



Each hide is individually attached to the delivery track running the length of the tanning department, for delivery of tanned hides to the samm/setting operation.

Tannery of the Year: Coming Indústria e Comércio de Couros, Trindade, Goiás, Brazil

A facility set up by three brothers to process hides from Brazil's centre-west region has become one of the country's most important exporters of wet blue as well as an active and dedicated provider of help to the communities that surround it.

On a 50-hectare site, ten kilometres from Trindade, in the Brazilian state of Goiás, Coming Indústria e Comércio de Couros operates its main tannery, processing local hides to wet blue stage. In 2008, the company acquired a small finishing plant 10 kilometres from the footwear manufacturing city of Franca in the state of São Paulo, which processes 400 pieces a day, but the bulk of Coming's wet blue hides, between 3,000 and 4,000 a day at the moment, go for export to all parts of the world.

Three brothers, Mario, Emilio and Márcio Bittar, are the founders

and directors of this company. They started in 1982. Originally from the state of Minas Gerais, the family went west to Goiás when the brothers were still at school. "We lived in a very small town," Márcio Bittar recalls, "and the education possibilities were few there, so we came to Goiânia when I was eight; we grew up here and are proud to say we are from here."

At first the brothers rented a factory in nearby Nazario and ran their operation from there, salting hides in the beginning and then, in the 1990s, putting a wet blue operation in place. There were



From a technical point of view

(1) Overview of operations

The company began processing hides to the wet blue state in the 1990s. This took place at several locations until September 2000, when the present site was purchased as a redundant tannery. Today the buildings have been replaced, together with all of the drums and machinery. The production has increased from the original 200 hides/day, to 3,000 hides per day, and 450 people are employed on the site, 71 being women.

In addition there is a rendering plant on site for producing grease and bone meal that commenced production in 2008. There is also a subsidiary in São Paulo that extends wet blue manufacture to 50,000 m² per month of crust and finished leathers for shoe upper leather, furniture and clothing.

(2) Manufacture and processing

Hides are received from 20 abattoirs from up to 250 km distance from the tannery. On arrival the delivery trucks are weighed on the company weigh bridge, and again after unloading to establish an accurate delivery weight for each batch.

Approximately 95% of the hides are fresh, and these are individually hooked onto an overhead delivery track that serves the elevated green fleshing machine at a rate of five hides per minute. After fleshing, the hides are stamped, hooked onto a second overhead delivery track for inspection and grading, weighed using a sensor fitted into the track, then according to a selected weight range, automatically dropped into a designated soaking and liming drum. The average weight range is 20–26.5 kg, and as hides can weigh up to 70 kg, several ranges are used.

The balance of hides received are salted, and these are cage-tumbled to remove surplus salt, then fed into an open-ended drum fitted with helically mounted shelves for a 15 minute wash and wet back before depositing into the fleshing area. If they are not adequately wet back they receive an additional short soak sufficient for green fleshing, then follow the same procedures as for fresh hides.

The soaking, liming and unhairing process is 22 hours for the average hide, but if the thickness or weight is greater, then the soaking time is extended.



Fresh hides are often loaded onto the delivery track directly from the bed of the hide delivery truck. The feed is directly into the fleshing machine, with the fleshed hides dropping to the hide-stamping station.



Once assessed for quality, then weighed on track, the hides are delivered to the designated drum according to individual weight.

frustrations, Mr Bittar says, because improvements he and his brothers wanted to make were blocked by the owner of the site. The tannery's present site became available in 2000 and the Bittar brothers snapped it up. Around 400 people work there, but the company has calculated that 1,800 people are directly dependent on the tannery for their daily bread. During the period January-August 2010, 9.5% of Brazil's total exports of wet blue came from Coming. The company was the ninth biggest exporter of hides in Brazil in 2009 and the tenth biggest exporter across all sectors in the state of Goiás.

Raw material matters

Export manager, Rafael Mariño, explains that the hides from the 18–20 abattoirs that supply Coming are mostly from the Nelore breed of cattle, with its characteristic hump. Cross-breeds between Nelore and several European types of cattle account for about 20% or 30% of the raw material. Most come from heavy male animals, although lighter cow hides are often included in the lots the abattoirs deliver. In fact, the hides that go for finishing to the plant in São Paulo are mostly split cow hides because the footwear firms say the grain on this type of

leather is better for their purposes.

