



Tannery of the Year: Zhejiang Mingxin Automotive Leather Company, Jiaxing, Zhejiang Province

Mingxin Leather is celebrating its twentieth anniversary this year. It is proud of pioneering work it has done in the automotive leather sector, especially its long-standing and ongoing investigations into the best ways to produce chrome-free leather for the same cost as chrome tanned. It is expanding and it now has global ambitions.

Car interiors leather specialist Zhejiang Mingxin Automotive Leather Company operates with 350 employees at the moment on a 100,000 square-metre site in an industrial zone in Jiaxing, an attractive, historic city in Zhejiang province, no more than 100 kilometres to the south and west of Shanghai. At current capacity, it is processing 3,000 hides per day and has an annual output of around 60 million square-feet of finished leather.

Company president, Johnny Zhuang, set Mingxin up in his home city of Wenzhou, 500 kilometres south of Jiaxing, with his family in

1994, concentrating at first on aftermarket sales. In 1997 it won its first business with an automotive original equipment manufacturer (OEM), in this case with Nissan. This work expanded and, in 2002, the company began to supply finished leather to Chinese OEMs just as the car manufacturing industry was beginning to take off in China. To cope with demand, it moved to its current site in Jiaxing in 2004 and had another big breakthrough in 2005 when global automotive leather player, Seton, invited it to form a joint-venture. Three years later, Mingxin acquired Seton's equity in the combined entity and



faced the world on its own again. Today, Mingxin Leather has sales offices in Germany and the US and is building a second tannery in Liaoning province in northern China to support client expansion. A new finishing and cutting plant in León, Mexico, and a development centre in Munich (scheduled to open in October 2014, with the intention to transform it into a complete research and development facility at a later date) are also part of its ambitious plans.

It counts among its main customers FAW Group, Volkswagen, General Motors, Honda, Chrysler, the SAIC-GM-Wuling Automobile joint-venture and Dongfeng Peugeot-Citroën Automobile. Audi and BMW will become customers before the end of 2014 as these OEMs continue their expansion in the Chinese market, senior programme manager, Kelly Shen, explains. The FAW-Volkswagen joint-venture, which has been producing VW and Audi cars in China for almost 25 years now, has awarded an A-Class Supplier certificate to the tannery. Mingxin's finished leather goes mostly into seating, with some steering-wheel leather from splits (for GM, in this case) and some leather for door panels also part of the product mix. Around 70% of its output is chrome-free at the moment and something like 75% is top-grain, with the rest split. Mingxin runs its own beamhouse but supplements supply with some semi-finished hides. "We go from raw to finished to enable us to control quality and cost as much as possible," Ms Shen explains.

The tannery works with four main raw material sources: Australian brine-cured hides, German salted hides, some wet blue from the Americas and wet blue and wet white from suppliers in China. It is proud of being a pioneer in making automotive leather from Chinese hides, helped by recent investment in bigger, more centralised slaughterhouses, which are improving the volume, quality and reliability of supply of domestic hides.

Technical director, Gary Liu, points out that eating habits have changed in China in recent years, with consumers changing from pork to beef and more cattle now being raised for beef, around 25% of them on feedlots. He says the total number of hides the Chinese livestock sector produced in 2013 was 32 million. Those from feedlots are of very good quality, he continues, and can be used for full-grain nappa or embossed leather. Around 50% of Chinese hides are from cattle raised by small farmers, but even



As the plant has expanded, mature trees and shrubs have been planted between the different buildings to green the areas.

these are working well in the production of snuffed or corrected-grain leather, Mr Liu says. "I would say that, after working with the major hide suppliers in China for many years, we know a lot about the quality of hides from different regions," he adds. "We have already worked on one project that only used Chinese hides and I believe we are on track to develop more programmes from Chinese raw material and to develop our hide sourcing in China."

