganate, this raw selection assists consistency within dyeing operations.

SHEEPSKIN MANUFACTURE

The input comprises three soak loads of 3,000 pieces per day. After a one-day soak the skins are painted on the flesh side for unhairing, the hair mechanically removed, followed by a one-day liming. The pieces are then fleshed, delimed/bated, and acid/salt pickled to pH 1.0.

Each skin is then trimmed, graded according to quality and size, stretched by hand to flatten and remove creases, then piled in bundles of 12 pieces to a height of 0.75 m. These stocks can be held up to three months if required, or alternatively can go directly into production where they are depickled to pH 6.2 – 6.4, repickled to pH 2.6 – 2.8, pre-fatliquored and chrome tanned in a 17-hour process.

The skins are then piled, covered in polythene and drained for 48 hours, this weight being used to calculate chemical offers within the retan/fatliquoring process. After dyeing, the skins are piled for one day before setting on the grain, then hang-dried using an overhead conveyor system.



There are five shaving machines used within the bovine production plant. One for whole hides, and four for side leathers.



Part of the sheepskin soaking department. After sulfide painting and hair removal by machine, the sheepskins are returned to these drums for liming.



Grading pickled sheepskins. Many are stored for several months to off-set irregularities in raw material availability.



The skins are conditioning as necessary, then softened and stretched using a cylinder staking machine, followed by a mordant selection for grade, area and dye suitability. Six dry shaving machines are used for crust shaving, and every skin measured for substance as thickness is very critical. In the final leathers 0.55 – 0.65mm and 0.45 – 0.55mm are the tolerances for men's and ladies dress gloving respectively, 0.35 – 0.5mm for golf gloving leathers, although sometimes customers have different specifications.

After dyeing to shade, the pieces are hang-dried, conditioned if required, staked on a cylinder staking machine, then wheel-staked using six custom built machines. The staking of golf gloving leathers is performed in a separate department to avoid the possibility of colour contamination. The pieces are then toggled, then finally measured, graded, wrapped in polythene and sealed before dispatch.

GOATSKIN MANUFACTURE

Goatskins are processed from the raw to finished state mainly as suede for shoe upper leathers at substances normally in the range 0.9 – 1.0mm and 0.7 – 0.9mm. The input is 6,000 pieces per day using a six-hour soak drum soak, followed by a 17 hour hair burn liming process as the hair has no value. After lime fleshing the skins are delimed, pickled and chrome tanned in a two-day cycle.

The operations are in many ways similar to the manufacture of sheepskins, so after selections into six grades and area sizes the pieces are crust fatliquored/retanned, conveyor hang-dried, staked using a vibration staking machine, and cylinder staked.

Buffing is considered a critical operation, and is performed using eight machines operating on a two shift system. Each piece is inspected, with under-buffed pieces rebuffed, and over-buffed pieces set to one side.

After dyeing, hang drying, and milling for normally four hours the temperature increases to approximately 35°C. The pieces are then toggled warm on an automatic flat bed toggling unit. This is followed by inspection, packaging and dispatch.



Mordant sorting of sheepskins. Not only are quality and size taken into account, but also the colour for suitability in dyeing to more than 50 shades.



After dry shaving, each sheepskin is carefully measured for substance.

Political developments led to the expulsion of the Armenian owners in 1975 and the tannery passed into state ownership. The state owned and ran the facility until the 1990s when the military government was overthrown. In 1997, current owner Sheikh Mohammed Hussein Ali Al Amoudi added Elico to the list of his investments in Ethiopia, his homeland (the billionaire is based in Saudi Arabia some of the time too, but his ambition is to see a prosperous Ethiopia). Throughout these changes, production has been continuous and more recent developments have included a finishing plant and a small finished goods factory, with five retail outlets throughout the city. Under the leadership of general manager, Brook Debebe, Elico now has 1,300 employees, more than it had under public ownership.

Livestock population

Elico is able to make around 25 square-feet of leather on average from each bovine hide, 4.5 square-feet from sheepskins and slightly more, about five square-feet, from goat. With Sudan dividing into two countries on July 9, Ethiopia is proud that it will become the country with the largest livestock population in Africa. The government calculates current totals to be 23 million goats, 25 million sheep and 41 million head of cattle. The livestock population is on the increase because the government is offering specific support to farmers to help them secure enough supplies of feed and water to run larger herds. In areas with plenty of rain, farmers are concentrating on food crops, but in drier areas, distribution of water and feed is improving and livestock farmers are taking

advantage. "The US and the European Union have a choice about whether or not to invest in agriculture," Brook Debebe says. "We don't have a choice; all we have is land and people. But we have achieved growth of 11.4% on average over the last five years and this has been led by agriculture. There has been no drought for the last eight years, in fact we have ended up being flood-threatened in some areas, and we are producing enough food to feed ourselves, but there is still massive scope for us to increase this."