"We have a good relationship with our suppliers," Mr Mariño says. "We are in constant contact with them. Relationships are the most important thing. We have to visit the suppliers regularly and, of course, payment is very important to them. Sometimes, the abattoirs are inclined to ask tanners for payment in advance, but with Coming, they have known us for many years and they know they will be paid." Attention to quality is high too. To help improve hide quality, Coming has been sharing with farmers a list of Ten Commandments [see technical section]



There are eight soak-liming drums in a single line, each 4.0 x 4.0 metres in size, fitted with four deep shelves; they rotate slowly. The drum capacity is 16 tonnes, but the load varies slightly according to the weight of each individual hide.

After liming and unhairing the hides are dumped onto the inclined floor under each drum, which then delivers the hide-mass to the area behind the drum. Each hide is then hooked onto a third delivery track that feeds the lime fleshing operation.

After lime fleshing, the hides slide onto a trimming table, and are then pulled forward manually onto a second table for quality assessment. They are then pulled onto a flatbed truck which can be moved directly behind the Mosconi whole-hide lime-splitting machine. After splitting, the hides are hooked onto a fourth delivery track, where each hide is again weighed before being delivered into the designated tanning drum.

The tanning department comprises 14 drums of size 3.5 x 3.5 m and a capacity of 11,000 kg limed weight. These drums are set in two rows and serviced from a central mezzanine floor. Each drum is serviced with four feed pipes via the feed hopper: raw water – via an aquamix system – recovered chrome solution, chrome liquor, and diluted sulphuric acid.

All of the drums in the tannery have been renewed since the tannery was purchased in 2000. They are all fitted with four deep shelves, are slow rotating, and almost all are manufactured in Brazil by Michelin.

Both shoe upper leathers and automotive leathers are manufactured using the same process, although the standards are to auto demands as this requires a higher specification. Lime splitting produces four wet blue thickness ranges: 1.6-1.8, 1.8-2.0, 2.0-2.4mm, and full substance, with approximately 75% of the hides unsplit and mainly used for shoe upper leathers. The tanning process is managed to a final pH of 3.6, and the temperature of 48-50°C is achieved by steam injection.

After tanning, the hides are dropped to the floor. Contamination is minimised in this area by fitting guttering under the axles and drive mechanisms to collect any oil drippings or axle leakage. The floor is also covered with polythene before a load is discharged.

A fifth elevated delivery track is employed to move the hides to the Bauche samm/setting machine, where they are opened out



The limed hides are dumped into the area behind the liming drums, then hooked onto a delivery line feeding the lime fleshing operation.



Lime fleshed goods are trimmed, inspected then loaded onto a flat top truck for transfer to the lime-splitting operation.

that it drew up 20 years ago. The company's aim in doing this is to show that if cattle have good grazing and a good balanced diet, the quality and size of the animals, and therefore of the hides, will improve. "Teaching farmers to do this was very difficult in the past," says the export manager. "Now people are more switched on and I think we are all seeing the benefits." With the same objective in mind, three Coming employees move around the main abattoirs the company sources material from to help, in the most diplomatic way possible, the packers' people improve their cutting and handling of the hide.

Hide availability

Sourcing raw material of any quality is becoming trickier all the time. Mr Mariño says: "The supply of hides is dropping every year, even though demand [for leather] is increasing. In 2008 and 2009 we were producing 5,000 hides a day. Brazil's meat industry, and hence the source of raw materials we use, has undergone considerable restructuring and I would say that there are now between 15,000 and 20,000 fewer good-quality hides coming onto the market every day compared to the numbers of only a few years ago. So the offer of raw material is now less and less."

In Goiás, there are few rival tanneries, but

there is competition because all of Brazil's big buyers of hides have a presence here, dedicated to securing the state's high-quality raw materials. Coming has considered trying to import hides from Venezuela, the US, Uruguay, Paraguay and so on, but the tax regime in Brazil makes this difficult. The reality of the situation, as far as Rafael Mariño is concerned, is that hides are going to continue to be more difficult and more expensive to source. As a result, he believes the price of leather is going to have to go up. "Slaughter is finite," he explains. "Supply is limited, but demand is growing. Therefore, leather will become more expensive. There is a perception in the global market that



by the operatives as they drop onto the feed conveyor belt. Each hide is then measured on the out-feed conveyor belt for area, then onto a second conveyor where they are assessed for quality and graded into six grading classifications for shoe upper leathers, and seven for automotive leathers. The hides are finally stacked onto pallets, sealed in polythene and placed in stock pre-delivery.