Long-term relationships

Mr Zhuang says that his company selects its raw material suppliers based on the demands of the OEMs. "They have clear expectations on yield," he explains, "so we choose our material accordingly. At the start we buy some hides, send samples to the OEMs and, if they approve, continue to buy from that raw material supplier. We also conduct our own rating of each supplier to make sure they maintain these levels, with the assessment based on quality, delivery and so on. It's a continuous process, part of our overall quality system. We don't change suppliers unless we have to. We give them a guarantee that we will continue to do business with them. Some of the longest relationships we have are with raw material suppliers and have been in place for 15 years."

On the question of how to cope with

recent increases in hide prices, the Mingxin Leather president says customers have been sympathetic, thanks, again, to long-term relationships. However, he says the best response his company has found has been to focus internally on finding ways of increasing yield and achieving fewer rejections while making savings on chemicals; one way to do this, of course, is to invest in new machinery. "We are trying very hard to bring costs down through technological innovation," Mr Zhuang continues. "We are trying to save on labour costs, too, streamlining production. In the last three years labour costs have come down by between 5% and 10% thanks to lean production, and yield has gone up by between 3% and 5%. The savings certainly have not come from salaries; salaries are always going up. Although, again, thanks to long-term relationships with suppliers, we have had a reduction of between 3% and 5% in chemical costs."

He says Mingxin has good relationships with its suppliers of machinery and chemicals and has worked together with suppliers of both types of technology to meet its goals. Areas in which he would like to see further developments, though, include extra effort to keep volatile organic compound (VOC) content down. "This is difficult for us," he continues, "because no one supplier can fix this for us. There are



From a technical point of view

(1) Overview of operations

Zhejiang Mingxin Automotive Leather Co. Limited is located in the Jiaxing Industrial zone of the province of Zhejiang. The company started to manufacture leather in 1994, and relocated to a new plant of 100,000 m² area on the present site in 2004. There are 350 employees involved in the conversion of up to 60 million square-feet per year from the raw salted and wet blue state into automotive seating, door panels, dashboards and steering wheel leathers. The production has increased by 300% since 2004; approximately 75% of the production is full and corrected grain leather, and 25% is chrome tanned splits.

(2) Manufacture and processing

The input is based on Australian brined and German wet salted hides, with American and Chinese wet blue hides. The soaking and unhairing or liming process is a 36-hour system, and is performed in a row of six 4.5 x 4.0m wooden drums, each holding a load of 18 tonne weight.

Hair-saving liming and unhairing systems are used where, after filtration of the hair, the used liquors are allowed to stand for 24 hours to settle the solids. The supernatant is then made up to strength for recycling in the next unhairing process. This provides savings of up to 30% in lime, 40% in sodium sulfide and sodium metabisulfite, and provides a reduction of 75% in suspended solids. There is also a reduction in the COD of the wastewaters discharged to the effluent plant and a corresponding lowering in energy use within treatment.

Organic products are used for deliming to avoid the use of ammonium salts, and ammonium salts and ammonia are avoided in neutralising. This is to minimise the nitrogen content within wastewaters for treatment. All of the grain leather tanned on site is chrome-free, and based on two wet-white systems that have been developed in-house. One is a phosphate-syntan combination tannage that commences with a pickle of pH 4.0, the other is a glutaraldehyde-syntan combination process. The tannage takes 24 hours to complete, and is followed by stacking down on clean



Areas adjacent the liming/unhairing and tanning areas are designated for chemical storage. The blue tank is part of the system used for holding used liming/unhairing wastewaters as part of a recycling system.



After lime splitting, the grain split from each hide drops onto a conveyor for delivery to the designated tanning drum.



Shows the delivery of a lime split hide from the overhead conveyor delivery system into the selected tanning drum.



After tanning, hides are stacked down flat on pallets for 24 hours to improve fixation of the tanning agents.



polythene for 24 hours to improve the fixation of tanning agents. These chrome-free leathers are viewed as significant as they provide better dimensional stability in automotive dashboards and panels than chrome-tanned leathers, and avoid any possible issues associated with these leathers on disposal. They are also considered advantageous as the chemical costs in manufacture are reduced, with less COD for treatment in wastewaters when compared to other chrome-free systems.