In terms of the pattern of animal slaughter and meat provision, Ethiopia's particular circumstances are well documented. The population is religiously mixed between Christians (mostly Ethiopian Orthodox) and Muslims. Periods of fasting or at least abstention from meat



BOVINE MANUFACTURE

Manufacture comprises three drum loads of 4,000 kg weight per day, each of 350-400 pieces. A one-day dirt and main soak is followed by a one-day hair burn process. After fleshing and lime splitting to 4.0 mm the hides are delimed/bated pickled and tanned in a one-day operation. This manufacture is supported by other wet blue purchases from within Ethiopia.

After grading and shaving to substance, the dyeing loads are weighted, normally being 800 kg in weight. After samm/setting, the pieces are part dried by vacuum drier, trimmed, hang-dried on an overhead conveyor, conditioned as necessary, vibration staked then vacuum dried to flatten.

After crust selection, the sides are finished using two roller coating machines with drying cabinets, two double headed spraying machines, three ram presses and a polishing machine. There is surplus finishing capacity within this bovine plant, and this is used for finishing small skins as required.

LEATHERGOODS AND GARMENT UNIT

There is a separate unit manufacturing leather articles such as ladies bags, briefcases, school bags, wallets and belts from leathers produced at the tanneries. This site is located near to the three tanning units. There is also a bespoke service where garments are made to measure.



Buffing is a critical operation in the manufacture of suede leathers, and each goatskin is inspected for quality of the nap.

(3) Co-products and solids management

- Recovered hair from sheepskins is sold for blanket/garment manufacture.
- Lime flesh splits and drained limed trimmings are sold for glue manufacture.
- Raw trimmings are deposited to landfill.
- Chrome shavings are compressed and deposited to landfill.
- Dewatered sludge's from effluent treatment are deposited to landfill. ☺

are long and spread throughout the year: not just Lent for the Christians, but also the weeks of Advent leading up to Christmas and certain days following Pentecost. Muslims observe daytime fasts during the holy month of Ramadan, but where Ramadan falls in the western calendar or the 13-month Ethiopian calendar varies from year to year. Conversely, at the times of great feasts such as Christmas, Easter, Eid-ul-Fitr and Eid-ul-Azha, as well as at Ethiopian New Year (in September) slaughter is high, putting the system of hide and skin collection under considerable strain, although better-equipped abattoirs throughout the land are helping.

Elico receives hides and skins from abattoirs and from traders who usually carry out salting and packing in their own territories. Salted material can be kept for up to three months because, at 2,350 metres above sea level, Addis Ababa is far from the hottest place in Africa. Elico has a policy of providing salt to some of the hide and skin traders it works with. It will take time for this idea fully to bear fruit; not all the traders are using the salt, and some of them are using it more than once. At times of high levels of slaughter, Elico's raw



Final toggling of goatsskin suede.

materials warehouse can store up to 200,000 skins, of which it processes 9,000 a day on average.

Economic situation

Religious factors aside, the economic situation also plays an important part in

determining meat consumption. Even outside periods of fasting, ordinary families can usually only afford to eat meat about twice a week. The staple diet is vegetables and the cereal crop teff, usually milled into flour and baked into spongy, savoury pancakes, from which people round the



Tannery of the Year Africa 2011: Finalist



Final inspection and grading of golf gloving leathers.



Final inspection and grading of suede goatskins for shoe upper leathers

table break off pieces to dip into an array of colourful, spicy dishes made from meat, perhaps, but also from tomato, pepper, chilli, onion, beans, potato and so on.

In spite of progress among livestock farmers and a rising animal population, the price of hides and skins is going up in Ethiopia. The current cost of a sheepskin is

around \$4, double the price compared to a year ago. The team at Elico says this situation is the result of "overseas investors making life difficult for local tanners". This is a reference to investors from Asia who have become actively involved in the tanning industry in Ethiopia. Unconfirmed reports suggest some overseas operators

have been paying high prices to gain control of raw material supply while, at the same time, paying salaries at less than half the level on offer at Elico and other companies. There is no minimum wage. The government in Addis Ababa is taking steps to counter this practice: it will limit overseas investment in tanneries and will ban exports of crust to encourage value addition from January 1, 2012

Elico first won ISO accreditation in 2004 and its underlying principles of transparency and shared information feature strongly in the company's culture. This applies to its purchasing strategy too. "Our criteria for choosing suppliers for chemicals and machinery are simple," Mr Debebe says. "The quality of a supplier's product must be high, and it must be consistently high. Its performance must be as expected. And we check. We test an organisation's chemicals before issuing a goods receipt. Obviously we look at delivery too; some companies deliver on time, others seem to have great problems managing that, and without naming names, I can tell you that we recently black-listed one quite big chemical company for a time. If chemical companies are supplying products we depend on and fail us, we would have to close down our production for a time. The other big issue we have with chemical suppliers is consistency of price, and we can also tell if a product that ships to us with a European price tag was really made in somewhere else."