(3) Co-products and solids management

- All lime splits and trimmings are sold for gelatine manufacture.
- All of the fleshings are rendered on site to produce oils and protein. This treatment is in conjunction with bones from the abattoirs that supply the tannery, as previously these were deposited to landfill. This rendering process produces approximately 35 tonnes per month of a sterilised bone-protein meal product that is used as feed for chickens, pigs and fish, and 35 tonnes per month of oil. This oil is used for pharmaceutical purposes and personal care, food additives, chocolate and ice cream manufacture. The lower grades are used in tyres for cars and bio-diesel.
- All of the biodegradable solids from lime liquor recycling and screenings, chemical dosing with ferrous salts, and dewatered solids from secondary effluent treatment are mixed together. This mixture is entirely chrome free, which enables direct land application by farmers for land improvement and as a form of fertiliser (*see section 4b below*).
- Residual dried chrome cake is bagged up, and removed from the site by a specialist company. The solids are ground, thermally treated, then blended with cement products and bricks. This operation is fully certified, and the tannery has to pay for this treatment (*see section 4c*).
- All of the wood ash from stream generation – 250-350 kg per day – is provided to farmers as a mineral source.
- Waste segregation starts in each department, but is rechecked and stored according to category, typically paper, reusable plastic bags of various sizes, containers, electrical, wood and metals, pallets and hazardous or contaminated materials. This reutilisation of waste was explained to the workforce, and the fact that money raised would be used for children's education. This resulted in the workforce segregating waste at home, then bringing potentially useful waste to the factory for recycling. ♻️



Tanned hides are received from the final delivery track by the operatives who open each hide for presentation to the samm/setting operation.



After grading, the hides are folded and loaded onto pallets. A box-template is used to ensure that the hides are uniformly stacked, before the loaded pallet is sealed and stored in the dispatch warehouse.

Brazilian hides are cheap, but they are not any more."

He goes on to explain that, a decade ago, farmers in Brazil were inclined to wait until an animal was five years old before sending it to slaughter. Today, stock goes to the abattoir at half that age, making it hard to imagine that Brazil's livestock population will build back up to its previously high levels any time soon. Official slaughter statistics from the government's statistics agency for the first quarter of 2011 show that the country's abattoirs processed almost 7.1 million head of cattle during the three-month period. This represents only a very slight increase (0.2%) on the total for the first

quarter of 2010. The figure for the corresponding figure in 2007 was more than 7.9 million head of cattle, but in 2008, this fell to 7.2 and the figure has not recovered. In the first quarter of 2009, it plummeted to 6.4 million. "The production system in Brazil has changed," Mr Mariño continues, "and it's impossible to increase slaughter. The supply of hides will remain more or less the same, and the price must go up because of the competition that exists to secure raw material." He says Coming's philosophy is to secure the best quality it can through the good, long-standing relationships it has had for many years with packer firms, even though it means paying a slightly higher

price. "Prices have been pushed up; consumers and brands are going to have to accept higher prices," he continues. "We know the price is not going to reduce now and we have to match our costs."

He points out that Coming, like most tanners, would like to be able to negotiate lower prices for its chemical supplies, but, just as with raw hides, it is having to accept increasing costs in this area. However, Mr Mariño quickly points out that his company is happy with the quality of service it receives from its chemical suppliers. "They are always here, and are always testing new ideas," he says. Machinery suppliers, whether Italian or Brazilian, are also frequent visitors.



The tannery is situated within a heavily wooded 50 hectare site. The location is within a farming area, several kilometres from the nearest road and housing.

Customer markets

Asia is the main market for the wet blue hides Coming produces, but it has clients spread all over the world. Some make finished leather for footwear, while others focus on upholstery leather for automotive and furniture applications. And there are customers on every continent. This diversification is deliberate; Coming came through the economic downturn at the end of the last decade in a strong position because it invested and carved out opportunities for itself in new markets when things became tough in other areas. There was a furniture leather boom when house sales in the US were high. It seemed natural to many consumers to buy leather sofas if they could afford to. Although the situation in the US has changed, Rafael Mariño believes consumers in other markets around the world are staying faithful to this. If they can afford leather furniture, they will buy it. "It's the same with automotive upholstery," he adds. "Once you've had leather in one car, you don't want synthetic in the next."

