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SHORT AND MEDIUM TERM INDUSTRY OUTLOOK

The future of the global leather industry depends upon a continuing and reliable supply of raw material and the ability of the tanners toconvert that material into products which have the functional and fashion appeal for the consumer at a price he or she is prepared to pay.

Notwithstanding the immediate outlook which is somewhat depressed on account of the world recession there is no reason to anticipate any grave problems for the industry.

Raw material supply

World human population is growing much faster than the livestock populationso the percapita availability of leather is decreasing. However, the future of meat eating looks assured in spite of a move towards vegetarianism in the West, mainly by the young, and a move away from red meat eating for health reasons. The growth of an affluent middle class throughout Asia is likely to more than counter any decreases in the West as the decade progresses.

Additionally, the value of the animal hide or skin is more clearly appreciated now than hitherto and although there is much complaint in the industry about raw material quality, various initiatives are firmly in hand to upgrade quality through offering incentives and to improve the recovery in the first place. UNIDO have, themselves, been deeply involved in this work with a hide and skin recovery programme in East and West Africa. If it succeeds, it will augment current supplies by an appreciable amount.

Interestingly, some wildlife conservation programmes - from elephants in Zimbabwe to alligators in the USA - have been so successful that the next step could well be culling programmes to maintain a manageable balance. This could lead to a new source of raw material.

Fish farming is another potentially significant source of raw material. Salmon farming is now well established in many countries including Canada, Norway and Scotland, producing skins which can be converted into a durable and attractive material for shoe trims, watchstrap, purses, key fobs.

Livestock is a renewable resource and in the short to medium term the leather industry anticipates no great change in the availability of its raw material although the balance between different types and origins may alter. Environmental considerations. The technology for making environmentally friendly leathers - without heavy metals, without producing toxic substances and treating wastewaters until they are deemed clean enough to return to nature - already exists. It has been well proved in Europe and elsewhere that it is perfectly possible to make such leathers on a cost-effective basis in high labour cost countries. The same must be true in the developing countries against the time when local legislation demands compliance.

Economic considerations Tanners in the high labour cost countries of the world are fighting a relentless battle against competition from the developing world. It is a fight they appear to be slowly losing as production quantity slips away. However, there is optimism that the West has a strong technological advantage and is also close to the high spending consumers who make high demands on leather. Production quality is, therefore, the order of the day for Western tanners who are concentrating on niche markets and high specification leathers.

Tanners in the developing countries should be optimistic about the short to medium term outlook. Almost without exceptionigovernment policy is to encourage the leathermaking industry and its vertical integration with leather product manufacturing means that a strong base is being built up to supply Western markets as well as their emerging domestic markets. Fashion Leather is capable of locking horns with virtually every other material in shoemaking, clothing, upholstery and leathergoods. It tends to be dearer than many but for some applications it has unique properties and generally maintains a cache-as a prestigeous and natural material. The likely scenario in the short to medium term is that leathermaking will recover globally and that tanners in the developing world, where labour costs are appreciably lower, will continue to take a larger slice of the cake. One of the factors which might work against this development is if the West, particularly the EC and may-be North America, refuse to accept leather and leather products from the developing world because they contain banned substances or have been made by child labour, or in some other way fall foul of Western standards and legislation. Such a course of action has not been suggested) so far as the author knows but it is a possibility that does exist.

in 1966-71 to 40.4 per cent in 1988-90 while the developed world's share fell from 64.1 per cent to 59.6 per cent. The share in world production was greatest in Eastern Europe and the former USSR. As indicated previously there have been significant increases in the quantities of hides entered world trade from developed countries. In 1968-71, 34.1 per cent of their world production entered international trade. By 1988-90 this had increased to 54.3 per cent but from the developing countries, the proportion had fallen from 20.4 per cent to 10.2 per cent.

