



Tannery of the Year: Tata International Leather Business Unit, Dewas, Madhya Pradesh, India

The tannery in the town of Dewas, in the Indian state of Madhya Pradesh, is a core component of the leather business unit of Tata International, part of the Tata Group, the largest private-sector firm in India. The tannery is a large-scale operation, sourcing 150,000 square-feet of raw material every day and producing three million square-feet of finished leather every month for prominent footwear, leathergoods and garment brands around the world. The facility was the first tannery in India to earn the right to put the country's Eco-Mark label on its leather and, with a strong commitment to empowering the workforce there, Tata International is confident the site can continue to make an important impact on the whole community in and around Dewas for many years to come.

There is something different about Tata International's finished leather business (FLB) unit. Tata International Ltd is part of the Tata Group of companies, which is one of the largest and most respected business groups in India, operating in various business areas, including steel, minerals, chemicals, energy, tea and automobiles (in April 2009, Tata Motors launched the cheapest car in the world, the Nano, priced at just over \$2,000), as well as telecommunications, software, hotels and consumer goods across several continents. It has an annual

turnover of more than \$70 billion and more than 350,000 employees.

Being part of such a big group means Tata's FLB has "different thinking" from that of most of the owner-driven family companies which dominate the leather business, in the view of Tata International's executive director, OK Kaul. The group's leather business was established in 1975 and was one of the first in the Asian leather sector to receive ISO 9000 and ISO 14000 certification; all its products are free from banned chemicals. Mr



The 100-acre site is planted with around 200,000 trees.

Kaul sums it up by pointing out that Tata is one of very few large corporations around the world to have gone into and stayed in the leather business.

He says: "As an industry, leather has to work hard to promote itself to end consumers. Look at the controversy over the alleged involvement of the leather industry in illegal deforestation of the Amazon rainforest last year and how little the leather industry spoke up to defend itself. The leather industry is not able to spend enough time and energy on such issues, whereas other industries spend more. I also think a lot of tanners feel that they would rather not get involved in activities in which they have to spend extra money, including investment in new systems, new equipment or new controls because the prices they are able to command for their leather are not good enough, and no matter how much effort they make, margins will continue to be small."

High fashion

Around 70% of the leather Tata International produces goes to Western Europe where German footwear brands such as Peter Kaiser, Gabor, Ara, Lloyd,

Spanish fashion retail high-flyers Zara and Mango, and UK group Marks and Spencer, as well as Sweden's Vagabond, are among its key customers. Mr Kaul describes them as companies with vision in the world of high fashion. His own company is preparing to launch a brand of its own with a chain of footwear stores across India. Shops will open first in small numbers in the country's biggest cities in June or July this year. Within five years, it is expected to have around 250 of its own footwear shops, selling shoes for men, women and children throughout India. A gradual change is taking place in the market there, Mr Kaul explains, especially among young, professional women. There is a clear shift from traditional saris to skirts and trouser suits, and demand for more fashionable women's shoes has grown as a result.

Tata also has its own footwear design centre near Florence, which produces design ideas and prototypes for major clients. And as Italian design "resonates very well in India", this resource will come in useful for the launch of the company's own footwear stores in its home market. The designers are full-time

employees of Tata who participate in all decisions on types of leather, prints, textures and all of the different components that contribute to an individual shoe design.

For a single company to supply design, raw materials and finished product manufacturing capability is unusual, the executive director insists, saying: "We have the capacity to do all of this, while operating in an environment that is a little difficult. For example, there is no authenticated source for raw material price movement, whereas in other countries, there are sources to indicate price movement on a weekly basis for hides. The situation for our FLB is even more challenging as it also processes goat and sheep skins, so we have to manage raw material for three product lines, in an industry in which raw material prices keep on fluctuating." He also believes that wet blue prices have to balance out in the long run; if tanners cannot afford to buy them, it will be difficult for abattoirs to sell, he points out.