Head of planning, Setiye Kassa, explains that in September 2010 the Ethiopian government bestowed on Elico the honour of becoming the first company in the leather industry to achieve the status of 'authorised economic operator', which means any inspection of chemical imports can now take place at Elico's warehouse rather than at customs. The government wants to promote exports as its main way of generating much-needed overseas currency. The prime minister, Meles Zenawi, personally chairs an export industries committee and is working hard to make life easier for companies like Elico, Brook Debebe says. "These are the companies that bring in foreign exchange and create jobs," he adds. "You simply cannot rely on the domestic market for this because ours is not enough of a consumer society yet."



From a technical point of view

(4) Water treatment and environmental management

WATER TREATMENT

Water is drawn from natural springs for manufacturing purposes, but because the volume required is insufficient for operations it is mixed with water from the municipal supply in a holding sump. Water is also abstracted from the river and held in a second sump, then used for washing floors and machinery within the tannery and effluent treatment plant. Hot water recovered from the vacuum drying units is also delivered to this sump.

There is only a cold water supply for chemical processing. This is delivered into 1m³ feed tanks placed above the drum axle level for gravity feed, after raising the temperature by direct steam injection. The temperature is checked using calibrated hand thermometers, and the volumes for addition are measured using volume markers within the drum.

CHROME RECOVERY

All of the exhaust chrome liquors are segregated from the tanning drums, coarse bar-screened, then fed into a collection sump. They are then fine-screened using a wedge wire screen, and delivered into a mixing/settling tank where the pH is raised to pH 8.5 using a mixture of magnesium oxide and calcium hydroxide. After two hours stirring, the chrome precipitates are allowed to settle. The supernatant is discharged to the effluent treatment plant, and the chrome sludge pumped to a reaction vessel where it is acidified using sulfuric acid. The final pH of the regenerated chrome liquor is pH 3.2- 3.4, basicity 33%, and the chrome content 10%Cr₂O₃. This is used for tanning, with new 33% basic chrome added to make up the required chrome offer.

EFFLUENT TREATMENT

Sulfide containing liquors are maintained separately from the other wastewaters. After screening, these are delivered into a concrete sump for aeration with manganese sulfate to remove sulfides, and then mixed with the main effluent in a balancing tank. This mixed effluent is chemically dosed with aluminium sulfate and polyelectrolyte, and then fed into a primary clarification unit. The settled sludge is pumped from the base into a sludge thickening sump where it is dosed with lime to increase the viscosity, then dewatered using a pair of conventional filter presses. Conveyor belts are located beneath both presses so that the dewatered cake can be delivered into hoppers for disposal.

The supernatant from primary settling is checked for COD, BOD, SS, Cr, S, and discharged into the adjacent river. If the analysis falls outside the standards set and cannot be rectified immediately, then all alternatives measures will be taken, up to closing the tannery, until the problem is resolved. ☉



Sheepskins are first stretched and softened using a cylinder staking machine.



Wheel staking is applied after cylinder staking to further soften, but more selectively across the piece



After wheel staking, the grain of the sheepskins are smoothed and flattened using a hand polishing wheel.



From a technical point of view



Hair recovered from the sheepskin productions has value. After mechanical pushing, the hair is segregated according to colour – black, brown and white. The loads are then paddle-washed, drained on pallets, spread on a concrete base to air dry, then stored. This is followed by compaction using a baling machine, then baling using hessian into bundles of uniform size.



As part of chrome recovery, these tanks are used to dissolve chrome precipitates in sulfuric acid to form a chrome liquor at 10% Cr_2O_3 for reuse in tanning.



After sulfide removal by aeration, all of the wastewaters are mixed together in this sump before chemical dosing and delivery to primary clarification.

Government influence

The Ethiopian government has long taken an active interest in the leather industry. Elico was one of 12 tanneries and footwear production facilities in public ownership for decades under the National Leather Corporation. It's no coincidence that Brook Debebe, who took over the running of Elico in September, has had a long career in government. He started in the tourism sector, helping to promote Ethiopia as a tourist destination (it can boast 13 months of sunshine!) and running around 70 state-owned hotels. Later he delivered training at the government-run Management Institute, with marketing as his main specialism, before transferring to the prime minister's office in 1985. He stayed there until 1998 when he became economic services bureau head and quickly took up ministerial duties. He was deputy minister of external economic cooperation, with special responsibility for economic co-operation and, later, vice-minister for trade and industry for six years. His next appointment was as Ethiopia's ambassador to the European Union and the Benelux countries. "During all this, I was board chairman of various companies, so I have had experience in business too," he explains. "Wherever you go, you have to manage people, and it's the same here. Part of my role consists of challenging the people here to come up with something innovative and already this year we have saved eight million birr (more than \$472,000). In August, we will meet with the labour union and share these benefits out in the shape of bonuses and salary increases."