During this period, the developing world changed from being a net exporter to a net importer, reflecting the expansion of tanning while the developed world changed in the opposite direction. North America and Australasia are massive net exporters of hides while the largest net importing area is East Asia, dwarfing Latin America. However, the number of hide sold within the USA has become bigger than the number that Korea buys. American tanners are buying 250,000 to 300,000 hides per week. US export quantities are around 270,000 per week, of which Korea may take about 200,000, the remainder being divided between Japan, Taiwan, China, Thailand, Mexico and other leading customers.

With the USA retaining more hides for tanning, there is an indication that one of the predictions of the president of the International Council of Tanners could prove true. He forecast that by the end of the millenium, the USA Europe and Australisia would not export any untanned hides and skins. Another prediction was that China will become the dominant leather industry in East Asia; that labour costs will be relatively unimportant in the competitive structure of leather and leather products manufacture and that China, India, Thailand, Korea, Indonesia, Taiwan, Argentina and Brazil will generate into huge new cons urner markets for leather.

Be that as it may, the situation in recent years in the leather industry has given cause for concern globally. Tanners in the developed and the developing world have both suffered from the global recession which has worked its way through Europe and North America and now appears to be increasingly affecting Japan. State of trade reports presented at the -International Council of Tanners annual meeting in 1992 confirmed that 1991 was a year of universal recession affecting both production and exports. The strong runners of the 1980s, upholstery and clothing leathers, suffered substantial declines and this picture of gloom

continued to cast a shadow over the leather industry during 1992 with many tannery closures in Europe and short-time working common practice. One barometer of the industry's fortunes is the Semaine du Cuir exhibition held in Paris, France, every September. This fair, which has traditionally embraced all sectors of the leather industry from hide and skin suppliers through leathermaking machinery and chemical manufacturers to leather product manufacturers has grown and prospered for half a century. At its peak it attracted well over 2000 exhibitors and approaching 80,000 visitors.

However, the dearth of business experienced by many exhibitors over the last two years has seen support for the exhibition diminish and as a consequence there will be no Semaine du Cuir exhibition this year (1993). In its place will be a more modest event in which costs of participating have been lowered in an attempt to maintain wide industry participation. A few years ago it would have been undreamed of for September to come and go without the Semaine du Cuir in Paris. Today that is a reality, reflecting the doldrums through which the industry is passing. Now,in 1993,the depressed state of the global leather industry continues although there is a feeling that the depth of the recession has been plumbed and that better days are round the corner Perhaps the day of leather upholstery has, however, now passed. Certainly it will be some considerable time before the automobile industry recievers from its current low point of production and with it renewed interest in leather upholstery. As a pointer, German leather production for upholstery was 40 per cent of the total in 1991 whereas in 1987 it was around 50 per cent. Highly fashionable textile upholstery materials are challenging the creativity of leather technicians who are creating new leather types to meet the fickle demands of the consumer. In many countries of the world it is also evident that leather clothing is off the boil in the fashion world. With three or four leather clothing items in the wardrobe, the consumer is looking for something different. Until leather clothing comes back vigorously into fashion, this sector also looks like staying in the doldrums. Footwear is a somewhat different story. Leather as a shoe material has intrinsic properties in terms of comfort which makes it highly desirable, particularly for closed men's shoes which could well be worn for up to 16 hours a day. Leather has the ability to absorb a considerable amount of foot moisture, keeping the foot dry, while it will also stretch and stay stretched - beddability.

Thus, for functional reasons alone, quite apart from fashion considerations, leather has a continuing place in shoemaking which will not easily be lost. Certainly the global percentage of leather for shoemaking has slowly decreased in recent years but that is more a reflection on the fashion upstarts of upholstery and clothing taking more leather. If they are on the wane, then leather for shoemaking will be seen to stage a comeback.

One interesting point which emerged at the International Council of Tanners meeting in Barcelona this year was Italian research indicated that the younger generation (in Italy) did not share the same respect for leather as a desirable natural material for goods and clothing as their parents' generation.