Wet blue imports are popular, partly because of the view in some countries that wet blue is bad news for environmental reasons. "This, too, represents an opportunity for us," says Mr Mariño. "The number of beamhouses is reducing in places such as China and this means tanners there are going to have to import wet blue.

Environmental issues are very important for leather producers. We welcome the opportunity to show that we can make a natural material while taking care of the environment. We are not doing anything to harm nature, and I think we have made great progress in promoting that. Certification from the Leather Working Group is one way

in which tanners are able to do this. We have achieved silver status, and we think it proves we are a clean company. Everything we can do to get the message across is good." ISO 9001 accreditation also helps.

He explains that, as with its suppliers, Coming has worked to build long-term relationships with its clients. Some

Animal welfare and hide improvement

The company encourages good animal husbandry, correct practice pre-slaughter within the abattoir, and correct treatment of the hide after slaughter. Training is provided to the 20 supplier abattoirs, and three company employees are continuously involved in training and inspection. A protocol for animal care was set down as an information booklet as early as 1990, and this remains central to the company's animal/hide care programme:

- 1) Branding: mark the cattle on the cheek, neck and behind the ankle only.
- 2) Use plain wire fencing only.
- 3) Vaccinate the cattle periodically.
- 4) Dehorn and castrate.
- 5) Keep the enclosures clean.
- 6) Check and remove sharp objects from areas where cattle are enclosed.
- 7) Balance the cattle feed with mineral supplements.
- 8) Never use prods or dogs in cattle management.
- 9) Regular treatment to combat ectoparasites.
- 10) Choose suitable vehicles for cattle transport. 🚚



From a technical point of view

(4) Water treatment and environmental management

(a) RAW WATER

All of the water consumed is drawn from a channel joining the main river that runs 300 metres from the tannery. The quality is sufficient to directly store in a reservoir supplying the tannery, although the boiler water needs special treatment. In the rainy season, the water is first allowed to settle in a sump before delivery to the reservoir, and a water treatment system is being installed within the next two months.

(b) RECYCLING USED LIME LIQUORS

All of the used lime liquors and washings are segregated from the other wastewater streams and delivered via gullies fitted with simple bar screens to the recycling plant. From collection in an open sump, the liquor is pumped to an elevated rotary screen that removes solids down to 1mm size, followed by settling using three settling tanks joined together in series. Any surface scum or grease is skimmed from the surface, and the final supernatant stored in an open sump which acts as a reservoir. This is used for soaking all of the fresh hides, and all of the liming floats.

(c) RECYCLING USED CHROME AND PICKLE LIQUORS

To minimise chrome consumption, all of the used chrome liquors and drainings from the wet blue and samming are segregated from the other wastewater streams and delivered via gullies fitted with simple bar screens to the recycling plant. The liquors are allowed to settle and balance in a sump, and then flow from the surface into a second sump which acts as a reservoir. The retention time is extended as this enables the liquors to cool from the final tanning temperatures of 48-50°C.

These liquors are used for the dilution of sulphuric acid used in pickling, and the pickle and tanning baths. The chrome balance is made up with fresh chrome liquor. The operation is managed by taking samples of the used chrome bath from one pack in 10 and analysis for chromium, calcium and total acid content. This establishes the balance between sulphuric and formic in the system and avoids a build-up of calcium salts.



The two sumps used for collection and cooling used chrome liquors and washings are shown in the foreground, with the precipitation sump for surplus chrome to the left. The two sumps for collection of the screened and settled used lime liquors that serve as reservoirs for the recycling system are set behind the chrome recycling plant.



The rendering plant processes both green fleshings from the tannery, and bones delivered from the abattoirs. The recovered oils are filtered using a filter press, and then settled into various grades before storage and sale.

customers have been buying wet blue from the company for more than 20 years. "When they start working with us, they stay with us," he says. He accepts as positive the work non-governmental organisation Greenpeace has done to highlight links to the meat industry (and by extension to the hide and leather sector) from illegal deforestation of the Amazon rainforest. This came to a head midway through 2009 when a report connected finished leathers to the deforestation issue, which led big packer groups in Brazil to sign up to an agreement with Greenpeace and work on a new traceability system for Brazilian cattle.

"Greenpeace is doing an important job," says Rafael Mariño. "Maybe they exaggerate a bit, and they cannot ask the impossible, but they alert society to problems and if companies are in the wrong, they need to change."