Another challenge that he feels the Tata International tannery in Dewas handles well is the implication that



From a technical point of view

In 1975, Tata International Limited launched its Finished Leather and Leather Products facility at an integrated leather complex on a 100-acre site at Dewas, Madhya Pradesh. Today, the tannery is the largest in India, with a workforce of 900 people, manufacturing leather from the wet blue to finished state for fashion footwear, clothing, leather bags, and upholstery purposes. On the same site and adjacent to the tannery are units for manufacturing footwear, clothing and bags of all types using leather both from the Tata tannery, but also from other sources. In total, the facilities employ some 2,000 people, a significant proportion being women.

All of the small skins and hides for the tannery are sourced internationally as wet blue sheepskins, goatskins and bovine hides, to provide an output of approximately three million square feet per month, at a ratio of 1:1:1 for each type of raw material. Although the final leathers are significantly different, they are all produced within the single tannery building.

All of these raw materials are inspected in a single warehouse, sampled and laboratory tested to specification (together with all chemicals received) graded and measured, then built up into individual packs to meet customer demands. The re-tanning department comprises 18 stainless steel Dose drums, and six smaller wooden drums: this allows batch input weights to vary between 40 and 1,220 kilos. The Dose drums are fitted with recirculation to enable external filtration, with the filtered float pumped back into the drum to produce a continuous shower effect. The temperature in each vessel is maintained using a steam-injection system built within the drum design, and all of the water and chemicals are metered into these drums from an



Part of the retanning/dyeing department showing a row of stainless steel Dose drums.



The pole-drying unit is used to provide a natural air drying for soft leathers.



All of the wet blue leathers received in the wet blue department are opened, graded and measured for area.



One of the team of crust sorters for the evaluation and grading of sheep skin leathers before finishing.

springs from handling small skins as well as bovine hides. It makes the operation more labour-intensive. "It takes 15 skins to make the amount of finished leather that you can make with one hide," he explains. "That means much more handling for the same output."

Innovation in response to threats

The tannery at Dewas has a current production level of 3.2 million square-feet of finished leather a month, but in the months ahead, production will also start in a new extension devoted to leather for athletic shoes. This will increase the

capacity by a further 3 million square-feet per month. This development indicates that Tata International has high hopes that it can continue to convince manufacturers around the world that they should choose leather for their products, rather than synthetic materials. "There is a threat to



overhead mezzanine level.

In addition to these drums there is a pilot plant comprising 23 drums of various sizes. All of the development work is carried out in this area, but also the processing of small orders ranging between three and 100 pieces.

Conventional samming/setting and vacuum drying follows dyeing/retanning, but there are two different sets of these machines dedicated to either small skins or bovine sides. Drying is completed using two different drying methods. Firmer leathers are force dried using a two-tier tunnel cabinet with a drying time of between four and eight hours. Softer leathers—both small skins and bovine sides—are aired off using natural drying on an overhead pole-drying system. However, the conveyor passes through two tunnels so that in the wet season the drying can be supported by forced hot air.

Finishing takes place in two separate finishing departments: one is used for bovine leathers and dark colours, the other for sheepskins and light colours only. All leathers are laboratory tested before final dispatch.

In-house quality circles

There are 39 quality circles in operation as part of a continuous product improvement scheme. This concept was initiated some 10 years ago, and comprises staff working with the workforce to identify ways to reduce potential causes of damage within operations, improve the outcome, make the operation more efficient, and reduce energy demands. At present 41 staff and 225 workers are involved in continuous assessment throughout the factory where problems are identified, then analysed, and the solution applied.

There are many examples: one involves the buffing operation, where at the end of the evaluation machine damage to the skins was reduced by 80%. This not only involved changing the feed technique, but the speed of the machine was reduced by using a different pulley arrangement and the size of the drive motor was also reduced. In addition to product improvement and a lowering of rejects, an energy saving of 50% was gained, and has now been applied to all buffing machines.

In another exercise, the energy consumed within the finishing department on the finish line steam-heated drying cabinets has been studied, and this has led to a decision to replace all of these units with infra-red drying cells. In addition it has been found that smaller fans could be used for dust extraction, and that air compressors could be used in more energy-efficient ways. These quality cycles are being managed throughout the plant, and both product improvement and energy savings are anticipated.



One of the two finishing departments. This one is used for finishing sheepskins and light coloured leathers.



One of the spraying machines for sheepskin leathers. The steam drying cabinets are to be replaced with infrared drying cells to reduce energy demands.



