



Turner “Selectra” automated hide grading system

Inspection and grading of hides is an area that can make or break a wet blue tannery. To over grade your hides is to invite outraged customers, disputed invoices and endless wrangling; to under grade your hides is simply to give money away. Grading by weight, substance and area is clear and generally unequivocal, but grading judgement according to surface defects is difficult, contentious and highly personal. The judgement of an experienced grader will inevitably be skewed by any number of outside influences, from ambient lighting to indigestion, and it is well known that if a grader is taken to task for over grading hides he will inevitably swing to under grading them in reaction. A reliable, automated system for hide defect recognition should, therefore, be a boon to the industry.

The Selectra system is the result of many years of parallel development in digital defect recognition from the French machinery manufacturer Turner of Annonay, and the R&D centre for the French leather industry, CTC of Lyon. When the Mercier Turner group collapsed in 2000, the bulk of their assets were bought by M. Didier Chambon, a former Mercier director,

who wished to resume machinery manufacture at the Annonay site (Figure 1). For commercial reasons it was decided to trade under the name of Turner. The factory and workforce has been streamlined, but the company is able to offer full support and spare parts for the 20,000 machines produced world-wide under the brand names Mercier, Turner, Moenus-Turner, Charvo, Rouanet and Oliver+Battle. They also continue to produce a full range of tannery machinery from fleshers to ironing machines, but M. Chambon decided that future development work should be in the field of high-tech automation for the tannery.

Technical expertise

CTC—Centre Technique de Cuir—in Lyon employs 96 people in leather-making consultancy, laboratory testing, environmental consultancy, training and research and development (Figure 2). It has been working on digital recognition of hide defects for nearly ten years, seeking to perfect a practical system for tannery use. In early 2005, the reborn Turner company and CTC decided to join together to produce an automated grading system using their shared knowledge. Selectra uses a high-resolution digital camera to scan each hide, and sophisticated computer programmes to process the data. The system ►



Figure 1: Refurbished Turner offices at Annonay

Figure 2: CTC's imposing headquarters in Lyon

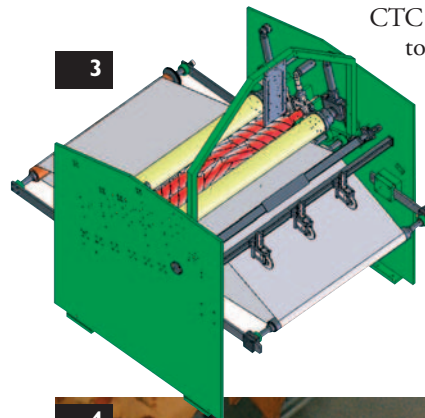


Figure 3: Structure of the Selectra machine

Figure 4: Infeeding hide – the three lights are photo-detectors for the leading edge



TURNER "SELECTRA" AUTOMATED HIDE GRADING SYSTEM



Figure 5: Digital camera on motorised mounting Figure 6: Hide passing out under thickness sensors
Figure 7: Operator using trackerball at control console

can be programmed to recognise and identify different surface defects on the hide, and indicate these in colour on a stored image. Parameters are fed in for the number of defects and their positions on the hide, and using this data in conjunction with area and thickness measurement also provided by the system, the grading decision can be made by the computer. The grading signal can then be used to operate a selection stacker.

The Turner Selectra 1500 machine was first presented at TanningTech 2004, and is now working in an Italian tannery, for sheepskin grading at crust. The Selectra 3000 model for whole hides was launched at TanningTech 2005, and the first unit is now installed in CTC, where it is available for demonstration and trials. The machine is basically a frame carrying a single endless conveyor driven by an inverter controlled motor, the top surface sloping up to an apex in the middle of the machine (Figure 3). The wet, tanned hide is manually spread onto the conveyor (Figure 4), which is made up of an open woven construction to allow water to pass through. It passes first beneath a felt covered pressure roller, which gives a partial sammying of the hide. It then passes beneath two setting cylinders, which smooth out the hide on the conveyor. The setting cylinders operate in conjunction with sensors on the conveyor, so that one cylinder descends to set the first 25% of the hide, then the second cylinder descends to set the remaining 75%. The hide then passes beneath a second felt covered pressure roller. The purpose of the felt rollers is not principally to dewater the hide, but to give an equal water distribution over the whole surface. Early experiments showed that fully sammed hides had too much colour contrast between dry and damp areas for the imaging to work properly.