Adult learning

Proud though he is of what Coming has achieved, Márcio Bittar is equally pleased about two education projects that the company has established. About four kilometres from the tannery, beside a peaceful lake, there are two classrooms, equipped with audio-visual equipment, in which adult learning programmes take place

for Coming employees. This began in 2010, and the numbers of workers volunteering to come for three hours before beginning their shift at the tannery has been steadily increasing. Some come to supplement the schooling they had as children; others are starting more or less from scratch to learn to read and write. The company lays on bus connections between the centre and the tannery and adult literacy specialists travel from Goiânia.

Children's centre

Further away is the former favela (a familiar Brazilian word meaning shanty-



The system is carefully monitored with the objective of recycling 90% of the chrome that is discharged from tanning. The residual 10% is dosed with calcium hydroxide and allowed two days to settle, with the supernatant discharged to primary effluent treatment. The chrome sludge is dried using a series of sludge drying beds, although this dewatering method is currently being replaced by a centrifuge.

(d) EFFLUENT TREATMENT

The remaining wastewaters are delivered through separate drainage to the effluent treatment plant where they are coarse screened, then wedge-wire screened before delivery to the primary equalisation and balancing tank.

The effluent is then chemically dosed using ferrous salts, and settled, with the supernatant flowing to the activated sludge treatment plant. Air is provided by six cavitation aerators mounted on pontoons floating on the effluent surface. After secondary clarification, the effluent is given a tertiary treatment by an extended settling in two sumps of four metres depth fitted with scum boards and operating in series. The supernatant is discharged to the main river.

Suspended solids from both chemical dosing and secondary clarification are settled, and the sludge dewatered using a centrifuge mounted on a raised platform. These solids are deposited into an open slurry tank mounted on the back of a truck, together with screenings, settled solids and surface skimmings from the recycling of lime liquors.

(e) ENERGY

- All of the soaking, liming and tanning operations are performed in deep shelf, slow revolving drums. These consume less electrical power than conventional vessels.
- There are several diesel powered generating stations on site. These are available if there is a failure in the main electrical supply, but as the tariffs at peak time are high it makes economic sense to use these generators on occasion.
- Steam is generated on site for both the tannery and rendering plant. This is via a wood burning boiler plant that uses timber cut to size. About 40 cubic-metres of wood is consumed each day, and can generate up to 12,000 kg steam per hour.
- Timber is purchased from renewable sources, but 33 hectares



Logs from renewable resources are cut to length and loaded onto a conveyor. As fuel is needed, the furnace doors open, and the logs automatically feed onto the fire bed.

of the tannery site is already planted with 30,000 eucalyptus trees, with another 70,000 trees planted at another site owned by the company. These trees take three years to meet optimum size, and then wood can be cut for three years before replanting and restarting the growing cycle. In the near future tannery aims to be self sufficient in terms of energy.

(f) NOISE, AIR EMISSIONS AND RESTRICTED SUBSTANCES

- Noise levels in the liming and tanning department are especially low as all of the drums are slow revolving.
- When any product is purchased, a VOC determination is required from the supplier, and these are monitored on monthly basis. The Gold standard for LWG is 15gm/m², and present values vary between 6 and 10 gm/m². The objective is to reduce these values to lower levels.
- To avoid odour from the rendering plant, the plant is fully enclosed, with air and steam from the process evacuated through trunking, and then cooled to condense the vapour. This has eliminated odour; the condensate is delivered to the primary effluent treatment plant for full effluent treatment. ☺

town) of Mariápolis, which is five kilometres from the city of Trindade. The authorities used a site near Mariápolis for dumping rubbish and a small community of rag-pickers set up home beside it. This has now become a housing development for 300 families. Their homes are more permanent now, but it's still blighted by poverty and other social problems.

In 2006, Coming set up an early learning and children's day-care centre here, funding the entire project, including the building and appointing a dedicated team of education and health professionals, care assistants and a genial cook. Fifty local children aged between three and six attend, learning and

playing in a healthy environment, eating breakfast, lunch and mid-morning and afternoon snacks, all free of charge.

Márcio Bittar admits now that he required a considerable amount of convincing before starting work on this project. The idea came from his two brothers, but he struggled to see how it could work. "I told them it was all right for them," he recalls. "They both work in commercial parts of the business and travel much more than I do. I knew it would mostly be down to me to administer the children's project." They waited a year, but eventually got the centre up and running.

