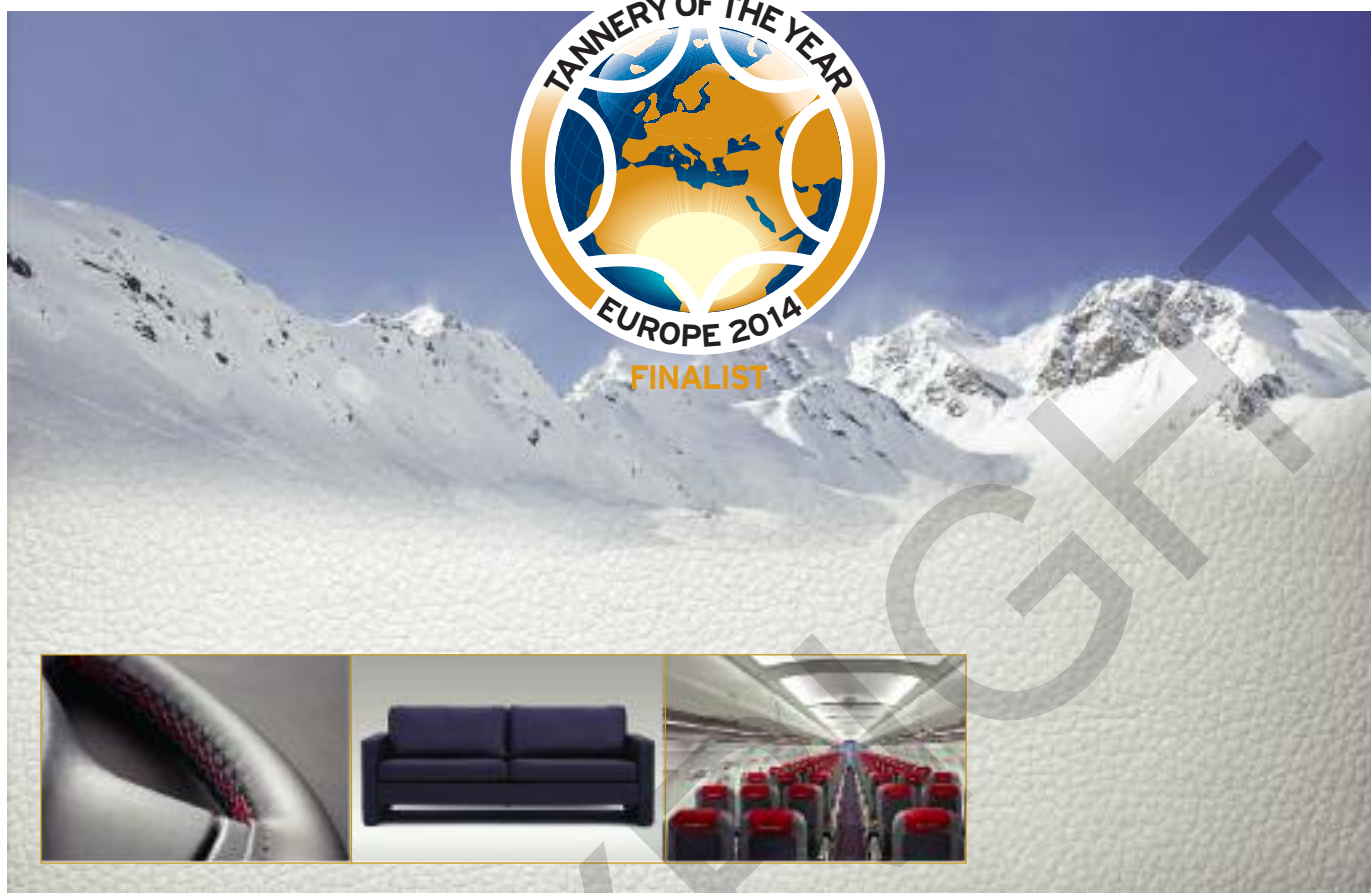




Tannery of the Year: Wollsdorf Leather, Wollsdorf, Austria

Wollsdorf Leather sells 70% of its leather to high-end automotive firms, working hard to meet all their requirements for quality and reliability.

Wollsdorf Leather, a full-service tannery based in a small town near the Austrian city of Graz, has a history that will seem familiar to students of the European leather industry's most recent 100 years of history.