The younger generation's motivation to buy was more influenced by brand name, whatever the material used in the shoes, bag or other item. It is highly likely that this finding could equally well have been found in any other country in Western Europe or North America and it raises questions which the global leather industry must address. Should greater effort be expended by the industry to explain to the younger consumers to benefits of leather over other materials? Should direct effort go to influence designers in using leather over other materials? In Japan, the leather industry starts its propaganda in schools so that the school children know the story of leather and have an interest in it when they come to be consumers in their own right.

One interesting trend in the leather industry is the development and production of leathers for specific purposes. As consumers have grown more used to choice, so tanners have gradually developed leathers which more closely reflect the qualities which the consumer wants in his product and materials. As an example, drycleanable clothing leathers, washable shoe leathers, golf gloves that stay soft and supple when wet and after wetting, chamois leather which wets quickly and do/not exhibit a slimy feel, boot leathers which are waterproof under all conditions.

Giving the consumer what he or she perceives he or she wants is the only way the leather industry can survive in the competitive 1990s. Perhaps it accounts for the interest, not yet over emphasised but nevertheless there, in leathers produced by O-nviroment-friendly processes. These are already being promoted by various

companies in Europe and North America and it is likely that the range on the market will increase.

ENVIRONMENT

The leather industry, although very widespread, is very small globally and despite what many regulatory authorities believe, leathermaking is not a particularly dirty industry, a major pollutor of the environment. The fact is that tanning confers upon a basically putrefiable material qualities which permit highly practical use for footwear, clothing, upholstery, decoration and many other applications. Were such a process not applied to the main product of the meat industry, what would be done with these hides and skins? Would they be thrown to the dogs as in Yemen where partially consumed raw hides deteriorate rapidly into potential sources of disease? Would they be buried in specially designated areas or would some other use or means of disposal be developed for them?

A hide or skin can be tanned today in such a way that it is rendered biodegradable after its useful life is finished. That would seem to be the ultimate in recycling. But we have to accept that the very process of modern tanning can and does create products which are unkind to people and the environment. That is the area we have to tackle.

Fortunately, much has already been done in developing the technology to manufacture leather so that pollution is minimised, and less harmful, less offensive by-products are generated. In finishing, for example, water-based preparations are able to take their places alongside solvent finishes in virtually all uses. New application technology such as roll coating can be totally environment-friendly and even in spraying, recent developments will enable traditional machines to meet the over more stringent environment protection legislation being enacted.

One could tell a similar tale in virtually all the different aspects of the leathermaking process. The most intractable problem has been to find an alternative to chromium in tanning. Exhaustive research and development over the best part of two decades has failed to come up with any one other material which provides the same versatility and flexibility in production while conferring sought-after properties on the leather itself.

True, many chrome-free process have been developed but none yet offers a fully commercial possibility. Current thinking is to refine chrome tanning so that exhaustion is complete.

The stage could also be set for a revival of vegetable tanning, that centuries old process which largely fell out of favour because it was long-winded and not deemed able to cope with modern shoemaking processes. Developments only last year (1992) indicate that new combination tannages in the drum could be fast and able to give leather the properties the consumer requires. Cost-effective solutions to leathermaking within a highly restricted environment do exist. There can be a future for leathermaking in the high cost, ecological sensitive countries of the West.

This should give heart to tanners throughout the world. Certainly the developing countries in Asia, Africa and South America are understandably less concerned at the moment about the impact of leathermaking on their environment. Their concern has been to get their industries up and running. There is little incentive to install pollution control systems if it is not called for by legislation. Those tanners have, therefore, enjoyed a considerable cost benefit.

That situation is now changing. The results of lax control on polluted wastewater discharger, and putrefying spoil heaps of solid waste matter from tanneries are evident for all to see in rivers that will not support fish life, arable land that will no longer grow crops, and vegetables grown on polluted land that contain dangerously high amounts of chromium. Sooner or later the problem will have to be recognised and faced. If not, disaster will ensue. Environmental considerations affect every aspect of the leathermaking process from the moment the skin is taken off the animal's back right through the leathermaking process to the by-products of tanning. Finishing is arguably the most affected because of stringent controls on solvent emissions but the obviation of salt in preserving raw hides, the search for alternatives to chrome in tanning and replacement of materials such as cadmium, lead and other heavy metals in pigments are wringing a revolution in the conventional leathermaking process.