Glazing machines are used to create high gloss finishes.

leather in the mass market, which synthetic materials are in a good position to serve because they can be mass-produced," says Mr Kaul. "But as long as the leather industry is able to keep innovating, the threat will be less. At Dewas we develop new leathers every month, around 600 to 700 new

samples each month. Something else the leather industry must try to do is to make better use of its waste—shavings, trimmings, lime sludge, soaking. Tannery operation generates waste at different stages; the industry has to find ways of using that waste. We have consciously

created a very high calibre team to innovate new processes and methods to create wealth from waste. We have an almost 20-member team at Dewas working day and night on research and development. We have been able to extract protein and chrome from sludge



From a technical point of view

Athletic shoe leather manufacturing

Tata is moving into the manufacturing of athletic shoe leather in a new extension to the Dewas tannery that is scheduled to start production in April 2010. Although samples are being developed in the existing plant, production is planned in the new facility to boost production by an additional three million square-feet per month. The new building has a floor size of 155 x 40m, with an additional section of 155 x 10m for buffing operations. The retanning drums are 3.5 x 3.5m Vallero drums, fitted with deep (Dragon) shelves, for processing at 3.5 rpm. This is to ensure a power saving of 50% when compared to conventional retanning drums.

All of the equipment being installed is state-of-the-art, and will include Feltre handling systems, Linta splitting machines, Alpi shaving machines, Bause samm/setting, Cartigliano vacuum driers and staking machines, Bergi buffing machines, Gemata roller coaters, tumbling drums by Erretre, area measurement by GER, pole drying by Vrinar, and humidification by Luwa.

Effluent treatment and energy generation

At present the tannery effluent treatment plant processes approximately 200 cubic-metres of effluent from wet processing and finishing operations. This is first received in a primary holding sump, then chemically dosed with a mixture of lime and aluminium sulfate before primary settling to produce an effluent of around 3,000 mg/l COD. The supernatant is then subjected to extended aeration in a sump three metres in depth using a pair of surface aerators that run intermittently to produce aerobic/anaerobic cycles. The effluent is retained for 18 hours, and the COD is reduced by approximately 50%. The effluent is then subjected to conventional activated sludge treatment for a period of 18 hours, reducing the COD to approximately 300 mg/l.

This treatment is, however, undergoing change, and an anaerobic digester is in the final stages of installation to replace the extended aeration stage. The supernatant from chemical dosing will be subjected to anaerobic digestion in this reaction vessel for two days, and this new processing stage will reduce the power demand of the whole effluent treatment by approximately 40%. However, between 600-700 cubic-metres of bio-gas will be produced, and this will be used as generator fuel: the electricity produced is calculated as being sufficient to run the whole effluent treatment plant.



Trees and shrubs are used extensively within the area of effluent treatment plant. The vessel in the background is for anaerobic effluent treatment and the production of bio-gas for energy.



Photograph shows filter columns used to remove colour from treated effluent, and part of the reverse osmosis plant.



Examples of effluent after primary settling, the effluent after conventional physical and biological treatment, and the permeate after reverse osmosis. This water is suitable for re-use in leather processing.

and shaving or trimming waste. We have been able to convert waste into energy in the form of bio-methane gas, as well as into paints and fertilisers. But if tanners are forced to focus on price all the time, it's inevitable that their commitment to innovation will suffer."

Respect for the environment

He points out that tanners in India will have to keep respect for environment at the forefront of their minds. The Indian government will not permit any production that could harm the environment, he says, and insists that any

company that fails to take this seriously will be in trouble. The tannery at Dewas became the first in India to secure the right to use the Eco-Mark label on its finished leather. The Bureau of Indian Standards introduced the Eco-Mark for finished leather in January 2000, making it



Reverse osmosis and zero effluent discharge

After activated sludge treatment, the effluent is chemically dosed with aluminium salts and polyelectrolytes, settled, and filtered through a column filled with a mixture of gravel filter and activated carbon to remove colour. It is then subjected to reverse osmosis using two units each capable of treating 100 cubic-metres a day. These operations produce 150 cubic-metres of permeate as clean water, and 50 cubic-metres of concentrate that contains residual dissolved solids from effluent treatment. All of the water is evaporated from this concentrate by spray evaporation, leaving a dry mixture of sodium sulphate crystals and other residual TDS, which is collected for deposit in a licensed site. This technique ensures that no effluent is discharged from the site.