A family called Schmidt, still included in the full formal name of the business (Wollsdorf Leder Schmidt & Co Ges.m.b.H), founded a tannery in Weiz in the 1920s and ran it for 60 years. They moved production to a new site at Wollsdorf, 15 kilometres away, in 1978, keeping the old site as a storage facility. The company is still 100% owned by the Schmidt family but has been run by external management teams since the 1980s, with Andreas Kindermann as the managing director since 2007. Over the decades, the focus of its production has moved from footwear and belts for local consumption in the early days to new, global markets such as specialist automotive leather applications, high-end furniture and aviation. To help add value to the company's automotive leather, the old site in Weiz now operates as a cutting plant, producing finished leather pieces to cover steering-wheels, airbags and other car components.

Sales revenues are currently at a little under €130 million per year and there are 870 employees, 570 at the Wollsdorf tannery and 300 at the cutting plant. The tannery is processing 2,300 hides a day at the moment. Around 95% of its output goes for export. Emphasising the international nature of its business, Wollsdorf Leather has a sales office in High Point, North Carolina, to help it serve the US furniture sector, another in Melbourne, Australia, and a recently set-up joint-venture operation in Fuzhou to provide car-seat upholstery for the Chinese aftermarket (but with all the leather produced in Austria).

Demanding customers

High-end automotive brands, including BMW, Mercedes, Audi, Jaguar, Land Rover, Bentley and Porsche, are among the company's biggest customers and around 70% of all current production is for the automotive sector, with 20% destined for furniture and 10% for aviation upholstery. In general, automotive leather has been one of the European tanning industry's few success stories in recent years (although it is these higher-end brands that are achieving most of



the growth). Demand among car-brands to offer consumers heavily marked-up leather-covered steering-wheels is high (Wollsdorf makes 24,000 sets per day, each consuming 0.3 square-metres of finished leather), but Andreas Kindermann says the only way to maintain or grow market share is to offer excellent value for money. That does not mean cheap, of course; this is not a cheap product (no industry makes cheap products in twenty-first century Austria). Value for money means meeting the strict requirements the automotive brands impose for reliability, quality and durability, which is far from easy. Each batch has to be tested according to the specifications, with the main focus on thickness, stitch tear-resistance, tear strength, tensile strength, elongation, flammability, adhesion of finish, rubbing fastness, colour and gloss.

"Quality starts in the abattoir," Mr Kindermann says. "We are working with our suppliers to increase knowledge of the best trimming practice and to make sure we can stick to the breeds and the origins that we know will give us the grain quality and the yield we need." Bull hides from Alpine breeds such as the fleckvieh dominate the selection, but raw material from other origins can be part of the mix too. With the price of raw material so high, head of purchasing, Josef Wolfbauer, has been working for about 18 months to identify additional sources of material, with quality and availability the key questions.

Reach for the sky

Aviation clients are also very demanding, but Wollsdorf Leather has noticed an important difference between these customers and those in automotive. In most cases, aviation companies put leather into an aircraft that they will run and maintain themselves. This means arguments about the economic merits of choosing leather upholstery ahead of synthetic substitutes resonate loudly.

Airlines including Qantas, Lufthansa, Austrian Airlines and Singapore Airlines have shown a keen interest in running a lighter leather that Wollsdorf has produced. It still meets all of the aviation industry's technical requirements regarding flame-retardancy, but, at less than 600 grammes per square-metre, offers a weight-saving of 40% compared to standard aviation leather. Each aeroplane seat uses up 1.5 square-metres of leather; multiply that by the number of seats



The movement of materials in the wet processing areas is highly dependent upon hoists operated from overhead cranes that run on parallel rail track set beneath the roof. These tracks run the whole length of the wet processing areas for moving hides both by grab and stainless steel containers.

in an aircraft and by the number of flights that aircraft will complete in a year and the weight-saving converts impressively into a fuel-saving (lighter aircraft use up less fuel) of £30,000 per plane per year, reducing operating costs and the airline's carbon emissions. Sales director, Gottfried Tandl, explains that the key to saving weight is to reduce the thickness of Wollsdorf's aviation leather, from around 1 millimetre to 0.7 millimetres, and still meet all the performance specifications of customers.