Some of the more significant developments are discussed below.

Raw materials preservation

There are a number of environmental and economical reasons for using short term preservation to replace salt: the cost of using salt, consent limits and cost of salt disposal, processing time to wash out salt and rehydrate the rawstock prevention of putrefaction prior to salting release capital tied up in stock. However, long term preservation, particularly using salt, does have some features which have yet to be surpassed: tested and reliable method, flexible, permits long term storage and stockholding overcomes fluctuations in rawstock supply allows export of rawstock Although a large number of methods have been tested under laboratory conditions, there are only three actually in commercial use throughout the world: chilling use of ice biocide solutions sprayed onto the skin, a method used mainly in warmer climates Historically, chilling has been the most successful method of short term preservation. The speed of cooling is essential and the hides must be hung out flat so that the whole surface is exposed to chilled air. This process is relatively cheap to run but is very expensive to set up. Chilling, although a tried method, is too inflexible for the majority of producers who are unlikely to provide their own cold rooms for holding stock. Ice has been used extensively in northern Europe, generally for providing rapid cooling prior to salting. "Shell" ice is often used for this purpose as it is easy to apply but does have the disadvantage of melting quickly, normally within 24 hours when stacked with hides, (this melt water has to be contained in transit). After salting, the hides are commonly stored at lower temperatures (6-10OC) to prolong the storage duration after the hides have left the hide market.

Using ice for cooling rawstock and as a mobile "coolant" is relatively economical at approximately one tenth the cost of salt. Labour costs are similar as ice can also be applied manually in the same way as salt.

Most work using biocides for short-term preservatoin was carried out over five years ago, particularly in South Africa. Products which have proved effective for soaking are candidates for use in short term preservation. The active ingredients found to be most effective for soaking include: Bronopol, Methylene bis thiocynate, Thiadiazine. Although biocides kill the bacteria present on the rawstock, the opportunity for recontamination can be dramatically reduced if this technique is combined with low temperature storage. The British Leather Confederation have been exploring the approach of rapid cooling, prolonged cold storage and the action of the biocide which comes into effect when the ice begins to melt and the solution comes into contact with the skin. The biocide ice has a

number of advantages over ordinary ice after the ice starts to melt around the edges and on the top of the stack, resulting in signs of putrefaction: As the ice melts, the biocide solution kills the bacteria which a. prevents further heating and melting of ice; b. prevents putrefaction, especially skins at the edge and top of the pile. Under more stringent conditions, the rate of melting will be higher. The major source of protection from putrefaction will be the biocide: not the cooling effect. No additional biocide is required during soaking. The biocide is applied at the earliest possible stage so that the bacteria are killed at source. The ice also helps to distribute the biocide on to the skins which can be a considerable advantage with static soaking in fell mongeries.

Ice is relatively cheap compared to salt. Biocides can be quite expensivethe price per skin or hide is slightly lower for biocide ice than that of salting. Further savings can be made because no additional biocide isrequired in the soak. Use of biocide ice may extend the duration of short term preservation to one week or greater, depending on ambient conditions. It also has the additional advantage of ensuring the optimum distribution of biocides during soaking. By eliminating the need for additional biocide in the soak it would becost effective to use biocide ice throughout the year.