Water management and solar energy

All of the rainwater that falls on the roof is harvested and held in a sump for use within the leather complex. When there is a surplus, this is collected in five lagoons each of 10,000 cubic-metre capacity, set in a woodland area. This water is available for processing, but there is a surplus and this is used for plant and woodland irrigation.

In addition, all of the permeate (150 cubic-metres a day) from reverse osmosis is reused both as boiler feed-water, and within leather manufacture. For boiler use, the permeate is heated using solar energy. This project was 50% subsidised by the Indian government, and comprises 1,200 solar panels, of 2 x 1 metres each in size, and the array is capable of raising the temperature of 50 cubic-metres of water to 80°C. The hot water is stored, then used as boiler feed-water, and saves 1.6 tonnes of coal per day, although the company is changing from coal as a source of fuel to LPG as a cleaner source of energy.



Part of the spray evaporation plant. Approximately 50m³ of concentrate from reverse osmosis are evaporated to dryness each day. No effluent is discharged from the site and the dry solids are disposed to a government approved facility.



Each day, approximately 50m³ the water from the reverse osmosis units preheated to 80°C using this array of solar panels, then used as feed water for the steam generation plant.

clear that to meet the requirements for the label; tanneries would have to pay close attention to the impact their operations might have on water and air quality, and to their management of hazardous waste. Even the packaging they use for their products must be recyclable, reusable or biodegradable.

Tata International feels it has been able to address environmental concerns well; in addition to its ISO certification, it has achieved a national pollution control award from the federal government in New Delhi in 2003. It says it will soon be SA8000 compliant too.

Technical challenges

OK Kaul feels that current levels of innovation from technology providers supplying tanners could be higher. In terms of tanning machinery, for example,

while some Korean companies are making inroads into the market (particularly with staking machines and roller coaters), he says Italian manufacturers are still the leaders. However, he expects much more from the technology providers in the form advanced machines to reduce and control tanning processes for cleaner and more efficient output. "This is an industry that has moved to lower-cost countries where efficiency is not so much of an issue because tanners can hire more people quite cheaply," he says.

Another observation is that the technical support from tanning machinery providers is lower than it used to be. It is now difficult to get engineering support, especially at short notice, he says. And for that reason the Dewas facility has its own team of 55 engineers and skilled manpower at the site. On the chemical

side, most of the products that the Tata International tannery consumes are being produced in India now, and interesting product development on the chemical side is still taking place. "The chemicals industry has a big role to play and it is carrying that role out," he says. "It is so important for there to be a good relationship between the chemicals provider and the tanner because they have to work closely together to make sure a product that works in the laboratory can be adapted to the real production environment."

Workforce issues

The Dewas tannery has been in operation since November 1975 and close to 900 people are employed there. The choice of location owed much to the availability of licences to set up a tanning



From solid waste to new raw materials

In a joint project with the Indian government, Tata has invested \$200,000 to treat solid waste and produce new products using its own patented technologies. Approximately two tonnes of chrome shavings are produced each day, and these are hydrolysed in two tanks each of 10 cubic-metres in capacity. These tanks are alternatively charged with shavings, lime added, the temperature raised to 98°C and maintained for four hours. The mixture is then allowed to stand for 18 hours, and the chromium hydroxide formed settles out from the hydrolysate solution at the base of the processing vessel.

The hydrolysate is drawn off from above the chrome sludge layer, and used for two purposes:

- 50% of the hydrolysate is used to generate bio-gas in a two-day anaerobic process using a pair of digestion tanks. The gas is collected in a gas-bag, then drawn off via a compressor to ensure that the gas pressure is constant. This is then used for cooking food in the tannery canteen. At the moment if an excess of gas is produced or there is a build-up in pressure occurs, this gas is vented and burned;
- the remaining 50% of the hydrolysate is evaporated to form a viscous liquid. This is used within retannage as a filling agent, but is also used as an adhesive and for the manufacture of floor tiles.