Digitally captured

As the hide passes over the apex of the conveyor, it is illuminated, and digitally scanned by a high-resolution camera mounted about 2m above the conveyor (Figure 5). The resolution of the camera is to 0.3mm. The felt rollers and setting cylinders are hydraulically driven, and there is a separate hydraulic system for pressure control and raising and lowering the setting cylinders. After scanning, the hide passes beneath three thickness measurement wheels which can be positioned as required across the hide, then comes down the conveyor at the rear of the machine ready for transfer to another machine (Figure

6). The Selectra unit at CTC is a dual purpose machine which can be used with wet blue or wet white hides, or with completely finished dry hides for final grading and analysis for cutting. The sammying and setting cylinders are not used for dry finished leather; instead, there is a vacuum system fitted to hold the hide down flat onto the conveyor as it is scanned.

The system is accessed at the machine with a colour screen and a sealed industrial trackerball unit (Figure 7) – Turner consider this to be more robust than a touch screen in this type of tannery application. Data from the machine is processed by a PC, which can either be mounted within the end casing of the machine, or separately in an office. The software is Windows-based. The machine at CTC can separately identify the following defects on wet blue :-

- Pinhole
- Teat
- Scars
- Veins
- Neck wrinkle
- Grain cuts
- Parasite damage
- Pleat or wrinkle (outside neck area)
- Holes

Defined defects

Further defects can be separately identified at the customer's request, but this list covers most requirements. They have found in practice that most tanners settle for identifying perhaps five or six major defects only. The defects are displayed in different colours on the image of the hide, and it is possible to zoom in to magnify certain areas for closer inspection. The hide area can be divided up into specific zones, and the number of permissible defects of each type per zone established, and set into the system as a parameter for grading (Figure 8). The scanned area of the hide and its average thickness are also recorded and displayed, and these parameters are also used in the grading decision.

On the current machine a throughput of one hide every thirty seconds is possible, giving 120 hides/hour or approximately 900 hides per eight-hour shift. The limitation is the time required for the computer to process the digital image; this can be reduced by using a more powerful computer, and the manufacturers aim to achieve 150 hides/hour by upgrading. If the number of defects

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Figure 8: Parameters for different hide areas are set at the computer

required to be identified is reduced, the speed of operation can also be increased. To date, only wet blue hides have been trialled, but Turner/CTC believe that defects will be more easily identified on wet white hides. The illumination levels and camera settings need to be optimised for wet white, but this should be a relatively simple procedure.

For wet hides, it is envisaged that the Selectra machine would be installed in line with a throughfeed sammy/setter machine and a multi-station selection stacker. The line would be manually fed by two operators with hides from the drum or processing vessel. Because the Selectra machine itself does a partial sammying and setting of the hide, a less sophisticated throughfeed sammy/setter than for normal processing would be required. In order to refer to the stored image data, each hide will need an individual identification mark or tag, and a suitable system is currently under development by Turner/CTC. The system would allow for the tanner to operate to fixed and agreed grading parameters, day-in and day-out, without the variation that is inevitable with human graders. It would enable separate factories to supply a single customer to exactly the same grading parameters, without dispute. Detailed analysis of defects could be used to identify and improve optimum hide sources, backed up with full image records.

For finished hides, it is envisaged that the Selectra machine would be used in conjunction with automated pattern-nesting and component cutting machinery, to optimise cutting yield for each hide. It would also enable a major leather purchaser to establish and verify clear quality control parameters with his suppliers.

Development continues on the Selectra 3000 machine at CTC in Lyon, as trials are undertaken with potential customers on different types of leather. Each tannery installation will be tailored to the particular requirements of the customer, and full training will be required for tannery staff to operate the system and to fine-tune the grading parameters. The Selectra system will now need to prove itself at work on the tannery floor, but it clearly has the potential to be a major breakthrough in automation and quality control. ☉

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