Tanning

It is generally assumed that around 80 per cent of the leather produced in the world is processed in its main tannage with basic chromium sulphate. There are, however, perceived dangers from chrome and regulatory authorities impose strict limits on the quantities which may be discharged in the tannery effluent. There are also calls from some users, the German automobile manufacturers amongthem, for a no-chrome leather to obviate the problem of recycling a chrome tanned leather. These pressures to get rid of chrome in tanning and the effluent have led to considerable effort to find a replacement to chrome but so far withoutsuccess. None offers the production flexibility or product versatilityof chrome. In fact, the stage has now been reached whereby the industry is coming round to accepting and adopting chrome tanning processes which achieve high fixation and discharge virtually no chrome into the effluent. It is possible, for example, to obtain a wet-blue leather containing four per cent chromium oxide whilst obtaining an exhaust liquor with less than 0.5g per litre.

Such systems, if operated correctly, fix the chrome uniformly throughout the leather and the better examples also fit into standard procedures used in tanneries, so that no major changes are required in working procedures.

Another approach to overcoming the problem is that of using a low chrome tannage to produce a suitable intermediary for further processing into vegetable, full chrome or syntan retanned leathers. Although this product will not withstand the boil test (it shrinks), it is capable of long term storage, with the application of fungicides and can be shaved. Certain markets in the so-called developing areas of the world, are now employing this technique as it also leads to improved selection by producing afiner grain pattern.

A secondary benefit of the low chrome approach to tanning is that the waste materials from shaving and trimmirgs contain less than 0.5 per cent chrome and so are safer for disposal.

By its very nature, chrome tanned is considered rather 'empty' and the use of less chrome in tanning could conceivably worsen this situation. This could make it even more necessary to perform a retannage with vegetable and/or synthetic retanning agents and resins. Vegetable tanning extract manufacturers have appreciated this requirement and in recent years a number of vegetabletanning extracts formulated for the retannage of chrome leather haveappeared on the market.

For example, a specially modified quebracho extract for chrome retannage has been followed by another which can be used as a tanning or retanning agent having simultaneous dyeing properties in a range of colours. The mimosa extract industry has also introduced modified extracts for the retannage ofchrome leather and another in which alumium is com lexed with the natural tannins.

Chestnut extracts which have been specially prepared for ultra-rapid tannages are now available and presumably would be useful in chrome retannage.

IMPACT OF USE OF VEGETABLE OR CHROME TANNING AGENTS UPON ENVIRONMENT

	Vegetable tanning materials	Chromium
Geographical source	Worldwide	Restricted
Type of resource	Renewable	Finite
Raw material collection	Harvesting	Mining

Energy requirements for production	Low	High
Manufacture pollution level	Very low	High
Tanning process pollution	Low	High
Waste leather disposal	Simple	Difficult

Finishing - in all probability leather finish technology based on solvent-borne systems will disappear in the future. That day has not yet arrived but it is coming increasingly closer spurred on by ever more stringent environmental protection legislation being enacted in Europe, North America, Scandinavia and elsewhere.

While different countries have different priorities, different limits and are at different stages along the implementation road, the net effect is that solvent emissions to atmosphere are no longer acceptable in many countries and are severely restricted in others. This situation does not yet apply generally to developing countries around the world but higher priority on worker welfare and global concerns on pollution suggest that solvent systems will eventually be phased out everywhere.

This situation has stimulated the development of water-based alternatives to solvent-based finishes which have been mainly the top coat laquers. Emulsions of acrylic or polyurethane resins can give comparable wet and dry rubfastness and, because they are anionic, they are compatible with most aqueous auxiliary products used to modify gloss or feel. Polyurethane dispersions for top coats usually contain small quantitities of solvent to assist the flow-out properties of the film.

Methods of application are changing too. Conventional spray equipment is wasteful. Between 30 per cent and 50 per cent of finish can be lost wheras using a roll coating machine, losses may be as low as five per cent. Exhaustion from spray machines and drying tunnels can be improved by efficient scrubbing.

At one time it looked as though the days of the spray booth were numbered but this is now thought unlikely, at least in the short term. Not only can water-based finishes be sprayed but a new generation of spray guns is coming on the market which cut down appreciably on teh bounce-back which is the root cause of waste and, therefore airborne pollution. The guns work on a high volume/low pressure

principle and transfer efficiency of the sprayed finish has been increased by between 50 and 70 per cent, depending on the skill of the operator. The new system can result in finish savings of over 30 per cent and, additionally, there is not loss of application speed compared with the conventional gun.