"The first week, about 15 children came," Mr Bittar continues. "Word had gone round

the community that we were going to do this, but the reaction was, 'A children's centre in Mariápolis? Wait and see. At the end of the month there will be a bill to pay.' But there wasn't. And a little later, some of the parents approached me and said, 'So what is this really about, Márcio? You must be preparing to run for election or something.' But of course I wasn't. The numbers of children attending picked up week after week and soon we were full."

Coming's only motivation was to do good in the local community. The centre meets all the requirements of government inspectors, but goes further in making medical and dental care available to the children. The



childcare that the centre provides allows parents in Mariópolis to go out to work in Trindade or even Goiânia and improve their families' standard of living. At the same time, the project gives the children of Mariópolis a high-quality start to their school careers, helping them make the most of the opportunities available.

Brazil's only fire brigade cadet band

In the wider local community, Márcio Bittar has also worked to help improve relations between the fire service, the police service and the local community. He explains that the prevalent attitude in many communities in Brazil is that the fire service "just puts out fires and the police are there to shoot people". His aim was to show that there are good people in the emergency services who work hard for the overall protection and wellbeing of the community. "The local children are now able to join a cadets programme and I think it's great that they can see, from the age of eight or ten onwards, that these organisations do good and, from their own point of view, offer them the chance of a good career. Relations between the police and the community are much better now, and the fire department in Trindade is the only one in the whole of Brazil with a band for the cadets. The children get to learn to play their instruments without paying anything."

At the time of the Tannery of the Year visit the children from the fire service cadets force were out of town, having travelled 400 kilometres west along the Araguaia River to work on an eco-project, cleaning up popular camping areas, but also talking to tourists about the importance of keeping the river and the areas around it free from litter. Coming donated money to allow the group to buy T-shirts and sandals to wear as a project uniform.

For Rafael Mariño, these examples of work in the community reflect the care and attention that the owners of Coming give to their own workers. It provides transportation by bus between the tannery and the town of Trindade for people working on each of two shifts and there are regular social gatherings with food and music. "People know the bosses and can talk openly to them," he says. "The people in charge here are very accessible, which makes it easy for them to get valuable feedback. They are always open to that, always open to learning more and to improving." 🌱

Control and Accreditations

The identity stamped on each hide after green fleshing records the source and delivery date/time of each batch of hides to the tannery. This information is supported by weighings made on the delivery tracks after fleshing, liming and lime splitting, and the wastage in terms of fleshings and trimmings. Quality inspections record flay cuts and holes on each hide after green fleshing at 18 hide parts, and this enables immediate identification of operatives causing damage at the abattoir.

Together with area and quality assessments at blue samm/setting, this forms a powerful management tool. This information all relates to quality and yields associated with husbandry and post mortem hide damage, and together with rapid feedback, is a key element in raising standards.

All weighing scales are calibrated by an external authority. Although there are set times for recalibration, weekly checks are performed by the company. If inaccuracies are found the external calibration authority is called in.

The company achieved the standard ISO 9001:2000 in 2004, 2008 and 2010. Silver rating for the Leather Working Group was achieved in 2010. 🌱

Flay cuts and holes in any hide and their location are recorded manually as symbols on a worksheet as each hide is inspected and first-time graded for quality.

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Environmental Impact

The company instigated a survey to determine the impact of the tannery on the surrounding area, and this was completed in June this year. Soil samples were taken up to six kilometres from the site, and a profile generated showing all of the common metals and minerals present. The conclusion is that the tannery has not caused an impact, but the survey has provided farmers with information concerning the nature of their ground. Deficiencies in minerals and micro-nutrients have been revealed, and the land can now be better adapted for the growth of new crops, or the identification of crops that better suit the land in its present condition. The analysis was based on standards provided by the Environment Protection Agency and formed the basis for the survey. There was no government pressure for this investigation, but the result is a valuable 46 page report.

A second survey has also been produced to meet new Brazilian legislation concerning solid waste. This commenced August 2001, and was completed in June 2011. This relates to all categories of solid waste and contamination of that waste. Everything has been measured and evaluated - tyres, waste paper, waste bags, pallets, barrels, etc - and there are also calculations for economic benefits.

This is the base for the solids from the tannery for recycling and effluent treatment as applied to farmland. In addition, any product that can cause damage to soil or the environment is separated, then removed and deposited as required by law by a specialist company. All hazardous waste is certified by this specialist company, and this service is paid for by the tannery. 🌱