He explains that the leather will usually last at least six years on a typical seat on an aircraft, compared to half that amount of time for textile-based upholstery. Leather is easier to clean, which makes it faster for airlines to turn leather-upholstered planes around and get them flying again, which is what counts, at least on short-haul routes. After a couple of years, he adds, textile-based upholstery has to come out altogether for thorough cleaning and afterwards undergo flame-retardancy treatment all over again. For these reasons, there is a strong feeling at Wollsdorf Leather that many of its aviation customers would like to use more leather in their aircraft interiors, especially in first- and business-class cabins to emphasise luxury and quality. An obvious example would be to use leather in the partitions between seats. A barrier to this has, traditionally, been the difficulty of meeting the aviation industry's rigorous requirements for cabin materials to have low heat release. If fire

breaks out, airlines want the materials in the cabin to release as little heat as possible for as long as possible so as not to make the fire worse, and to increase the amount of time passengers and crew have to escape. Wollsdorf Leather believes it is on the verge of being able to present to the aviation industry a leather that can be used in seat surrounds and still pass the required test for heat release. "There is still a lot of work to do before we are able to put this idea into serious production," Andreas Kindermann says, "but the important point is we are working hard to find ways to add value to aircraft leather."

River restored

Soon after Andreas Kindermann took over, Wollsdorf Leather found itself implicated in a cross-border dispute. The tannery's location is near the local river, the Raab, as is often the case with manufacturing plants that require good access to water. The Raab is narrow here, although fast-flowing at the time of our visit, the beginning of winter. If you follow its course for 70 kilometres or so, you come to the border with Hungary, where the authorities launched a complaint in 2007 over pollution in the river, known there as the Raba. Campaign groups were quick to become involved and quick, too, to blame the leather industry for the poor quality of the water. A second tanner, even closer to the border, and Wollsdorf had to face enquiries from the authorities, protests



From a technical point of view

(1) Overview of operations

Wollsdorf Leder Tannery and headquarters is located on open countryside near Graz in Austria, where it has operated since the mid 1970s. 570 people are involved in leather manufacture and administration at this site, with another 300 people at the nearby cutting and sewing plant operating at the site of the original tannery that was established some 80 years ago.

The tannery can process more than 16,000 hides per week into 3.5 million m² of leather per year. Approximately 70% of these leathers are for steering-wheel leathers, 20% for furniture, the balance being mainly for aircraft seating and a small volume for automotive seats. The leathers are mostly full grain, with a high percentage lightly finished and non-embossed.

(2) Manufacture and processing

Input is based on salted and fresh bovine hides, 90% being sourced within 500 km of the tannery. In particular, bull hides from the fleckvieh breed are used as they provide a very uniform and predictable substrate that is needed as part of meeting the high stretch and elongation specifications that are essential for steering-wheel leathers.

All of the hides are drum soaked at a standard in-put weight of 14 tonnes/drum load, then transferred into a separate department for unhairing/liming. All of the hides are lime fleshed only: this is due to BSE controls (the virus is destroyed by alkaline treatment) and hygiene demands as by-products are ultimately used for human consumption.

An elevated through-feed fleshing machine is serviced by a chain conveyor hide delivery system, and then the fleshed hides are trimmed on a conveyor belt, followed by lime splitting. Each limed load creates a single tanning load for the grain splits. The flesh splits are fed onto a conveyor where they are trimmed into coupons for split leathers. Damaged splits, belly trimmings and neck parts are separated for sales for gelatine manufacture.

A wet white tanning process is used for most of the production. On discharge from the tanning drums into stainless steel containers, the leather is graded on a conveyor following samming, with hides to approved quality fed directly by conveyor to the shaving operation. This comprises two machines facing each other: the butt part is shaved on the first machine, with transfer to the second for shaving the neck areas. Both feed and removal is via conveyors over the top of each machine.

All retanning and dyeing operations are managed under close control using automatic dosing systems. Special attention is taken to wash out all pipework to prevent any contamination.

The leathers are samm/set, followed by wet stretching and automatic transfer to low temperature vacuum drying. This is followed by tension-free airing off using an elevated conveyor system to reduce moisture over 24 hours, staking using feed-through vibration staking machines, dry tumbling as required, then restaked. Furniture leathers are processed undyed, and after crust inspection are wet back and dyed to shade.



All of the fleshing is in the limed state as the processing operates to standards set down for food production. Hides are delivered individually to the elevated through-feed fleshing machine, the whole system being designed to minimise handling.