It is highly likely that the roll coating system, which is not yet commonly used in the leather industry, will be further developed because it offers environmental benefits. Indeed, there are already finishing systems which do not require any spraying but only application by roll coating.

Roll coating achieves good mechanical action during application and lends itself to accurate control of the finish, resulting in good physical properties. There are currently limitations to roll coating, however, mainly related to handling light, floppy leathers and applying light coats.

Another approach is foam finishing, a technique which fell out of favour some years ago because it contained propellant, but is now being reinstated because environmentally friendly mechanical foam forming techniques can be used. Trials to date have looked promising.

Utiliising tannery wastes

The conventional leathermaking process produces an appreciable volume of waste. From the offcuts of raw hides through offcuts and shavings of part-processed leather and finished leather to sludge from dewatered effluent, there is a rich cocktail of materials and chemicals which need to be disposed of, or extracted for further use.

Simply dumping or landfill have been the traditional approaches for handling this problem but as the environmental implications have become more acute, so industry has responded with less wasteful and harmful ways of disposal. Indeed, much effort has been extended - not yet too successfully - on using the tannery by-products as a starting point for producing useful 'new' materials.

Efficient wastewater treatment technology is already well established to transform polluting effluent into cleaner liquid which meets different authorities limits on COD and BOD levels. Tanneries in the developed world are strictly

controlled in terms of what they can put down the drain and effluent treatment plants, either individual or collective, are the norm. It is a different story in the developing countries, but even here there is so much awareness today of the damage being caused by the unregulated discharge of effluent that one detects change in the offing. Many clusters of tanneries, from Turkey to China, are being moved to purpose-built estates away from residential areas and this development is providing a heaven-sent opportunity to incorporate modern treatment facilities.

The solid and sludge of tannery effluent is a different matter from the liquid one. Recent years have seen increased interest in more effective drying/pressing systems which provide a compact material - easier for handling, more efficient for carting and cheaper for landfill or storage. This compaction technology has been borrowed from other industries but has made a useful contribution to solving some effluent problems.

Some of the potential uses for tannery by-products are given below: Biogas can be recovered by the digestion of sludge, and CTC - the Centre Technique du Cuir in France - actually built a biogas plant at a tannery to assess how the system worked out in practice. 3-t was shown to be a practical proposition with a reasonable payback time, especially important in high energy cost countries and times, but was limited by needing a higher input of raw material than could be reasonably provided by one tannery. Biomethanisation reduces the volume of sludge and improves its stability, thereby yielding a material more acceptable to landfill.

Solid wastes can be a useful source of chemical and protein. For instance, it is possible to recover chromium from chrome leather shavings and waste by enzymatic hydrolysis. Leatherboard can be produced by vegetable tanned shavings and trimmings. It is also possible to use chrome tanned waste although the quality of the leatherboard is not as high. Untanned trimmings have long been a traditional source of gelatine and untanned fleshings a source of glue. Tallow and grease can be obtained from fleshings by rendering. Perhaps the most interesting developments in recent years have been these that have highlighted the possibility of producing protein suitable for animal and fish-feeds from solid wastes. They can be used alone or in combination wit soya and/or synthetic aminos to supplement the deficiencies in collagen.

Flesh splits can be converted into collagen sausage casings. Collagen can be coagulated with natural and synthetic rubber lattices to give low density rubber shoe soling material. Collagen can be incorporated in coating materials, in pharmaceutical applications, as an absorbent material for filtering sulphur dioxide and other air pollutants.

Protein hydrolsates can be applied in the manufacture of cosmetics. They can also revert to the leather industry, being incorporated at the pretanning stage and contributing to the subsequent better uptake of tanning materials.