All of the flesh splits from lime splitting are chrome-tanned on site, and this process involves chrome recovery techniques. Here the chrome exhaust liquors are separated, filtered, and then held in a tank for reuse in subsequent split tannage that commences with a pickle that operates at pH 4.0. This results in saving up to 10% in chrome powder, salt savings of 80%, and sulfuric and formic acid savings of up to 50%.

The drying operations use two different techniques. The chrome-tanned split leathers are set, then toggle dried using two drying units. This operation requires eight hours in total.

The chrome-free leathers are samm-set, wet staked and stretched, then automatically delivered onto the plates for vacuum drying, at 40-42°C instead of 50°C as used previously. This is followed by a second wet stretching and staking before drying on a TAIC conditioning-drying unit. For chrome-free leathers, this drying technique provides leathers with a tighter grain structure and higher yields when compared to toggling. The total time for this complete sequence of operations is reduced to 40 minutes.

Within the finishing plant, there are three Mega Star Gemata roller-coating machines. For stucco, for sealing any loose flesh fibres, and first coat applications these provide a reverse roller action, with synchro action for top coats. These machines are set on rails and placed in front of three spraying lines fitted with steam-drying cabinets, although the spray cabinets are no longer used. These machines compensate for any variations in the substance of crust leather as the hides are supported by rubber rollers. This has provided better base-coat cover and improved productivity than previous finishing techniques, and the systems require less maintenance. Spraying machines are also used, and these are set behind the three roller-coating lines. Bridges are fitted between these machines that can be lowered into place to form linkages for operation in tandem when required. HVLP spray units are used, as they provide improved finish application, savings in materials, and reduced overspray. The dullness required and fastness properties are also improved, and the leather feels softer and is more elegant in handle.

(3) Solids management

- Hair recovered from the hair saving process is sold for the manufacture of felt.
- Lime fleshings are heat-rendered on site to extract oil and grease, which is then sold.
- The residual fleshings are pressed to dewater, and are then disposed of by incineration by an external provider.
- The shavings from chrome-free tannages are sold for processing into industrial gelatine.
- The sludge from the effluent treatment plant is removed from site, mixed with other fuels and combusted as a source of energy.



After shaving, the savings are compressed into blocks. These are then sold for the production of industrial gelatine.



This shows the automatic delivery of hides onto the vacuum drying plates. These hides have been previously samm/sett and wet stretched/staked.



After vacuum drying, hides are manually transferred to a conveyor feeding a wet stretching/staking machine, followed by TAIC drying.



(4) Water and environmental management

All water used within manufacture is drawn from an adjacent canal. From 2012 to 2013, changes within production have reduced water-use by 50%, and the usage now stands at 10m³ per tonne of input weight.

Effluent treatment

In the last three years RMB 15 million has been invested in improvements in effluent treatment at this site. This is over and above the investments in recycling of used unhairing-lime and chrome tanning wastewaters.

The treatment plant is designed to treat 3,000m³ per day, but at present the offer stands at 2,000m³ per day. All of the wastewater streams are first coarse screened and collected in a holding tank for partial mixing, then pumped through a pair of self-cleaning rotating screens to filter out coarse solids. The effluent is then delivered to a primary balancing tank of 3,000m³ capacity for complete balancing and homogenisation, and oxidation of sulfides using catalysed aeration.

This tank is fully covered and fitted with extraction ducting to continuously remove aerosols and evolved gases, which are then water scrubbed before discharge to the atmosphere. This eliminates any odour discharged from the site. The effluent is then delivered at constant rate for chemical dosing with iron salts, and the precipitates removed from a custom-built flotation tank fitted with an automatic scraper mechanism. The solids collected from this operation are delivered to a sludge-thickening plant, with the settled effluent after thickening returned to the primary treatment stage.