After lime splitting the flesh splits are trimmed to remove bellies and necks to provide uniform coupons for split manufacture. Particular attention to safety requires full face guarding against possible knife cuts, and eye protection against possible splashes.



Hides are delivered fully opened from grading via over-machine conveyor for shaving. The butts are shaved on the first machine, then passed to the team on the second machine for shaving the necks. All machine settings are controlled from the first (master) machine.



To ensure accuracy of thickness, steering-wheel leathers are dry split and buffed/dedusted on the flesh side before finishing. Finishing operations mainly comprise a first roller-coat application, followed by spray finishing using two spraying machines each with two cabinets and drying tunnels. Development work is taking place to replace the steam drying units with infra-red drying, but at a very specific wavelength. It is believed that this will result in a reduction of curing time of the finish from 24 hours to, perhaps, three hours, and improve yield values.

The process from raw to finished leather takes 13 working days. Many of the leathers are to a very high specification as demanded by the automotive sector and aviation industry. This includes cool leathers, leathers that are 40% the weight of standard leathers (saving 600 gm/aircraft seat), fire retardancy, anti-soiling and high abrasion properties – and in particular for steering-wheel leather – completely predictable behaviour in terms of elongation under load in all directions.

The whole operation is a balance between using the right type of hides and the right selection at all points, optimising the processes involved by maximising the use of plant and equipment, and management of costings. For example, no dyeing load is less than 100 hides even if the particular requirement is less than this quantity, although this means that stocks have to be high at both the crust and finished state. However, it also ensures that stocks can be drawn upon for very rapid response, or to provide delivery as low as one hide for concept design purposes. Considerable finished stocks of more than 220 colours are permanently held at the cutting and sewing plant for operations both for in-house operations and external supply.

The cutting operation produces 24,000 steering-wheel sets, 100 m² for instrument panels, 4,000 small parts and 850 airbag caps each day. Operations commence with an initial hide inspection and marking of defects on the leather. A second inspection with the leather stretched by 5% reveals any hidden defects, and these are also marked to colour code.

Three main cutting operations then follow. One operation comprises a computer scan of the hide on the cutting table so that the optimum placing of cutting dies can be determined. Each location is identified and then projected as a colour-coded image onto the hide for the manual placing of the individual cutting dies, followed by cutting of the components using roller press. A second arrangement uses oscillating cutting heads to directly cut the components under computer control. A third option is used for small components or small orders, where the dies and cutting are manually operated.

The components are then skived, embossed or punched as specified and embossed or printed with logos according to customer demands. All components are barcoded to record the full processing history from the raw hide state.

A particularly high specification leather is for a cap covering airbags in the centre of steering wheels. The technical standard is ultimately dependent upon an oscillating knife that cuts a tight diamond lattice pattern into the flesh side of the component. The depth of this cut is precisely 0.3 mm in a 0.7 mm leather: this causes a deliberate pattern of weakness in the cap leather to enable an airbag to expand on impact in a uniform manner.



All of the leathers designated for steering-wheels are dry split for complete control of the leather thickness.



Softening is provided by combinations of through-feed vibration staking and dry milling both in the pre-finished state and within finishing. In this situation the pre-crust leathers are trimmed on a conveyor after staking. Operatives wear ear protectors.



All of the finishing blends are managed using a dispensing system.



Many different colours are produced to cover the range of leathers manufactured. Close attention is paid to ensure removal of any dust within finishing operations.



After an initial hide inspection, and identification of defects, the hide is stretched by 5%. Hidden defects are revealed, and marked according to a colour code.



CAD (2D/3D) is used to establish optimum cutting values. An image is projected onto the hide where colour coded cutting dies are placed manually. The cutting efficiency of this operation matches computer managed cutting systems.

(3) Solids management

- Trimmings from limed hides and limed splits are sold for gelatine manufacture
- Shavings and trimmings from wet white tannage are sold for conversion into pellets as fertiliser
- Tannery sludge is put to thermal use
- Limed fleshings are to be heat treated, the plant being in the final stages of installation for grease recovery for bio-diesel. The degreased fleshings after dewatering will be used for bio-gas production by an external provider
- Processing plant is in the final stages of installation to recover proteins from the liming process, with the dewatered precipitates used for bio-gas production.