Typical of the effort which is now going into research of how to better use tannery waste is the example provided by the Wisconsin Department of natural Resources in the USA. They have provided a US$150,000 grant for Piister and Vogel Leather Company and the Milwaukee School of Engineering to investigate ways of reducing and recycling solid waste from tanneries.

The project is to develop and then demonstrate a pilot facility which is expected to virtually eliminate scrap waste from the leathermaking process by separating and marketing its by-products.

The product will remove tricalent chromium from leather shavings and trimmings through an hydrolysis process. Once working, the process will be scaled up to ten times the pilot rate.

Benefits of the project, applicable to the leather industry worldwide, are expected to include the development of a protein-rich commercial fertiliser while recovering and reusing the trivalent chromium. Production technology, marketability economics and environmental impact are all facets of the one-year project.

It has to be said that virtually all efforts to gain benefit from tannery by-products, principally sludge have usually foundered because the economics have been right. Sometimes the cost of producing the 'new' material has been too high: sometimes the availability of raw material has been insufficient to make the process economical. There is little doubt, however, that the equation of economics and priority is changing, giving a new impetus to this vital work to more

efficiently use the earth's resources and maintain a cleaner planet.

TECHNOLOGICAL TRENDS

Machinery One of the potentially most significant technological developments in the leather industry is the emerging ability to identify a skin or hide with a bar-coded tag which will survive the leathermaking process. It is highly significant because it will, for the first time, enable each individual hide or skin to be traced back to source. At present hides and skins are bought and their quality is largely unknown until after the hair has been removed and various other preliminary operations have been carried out.

With the ability to identify an individual skin, tanners will be able to pay farmers a premium price for high quality and a lower price for poor quality. I.t will be possible to institute systems for encouraging farmers and abattoirs to pay more attention to hide and skin quality. Their current price is to consider the skin as simply a by-product which will attract a commodity price, so generally little effort is expended on measures to safeguard its inherent qualities. Various systems assess skin quality early inthe leathermaking process and feed back to abattoir and farmer have been available for some time. These can work to some degree in the cooperative environment common in Scandinavia. They are not so successful when tanneries are dealing with skins from a variety of sources. The new tagging system which originated in New Zealand, has yet to be perfected to become of universal value but progress indicates that the avenue of approach offers a promising future.

Perhaps partly because of the parlous state of the global leather industry there has been little sign of heavy investment in leathermaking machinery development. Nevertheless, evolutionary developments continue, largely designed to improve prodctivity and consistency in quality.

Thus, there is a strong move towards through-feed processing machines exemplified by a through-feed fleshing machine by CM which can prefleshraw woolled sheepskins, for example, at up to 950 skins an hour. It is claimed to do the work of three conventional fleshing machines while reducing the labourneed from six to two operators.

Another example is provided by Rizzi's continuous shaving machine which has doubled the throughput of a conventional shaver while putting into place another piece of the jig-saw for automated leathermaking. It requires no operator at feed-in, processes leathers on a through-feed basis and connectsdirectly to an automatic stacker.Conventional shaving machines normally involve shaving one half of a hide, removing it from the machine, turning it through 180 degrees and feeding itin again. The process leads to excess labour requirements due to the doublefeed-in operation and considerable dead time for hide removal, 180 degreerotation and final unloading. Furthermore, there is the problem of uneven thickness: the hide is not always completely even when it is shavedin two stages owing to the different means of inserting it in relationto the blade cylinder and chrome roller. A considerable difference inthickness in relation to the rest of the shaved surface may be noted on many hides at the point where the two shaving operations overlap. The new machine overcomes all these problems and since blending the two shaved areas is no longer dependent on operator skill, results are uniformly consistent.

Finvac have announced a new concept in stretching and staking a softening operation whuch employs transport chains covered in nylon plates; these are slightly ridged, travelling above and below the machine's through-feed transport band. Pressure is applied beneath the lower transport chains by means of compressed air hoses. The transport chains diverge to 126 per cent of their initial composite width and thereby stretch the leather as it travels through the machine. Adjustable pressure controls the degree of stretch obtained. Drying is one of the most critical operations in leathermaking and it is generally accepted that the slower and gentler the drying, the softer and better the leather will be. Toggle drying, paste drying and vacuum drying are all established methods now joined by new machine called the Dynasec to be used after initial drying.