The chemically treated effluent is then received in three secondary treatment plants of total volume 3,000m³ that operate in parallel for conventional biological treatment, with the effluent constantly flowing between them. The effluent is then clarified, before delivery to a second stage of biological treatment of 2,000m³ capacity for extended treatment, before a final clarification and discharge to sewers. The sludges from each of these treatment stages are not mixed together, but delivered directly to an elevated filter press for dewatering.



To soften the appearance of the effluent treatment plant, the raised concrete section around the sumps that receive the tannery effluent have been covered in a matting of green plastic flowers.



There are three Mega Star Gemata roller coating machines used in the finishing department. This image shows the feed for top coat application.



The roller coating drying cabinets are set in tandem with spraying lines. These can be linked together by lowering the overhead bridge arrangement shown in the top of this image.



Visual displays are used throughout Zhejiang Mingxin Automotive Leather Co. to clearly define the exact way that leather is to be handled.



Solar energy is an unusual and novel technology used in this plant. Following pilot trials, all of the covered areas (primary treatment, one of the three secondary treatment stages, and the extended biological treatment stage) have been fitted with solar panels. This cost several million RMB, and all of the effluent circulates through this display. The outcome is a rise in temperature for the biological treatment of an average of 10°C to between 15°C and 25°C degrees according to season, and thus an increase in performance.

The BOD reduction is stated as 90%, and the nitrogen content is reduced from 45 mg per litre to 10 mg per litre. Some of this effluent is reused within the tannery for washing the plant and machinery. The plant meets all government requirements for discharge to sewer. For purposes of control, samples are continuously taken and automatically analysed on site, with the findings sent to the local authorities to ensure that the plant operates within the limits for discharge.

Energy

All of the steam used for hot water and for leather drying is purchased from a company who provides steam for all of the manufacturing units within the industrial zone.



The areas for primary and secondary effluent treatment are roofed to reduce odour. In addition, these areas are fully covered with solar panels through which the effluent is circulated to raise the temperature by 10°C, and thus improve the efficiency of the biological treatment.

specifications and we have to fulfill them; it's a low level of parts per million, and the VOC content can come from different products that you have to use, from raw materials handling to finishing, so we need to talk to all suppliers and ask them all to help us with this." On the machinery side, his wish is to have more automation and more integration between the movement of materials around the tannery and the company's enterprise resource planning software system, with greater use of even relatively old technology such as barcodes to capture the data. "In our experience, it's not so easy to build barcode readers onto tanning machinery," Mr Zhuang says, "and that's why we would like our machinery suppliers to work with us on this."

No excuses

The company has its own environmental mission statement and invested an estimated \$2.5 million in its wastewater treatment facilities between June 2012 and November 2013 in response to what chief executive, Hermann Winkler, describes as the very strict requirements in place in China now, which have resulted in a series of tannery closures in 2014. "There are no excuses on the environment now," he says. "Some companies may have been able to get away with poor practice in years past, but it's all catching up with them now. The people who cause problems will now be answerable for them." Environmental accolades that Mingxin

Leather has won include an award from the China Leather Industry Association for its self-funded use of solar energy in its effluent treatment plant and the same organisation's top-placed tannery in the 2013 Eco-Leather Mark awards.

Technical director, Gary Liu, whose career has combined work in academia (at the University of Sichuan) and on the supply side (for chemicals manufacturer Lanxess) as well as in tanneries, says he believes output of finished leather from China will remain the same, just that a smaller number of very big tanning groups will produce it. Mingxin's own expansion is part of this. Mr Liu explains that the new Liaoning tannery, which is being constructed in the city of Fuxin, will have the capacity to process 5,000 hides per day. It will supply automotive factories in the northern part of China, such as the plant BMW opened last year in Shenyang, 200 kilometres away, while the Jiaxing facility will continue to supply car manufacturers in the south of the country.