(4) Water and environmental management

[a] WATER

All water used within manufacture is extracted from the river that runs alongside the tannery. The effluent treatment is returned to this river after comprehensive effluent treatment to stringent standards that include 27 parameters for discharge. These are monitored daily by the company, but also twice per month by local authorities.

[b] EFFLUENT TREATMENT

Approximately 1,500 m³/day are treated over a seven-day week. The wastewaters are segregated into three streams:

- Dirt and main soak discharges.
- Floats and washings from unhairing/liming. These are subjected to catalysed aeration for the removal of sulfides.
- All remaining floats and washings are mixed together and dosed with lime to raise the alkalinity to pH 10.0 to precipitate solubles from free-of-chrome tannages and retannages, and the small residual chrome content.

The three streams are then mixed for conventional primary settling and clarification. The supernatant is then subjected to full secondary biological treatment in a Pasveer ditch system, then clarification. This is followed by an extended treatment in a second Pasveer ditch system that has been converted to induce air for flotation of fine remaining solids, which are then removed as a scum from the surface. After clarification, the supernatant is subjected to a second air diffused flotation of conventional design, then activated carbon filtration.

The plant is continuously monitored so that any problems can be rectified immediately. Control is supplemented by using iPads to display information, and these are taken home by managers to ensure monitoring and reaction as necessary over the extended day.

After mixing primary and secondary sludges for concentration, the solids are dewatered to 50% moisture content using a Bucher press. Designed to maximise juice extraction from fruit, this equipment is highly effective for dewatering typical tannery sludges, but also degreased limed fleshings. The equipment comprises a cylinder that is batch-loaded with sludge for dewatering, and a piston to provide compression. As pressure is applied water is released via



This raceway is being used for separation of residual fine solids after conventional secondary effluent treatment. A small volume of air is introduced to create a scum, and this is directed (low left) towards a belt mesh that lifts the scum and entrapped solids from the surface.

numerous fabric covered sections of flexible pipework located within the cylinder and surrounded by the sludge. The whole cylinder and piston arrangement rotates during the cycle to improve the flow of water through this pipework as it is released, and the whole operation is fully automatic.

To reduce the load on the plant and optimise solids disposal, all of the wastewaters from unhairing/liming after oxidation will be acidified by low Ph Value to precipitate the protein. This will be separated in a series of clarification tanks, and the supernatant at reduced COD/BOD will be fed into the effluent plant for biological treatment. This plant is in the final stages of installation.

[c] ENERGY

All of the electricity consumed in manufacture is generated by hydro-power, and the company pays a premium to the energy provider for this green supply. Natural gas is the other source of energy, but this use is set for a 50% reduction by replacement with grease as bio-fuel (1,000 tonnes/year) extracted from limed fleshings. ☺



The Bucher press is used for dewatering sludge and fleshings to 50% moisture content. Managed as a batch operation, the solids are contained within the horizontal cylinder (right) which is then subjected to pressure by a piston under hydraulic load. Internal flexible piping is enclosed within the sludge mass for drainage, and the whole arrangement slowly rotates to facilitate the water released.



This shows the conical base of six settling vessels being installed for the recovery of proteins following the acid precipitation of unhairing/liming wastewaters and washings after sulfide removal. The objective is to reduce the impact on the biological plant, and to recover solids with secondary use to avoid disposal.

from the campaigners and negative publicity for a short time, but when Mr Kindermann asked for time to choose the best way to reduce the effects on the river of his company's leather production, he received it. "I was open-minded about finding the best solution," he says now, "so I consulted externally. I gave the campaign groups my word that if they gave me enough time to make good decisions, I would first tell them what we planned to do and I would bring the plan to fruition, but I said they would make things even more difficult if there were negative stories in the newspaper every week. And they agreed."

After a number of improvement projects

in and around the onsite wastewater treatment plant (see technical section), all of these relationships are cordial again. Separately, a recent audit carried out by well known German consultant Jutta Knoedler showed Wollsdorf Leather's carbon emissions to be 50% below an average she has worked out for tanneries in Europe. Around 10% of its fleshings (the total is 10,000 tonnes per year) is clean enough to go into biodiesel and the company is paying a premium to its energy supplier to make sure all the electricity it uses comes from hydro-powered sources. It has even asked Vallero, the Italian manufacturer of tanning machinery, to carry out an audit and give

Wollsdorf a guarantee that the wood in the tanning drums it has bought has come from sustainable growth. "They told us we were the first tannery to ask them that question," Mr Kindermann says.