Ideas that have helped the company save money in recent months have included research and development work on product modification, as well as new product development focusing on optimisation of resources. The company feels it has achieved substantial improvement and is expecting a total saving of nearly \$500,000 at the end of the budget year. Workers are also involved in coming up with innovative ideas and two recent successful examples have been the use of traditional typewriter ribbon apply fashion finishes to bovine hide.

Social life

One of Elico's customers demands social audits of all its suppliers. For this, qualified auditors from South Africa have visited the company's facilities in Addis Ababa to check on issues such as child labour, health and safety and fire policy. The company has passed each test. At an even more human level, one of the most memorable things Mr Debebe has done since taking up his appointment in September 2010 has been to ask previously dismissed workers to return to Elico. In a restructuring exercise that took place before his arrival, 200 Elico workers were made redundant. Finding himself in need of extra workers soon after taking over, Mr Debebe called them back. "Some of them were in tears of relief coming back to the tannery again," he explains, and he points out that for workers to regain their jobs in Ethiopia was particularly unusual. "We have been urged by consultants to fire workers if they make a mistake. But if you fire them in this country, the likelihood is that they will never work again in their lives."

All workers have health insurance, and if an employee is sick, he or she can receive full pay plus medical expenses for three months. Specialist teams receive special care. For example, the 12-strong group of men and women who carry out quality



Final inspection of bags made from Elico manufactured leathers.

sorting of sheepskins at pickle stage each receive an annual eye test. The canteen is subsidised so that a hot dish that would cost 25 birr (\$1.50) in even a modest restaurant costs only five on site. A sandwich costs 3.50 birr; coffee costs 1 birr and tea just 50 cents.

Among the benefits for workers is that the tannery premises include a full-size football pitch, as well as smaller areas on which people can play five-a-side or volleyball. Popular among the workers at

lunchtimes, or at weekends, these open spaces also attract children from the community that lives close to the tannery. Elico has also agreed recently to build a new road in the area and to set up communal water taps. The water pipe is there, and some members of the community have spent money putting taps in, usually charging neighbours a fee to take water from their taps. A communal resource funded by the tannery will eliminate the need for this.

Control and Accreditation

All three manufacturing units have an established ISO 9001 quality management system. The main structure of the system is based on the following working parameters:

- Document and record control procedures.
- Management responsibility.
- Resource management.
- Product realisation.
- Product measurement, analysis and improvement.
- Work instructions and standard formats.

In particular, process formulations, work instructions and standards are located at the point of process or operation with visual instruction as required. There is also recording and feedback concerning the accuracy/acceptability of machine operation from on-going inspections.

There is also an ISO 14001 Environment management system. Both systems are supported by laboratory analysis. 🌐

Product flow

When Mr Debebe arrived at the tannery, there was a large quantity of finished leather in stock. He reduced the price and sold it off to make the company's supply chain more fluid. It was Ethiopian New Year when he took over, so, after nationwide feasts, a large quantity of new raw material had just become available. His instinct was to borrow money from the bank and buy skins. In the end, he acquired 300,000 of them. Advice from inside the company was that there are better times of year to buy skins, owing to the comparatively high level of damage at that time of year. He invited prominent customers from Italy to visit at just this time, and when they saw product flowing through the tannery, they put their names down to acquire some of it.

At the moment, none of the finished goods Elico produces in its own workshop go for export, but there is a trend to focus more on finished products, and the company has been trying to acquire a footwear manufacturing firm with the plan to export at least 40% of the shoes it hopes to make, if possible by becoming an outsource manufacturing partner of a big-name brand. The information the company has is that the government wants to introduce an incentive to makers of finished products, rewarding their efforts to add more value on Ethiopian soil by reducing the tax they pay by 10%. At the same time, as mentioned above, industry observers expect extra taxes on exports of crust to come into force next January. This would give three options to tanneries that take raw material only as far as crust at the moment: increase their prices, install finishing plants (the government has said it will offer loans to help them buy the necessary machinery) or sell their crust to Elico for finishing and export, or for use in Elico's finished products.

Regardless of what the competition does, Elico has plans of its own. "Our aim is to grow all our operational activities," explains quality manager, Daniel Akalu. "We have a budget of around \$18 million over the next five years to upgrade our machinery. We plan to double sales, currently around \$16 million a year in export and domestic markets. We have a plan in place to reach \$20 million in sales next year. We are very ambitious." 🌐