Hermann Winkler, a veteran of automotive leather production in the Americas, in South Africa and in various other locations around the world, says expansion is essential. "We're investing in this because you have to go where the OEMs go. You can't handle everything from one location," he explains. "That's why we're investing in Mexico and it's why we are investing in northern China. Expansion at our Jiaxing tannery would be

expensive because we are near Shanghai and costs here are going up. Northern China will be a lower-cost location, and close to important OEM plants. We have no choice but to be flexible today. If the market moves we have to move with it. And with Mexico, we will be able to carry out finishing and cutting for customers in Puebla and Ciudad Acuña, using crust from Mexico or, because the distance is not so great, from Brazil."

Appeal of chrome-free

Gary Liu explains that Mingxin makes 70% of its finished leather without chrome because OEMs want chrome-free leather. Working with a former president of the International Union of Leather Technologists' and Chemists' Societies, Professor Bi Shi of the University of Sichuan, the company has developed two proprietary chrome-free tanning systems, one based on phosphates and the other on glutaraldehyde. The important point for the technical director is that these tanning systems are metal-free. No metal means easier disposal of the leather in car interiors post-consumer use. This has a strong appeal for OEMs, especially in places such as the European Union. He has worked closely with chemical companies who have been offering chrome-free alternatives in recent years, especially for automotive tanners. "I like some of the ideas very much," he says, "for example, not using as much salt because that makes it much



easier to run your effluent treatment plant. Chemical companies' technicians have come here and we have tried several times, but it's not worked as well in production as in the laboratory. We need these systems to work in industry and to be cost-effective, so that tanners can still achieve a good cutting yield and have a low percentage of rejections." He says Mingxin Leather will use its own chrome-free tanning systems at its new plant in Liaoning because it wants its production there to put the least amount of pressure possible on its wastewater treatment plant and to be as sustainable as possible.

There are other technical reasons for preferring chrome-free, too, Hermann Winkler insists. "Chrome-free leather has less tendency to shrink," he says. "There are strict regulations on this from OEMs. In a laboratory, chrome-tanned leather may come out of some tests better, but in reality, in a car with the humidity and so on, chrome-free performs better. This has been well known in the industry for ten or 12 years."

Luxury and comfort

More generally, the market for automotive leather in China is "growing very fast", according to Johnny Zhuang and consumers love it. Leather means luxury and comfort, he says. He would like tanners around the world to find more ways to work together to promote the 'luxury and comfort' idea and keep the appreciation of leather high among consumers. "We want to keep making a positive impression, on the local authorities and on consumers," he says. "At Mingxin Leather, we believe the best way to do that is to keep being innovative, to keep being pioneers. The work we have done to find alternatives to chrome, for example, is a good example of that. By the end of 2016, 90% or 95% of our finished leather will be chrome-free and that will make a tremendous impression on people outside the company. The newspapers will react and government people will begin to form a new opinion of leather. Consumers will be more willing to buy and use leather if the tanning materials are more environmentally friendly. Chrome isn't all bad, but some tanners here have not done a good job of collecting and recycling it and that has made a poor impression on local authorities in some parts of China." Most of all, he insists, the problem with chrome-tanned leather is that



Chief executive, Hermann Winkler, presents prizes to the children of Mingxin Leather employees to encourage them to work hard at school.



Employees gather for "a big party in a family atmosphere".

it's difficult to biodegrade, which makes disposal after use difficult, whereas chrome-free leather will biodegrade. "Our shaving dust can be used to make industrial gelatine," Mr Zhuang says to emphasise the point, "and that's 20% of the weight of the hides we process."