In 2012, the local authorities gave the tannery a water management award. In November 2013, Wollsdorf Leather was named as the winner in the industrial category of the annual Export Award of the state of Styria. These important achievements appear to have attracted considerably less publicity than the Raab dispute of 2007, but they are a sign that the relationship with the authorities is now on the soundest possible footing.



A major managerial challenge for Wollsdorf Leather is that German is the mother language for only 20% of the workforce, and that the workforce encompasses 40 nations under one roof. The problems that arise within both training and health and safety have been addressed by the extensive use of display panels and operational manuals that make use of visual aids. Specifically, these provide visual examples of correct and unacceptable practice with captions stating OK and NOK (Not OK).

Team for today

Andreas Kindermann places a high level of trust in his management team, saying that he regards it as his responsibility to concentrate on the future of the business and leave most of the day-to-day running of the tannery to them, or, as he puts it, "think about tomorrow while they look after today". Production director, Herwig Grabner, worked his way up from the shop floor. He describes himself as a tanner, but is deeply grateful for the help he has received from the company to resume his studies in recent years, completing an undergraduate degree in engineering in Mittweida and then a Master's in Vienna. He jokes that this has enabled him to become "a translator" between production and management because he is now able to speak "both languages". But the serious side of this is that the business cases he presents now for new machinery or new projects now make it much clearer to the company's management team how quick the pay-back will be. There are currently 52 improvement projects on the go or under consideration and, clearly, this is an environment in which new ideas are welcome.

As a result, production time, from raw material to cutting, has come down substantially in the last four years. Raw material is expensive, Mr Grabner says, and if a tannery is going to continue to operate in a wealthy country like Austria (it had the tenth highest standard of living in the world in 2012, according to the World

Bank), everything has to run as smoothly as possible.

The day-to-day work to improve the tannery's environmental performance is in the hands of Siegfried Figoutz, who joined the company from the automotive industry in 2009. He says it was a bit of a shock to start at Wollsdorf Leather when the dispute over the water quality in the Raab was still running, but he is still enthusiastic about addressing the challenges all tanneries face in reducing their impact on the environment. He is still trying hard to make improvements. Mr Figoutz says it probably took a full year before the changes he brought in began to make a difference to measurable things such as the water-quality readings from samples from the river, but he is confident now of a wider recognition of changes for the better, reflected in the awards for water quality and export performance from the regional authorities. "And I can tell you what has made the difference," he adds. "There has been a change in the philosophy here and waste management is now integrated into the way the tannery works."

As well as taking responsibility for raw materials sourcing, head of purchasing, Josef Wolfbauer, leads much of Wollsdorf Leather's dialogue with its chemicals and machinery suppliers. He and his colleagues carefully record the performance of suppliers in terms of price, product quality, delivery performance and so on. On the machinery side, he points out that reliability is the key

factor. Wollsdorf Leather wants the machines it buys to run well with "just normal maintenance" from in-house technicians. However, if external help is required, it wants spare parts and technicians to arrive quickly and to provide the necessary support. "We want companies who do what they say they will do," he says.

In terms of the people who work at the tannery, Wollsdorf Leather is a much more diverse place now than it was two decades ago, reflecting wider changes in this part of Austria and, more widely, this part of Europe. Among the 870 employees, 40 different nationalities are represented.

Human resources director, Petra Gauster, regards the rich diversity of the workforce as something tremendously positive, but it also means the company has to take several special steps to look after its people. Examples of extra lengths the company has gone to include a careful dialogue with a Graz couple of African origin. The husband had worked at the tannery for some time and had consistently put forward his wife as a candidate every time Wollsdorf Leather carried out a recruitment exercise. The company expressed concern for the couple's six young children and turned the request down on a number of occasions. However, the requests continued and the company eventually agreed to allow the husband and wife to work mirror shifts so that, with a little overlap help from a neighbour to cover travel time, both could work with one of them always free to look after the children.

On another occasion, the company lobbied hard to secure work and residence permits for the daughter and son-in-law of a Romanian employee who had been diagnosed with terminal cancer. He hoped to have his family as close to him as possible, but permits for people from Romania had, at that time, become restricted. The company appealed and persevered and eventually succeeded in securing permission for the man's family to come to Austria. They are still there and still work for the company, although the man succumbed to his illness some time ago.