A single day's production of shavings awaiting processing to produce collagen hydrolysate, and chromium hydroxide as part of the recovery of chromium sulfate.

When fully settled, the chrome precipitate is discharged from the base of the hydrolysate vessel, then centrifuged to produce a dry cake. This is then added to a reactor where it is dissolved in sulphuric acid, then adjusted to form a chrome solution of 33 basicity, equivalent to 12 tonnes of chromium sulfate per annum, for use in leather processing.

Other useful products are also made on site:

- the sludges from primary settling before chemical dosing in the effluent treatment plant—being mainly fibrous—are also processed to form two products that are used in leather processing;
- the residues from over-spray in the finishing department are collected, dried and ground to a fine powder. This powder is mixed with concentrated hydrolysate and other binders to make a biodegradable paint. This is used around the effluent treatment and hydrolysate processing plants, and within the tannery. There is a surplus and this is given away for decoration and maintenance within local schools and other social amenities;
- the precipitates from chemical dosing are not suitable and are disposed to licensed disposal sites.

Each day, approximately 50 cubic-metres of the water from the reverse osmosis units are preheated to 80°C using solar panels, then used as feed water for the steam generation plant. 



Part of the plant used to concentrate the hydrolysate recovered from shavings. Overspray from finishing is used with hydrolysate and binders to manufacture paint, as can be seen in the background.

operation at that time, with tanners finding themselves confined to the parts of India that were in greatest need of economic development. Tata International was happy to be part of that economic development because a fundamental element of the philosophy that underpins the activity of the entire group is that wherever it operates, Tata will strive always to improve the quality of life of the people it comes into contact with. "That's

the first thing on our agenda," the executive director says. "We have moved to increase the capacity of the Dewas site to make finished shoes, and this has focused very firmly on young, local women. The company has set up the new footwear factory on the same campus as the tannery. This started in 2008 and we decided then that this would present a boost to our efforts to improve the lives of women. Recruiting workers for it was a

challenge. The first group of 40 workers was the most difficult to get, so we went round local villages and convinced parents that it would be a good move for their daughters."

Some of the women came from families that had never allowed their daughters to go to work before. The company has provided transport facilities to take the workers safely to the site from their villages and drop them back home at the



The first drums are being installed in the new tannery for the manufacture of athletic and upholstery leathers.

end of the working day. The company has also created a separate canteen facility for their breakfast and lunch. Recently a group of local Madhya Pradesh girls, most of whom had hardly ever left their own villages, got the chance to travel to China to spend 90 days learning how to make shoes. On their return, they have become the front-runners in the Dewas factory, supporting their colleagues and new entrants. Production is currently running at around 2,000 pairs a day, but this will increase to 5,000 pairs per shift when the footwear manufacturing facility reaches full capacity.

The executive director says that, in Dewas, as at all its production sites, Tata International is applying another of its key guiding principles, to invest part of its profits towards projects such as schools and health centres. This has made a difference in the town, he insists.

Conclusion

In spite of the challenges that the leather industry faces, Mr Kaul's conclusion is that leather production must continue. The centres of production might shift to lower-cost countries such as

Bangladesh or some African countries, but leather will not vanish. He points out that many textile mills in Europe and North America closed during the twentieth century, but the demand for textiles has not reduced. While other resources like crude oil, which is central to so many of

the alternatives to leather, will become more and more scarce, leather will remain a sustainable and renewable resource. "We need more forums for people to share their knowledge," he says. "The whole industry has to talk about this and say what they are doing." 

Environmental awards and bio-diversity

The company has received many awards including:

- TERI Corporate Award for Environmental Excellence in 2005.
- "Environment Award for Best Practice" Madhya Pradesh Government in 2004.
- National Award for Prevention of Pollution in 2002-03 by Government of India, Ministry of Environment and Forests, New Delhi.
- Rajiv Gandhi National Quality Award 2000 in 'Best of All' category.
- ISO 14001 and ISO 9001-2000 certification.
- Recipient of Best Performance Award from CLE many times since 1984, for India's highest exporter of leather and leather products.
- In 1975 there was one single tree on this 100-acre site. Now there are 200,000 trees, and saplings are distributed for planting by the employees. 