The business of growing people

The company has its own management school as part of an extensive internal training programme. Development is continuous, with teaching from internal instructors as well as external experts. As well

as developing their knowledge of leather technology, people from the shop-floor have taken part and developed good skills in English and in IT and made good careers for themselves. "Some people have even gone to Europe to study," the company president continues, "because we want to be an international company." Possibly the most impressive story, though, is the one Mingxin has built up with Sichuan University, which is China's most prominent leather education institution. Scholarships are available for talented people from the Jiaxing plant to study in Sichuan. In the last five years, Mr



Zhuang calculates that between 30 and 35 of his employees have had access to this university education. "And they have become the backbone of our company on their return," he adds. One person he's particularly proud of is a member of the quality department, whose name he prefers not to give. But he says it's someone who dropped out of school early and only later in life began to develop a strong attitude to learning. "He's now very senior," Johnny Zhuang says. "He really knows leather and is an expert in his field. We have grown a lot of people; the team that got the job for us to develop steering-wheel leather, for example, is made up of people who have learned a lot on the job. We invest a lot in this because people who grow enjoy their work a lot more." One spin-off of this is a regular flow of improvement ideas from the tannery floor. There is a cash reward from employees who put forward ideas that the company puts into practice. In 2013, a total of 146 such suggestions were successful, generating efficiency savings that Johnny Zhuang estimates at more than \$500,000 per year.

Community assets

Work in the community includes a programme of prizes for employees' children, given out each year at a celebration in which all the employees and family members meet at a reception in downtown Jiaxing. Mr Zhuang describes the event as "a big party with a family atmosphere". As 20% of employees come from other provinces and live in dormitories close to the tannery, it's not always easy for their families to take part, but it's increasingly common for husbands and wives from provinces such as Hunan to work together at production facilities such as Mingxin Leather's. Workers' children receive an award of money to encourage them to do well in their studies. Older people in the community also receive regular visits from Mingxin Leather employees, who bring with them gifts of money, food and clothing. On a more regular basis there are sports activities: basketball, table-tennis and even tug-of-war are popular options. "We have a great team here," Mr Zhuang says. "We are passionate about what we do. We treasure leather and want to be the best in the industry." The tannery aims to be an asset to its community.

Mr Zhuang thinks that the closure of tanneries in other parts of China who were clearly falling short of having a positive impact on their communities was inevitable.



The bench and floor areas within both the preparation centre and laboratories are dedicated to individual customer sampling requirements and test methods. These areas are identified with yellow and black adhesive strips.

Control and Accreditations

LABORATORY SERVICES

There are three laboratories. One is a conditioning and preparation centre for sampling, with separate laboratories for physical and chemical testing, and this includes management of the effluent treatment plant. VOC tests are performed by an approved external provider, and all leather test procedures are to customer and company specifications.

It's correct for tanneries who paid too little attention to the environment to be closed, he says, before adding: "China should have tanneries in clusters and centralised effluent treatment plants. This is what we will have at the new tannery in Fuxin. The closures were no surprise; we knew this would happen and I think it's fair because we know that meeting the requirements takes a lot of work and a lot of investment. That's why, in the medium- or long-term, all the smaller tanneries in China will be closed and by 2020 I think there will be no more than 100 tanneries left here."

He is, naturally, determined that Mingxin Leather will be one of the survivors and he is convinced that it deserves to be. "First of all, we are very careful of the environment," he explains. "Our study of chrome-free leather began in 1996; that was when we began to look for alternatives. By 2016, almost all of our leather will be chrome-free; it will be biodegradable, it will go back to nature. In Europe now there must be a minimum of reuse and recycling of 80% by

average weight of the material in each car. We want to contribute to that with biodegradable leather. We will continue to work with our chemical suppliers to make this better, for example, to find alternatives to glutaraldehydes, because glutaraldehydes are expensive and it's important to bring down the cost of chrome-free leather to be able to make it at a similar cost to chrome-tanned leather. We are proud of the contribution we have made to this and regard it as a real milestone for the global industry."

He goes on to say that an important part of the work of Mingxin Leather's new development centre in Munich will be to promote the concept of chrome-free leather to OEMs, to show them, the company president says, that chrome-free leather can meet all their requirements. "This is the main reason why we want to get costs to the same levels as those of chrome-tanned leather," he continues. "If we can do that, the OEMs will want chrome-free leather. It's cost that is putting them off." ●