A development programme, called the Wollsdorf Academy, has taken root and is allowing people right across the company to advance, to learn, to enjoy their work more and to earn more money. Ms Gauster has developed detailed learning modules that workers can complete at their own pace. New levels have come into the company



Effluent following secondary clarification, before flotation and filtration using activated carbon. The quality is particularly high as the discharges are into the adjacent river; this receives effluents from other manufacturing operations, and eventually flows over the border from Austria into Hungary.

structure to allow more people to gain promotion. She has seen positive results, such as a reduction in staff turnover from between 8% and 10% five years ago to around 2% today. To emphasise the importance of this, she says: "This is still a relatively low-wage industry and there are plenty of other factories in this area where people can earn more. We have found that the best way to recruit people is through word of mouth. People working here already have told their friends and family that if they are willing to work hard they can stay here for a long, long time and make progress. If people are willing to work hard, they can achieve a lot."

Value for money

There can be no doubt that Austria is an interesting place to produce leather, but far from cheap. Josef Wolfbauer, like practically everyone in a purchasing role for tanneries, spent much of 2013 thinking about ways to cope with the record high raw material prices, including, as mentioned above, attempting to find additional sources of material of the right quality. In addition, he explains that Wollsdorf Leather keeps having a go at producing leather that meets all of its quality requirements from alternative hides. "But we generally need tighter grain than you can get from those hides," he says. Mr Wolfbauer's parents ran a tannery of their own in a different part of Austria until they retired, so he feels he has grown up with the sector and been able to accumulate a lot of industry knowledge. He insists, for example, that lower volumes of raw material and higher prices are all part of a cycle and that the numbers will, once again, eventually become more manageable for tanners. There is demand from customers. The figures he has for 2013 suggest automotive companies around the globe together produced 71 million new cars and that their target for 2014 is 73 million. Some of these will have little or no leather in their interiors, but Wollsdorf Leather's most important customers clearly do want to offer consumers leather upholstery and leather-covered steering-wheels, which should be good news for them, for the consumer and for the tannery.

This is positive. But he wonders about too many user organisations regarding leather as a commodity these days, and about the contribution the tanning industry itself has made to that situation. He

blames "too much short-term thinking" and says the whole industry should work together to talk to consumers about how leather is made and where it comes from. If consumers developed a clearer understanding of the naturalness of leather, for example, marks on the skin might cease to be regarded as faults, he suggests. And this would make life easier for tanners because they would be able to process and sell more of the raw material they invest in.

The key for managing director, Andreas Kindermann, is adding value to customers' own products: car interiors, furniture, the experience on board an aircraft or whatever. "We know we are not the cheapest," he says again, "but we believe we offer good value for money. Each of our consignments is of the same high quality, meets all of customers' technical requirements, and is on time. We are never late. The price of steering-wheel leather per square-metre is attractive, but the demands are very high and difficult to meet consistently. You have to have a lot of flexibility."

Flexibility, here (and unusually for any aspect of the automotive supply chain), means keeping a high stock of crust to be able to cope with customers asking for extra sets of leather at relatively short notice. Mr Kindermann, from an automotive background himself, found this a little difficult at first. He recalls: "I used to think 'no inventory', because I had always believed that, as well as costing money, inventory disguises problems. But our customers change their orders, often without giving us much notice, and to be able to cope we have to keep a high stock of crust, material of the right quality that will give us the right yield. Keeping stock costs, but if it helps us achieve the right level of consistent quality, it's worth it." ☺

Control and Accreditations

LABORATORY SERVICES

In addition to control covering the stringent demands for automotive, steering-wheel and aircraft leathers, a special test is required for leathers for airbag caps. The depth of patterned cut within each component has to be measured at 0.4 mm of a leather of 0.7 mm thickness. The sampling level is extremely high, and these records are kept of 11 years.



ACCREDITATION AND AWARDS

- ISO 9001⁽¹⁾
- EN ISO 14001⁽¹⁾
- ISO/TS 16949⁽²⁾
- EN 910⁽²⁾
- BS OHYSAS 18001
- The Blue Angel
- ECO2L

⁽¹⁾ 1st Tannery in Europe

⁽²⁾ 1st Tannery in the World