A development of the Dynavac machine. the Dynasec consists of a table covered with a non-stick foil heated to a predetermined temperature. The leather will have a moisture content varying from 24 to 35 per cent depending upon the initial method of water removal. After setting the time cycle, the machine hood is lowered and the leather is stretched under vacuum. The upper membrane of the hood is designed to allow the passage of water vapour released from the leather. The machine has an efficient water condensation system and a chiller system is installed to facilitate low temperature drying for delicate leathers.

The Dynasec can eliminate hand slicking - the action of spreading out wet leathers onto a table - normally needed on conventional vacuum dryers. By holding the leather in a stretched position during drying, yield gains of 3 - 10 per cent can be achieved while moisture content in the final leather can be reduced to 14 - 16 per cent. Reck wrinkles are also reduced and one staking operation - used to soften leather by easing the tight fibre structure - may also be obviated.

While the Dynasec can do the work of a conventional vacuum dryer, it is best used for drying prior to finishing where drying cycles are shorter and the 3 - 5 per cent increase in area yield is immediately secured for the finishing process. Increased yield and labour savings can provide a pay-back time of less than ten months. Depending on the drying cycle time, one operator can handle up to four Dynasec machines.

For use right at the end of the leathermaking production line, Mecanicas Pro-Piel have developed a machine to eliminate handling by producing a machine which combines no less than four separate operations. The Modular 2000 electronic measuring machine piles, batches and packages finished leather following the electronic measuring operation.

Leathers are piled automatically after measuring and when the predetermined area content for each package is reached, wrapping paper is positioned over the batch and the batch is moved forward and automatically wrapped in paper. A label is then attached to the package giving the total leather area and the number of leathers in the batch. The machine is adjustable to handle different areas and different substances (thicknesses) of leather.

The above examples of individual machine developments in leathermaking demonstrate that progress towards automated production is continuing. Perhaps the most significant example of progress achieved to date is seen in the precise and automatic control of wet end processing. Most 18 leather - estimated to be around 80 per cent of global production - is still produced in drums. While these can look like a primitive left-over from Victorian engineering, drums are, in fact, a high developed processor in which raw hides and leathers can be subjected to precise conditions of treatment to achieve consistent results. Some of the conditions which can now be controlled in an integrated process operation, include liquor temperature, liquor strength, liquor pH, speed of rotation, direction of

rotation, time of rotation and times and conditions of different operations. Various levels of control are available to enable tanneries to develop from simple water batching systems right through to total automation of wet processing.

The systems are bringing a revolution in leathermaking, not only in the direct contribution towards increasing quality and productivity but also through the generation of management information to help in the general administration of the tannery.

Most installations have been made in the high labour cost countries of the world since it is here that the benefits to be derived through automation have a faster pay-back time. However, quality leather production is no longer confined to the Western world and with cost pressures on preventing waste, environmental protection and the high costs of chemicals and other utilities in the developing world, the impetus to automate is rapidly spreading.

TECHNOLOGICAL TRENDS

Chemical developments

As shown in the ENVIRONMENT section of this report, environmental considerations have been a major influence on technological trends in leathermaking. This has been most noticeable in chemical developments where the objective has been to prevent the production and/or discharge of toxic or harmful solid, liquid and gaseous wastes from tanneries. A bewildering array of soaking assistants, degreasants and bacteriostate are now available which are newly developed with an eye to biodegradability. Some are based on enzymatic activity rather than the effect of simple chemicals or surface active agents.

Most of the polluting substances appearing in tannery liquid wastes arise from the processes designed to prepare the stock for tannage, and it is interesting to note that the new processes have the objective of preventing the presence of pollutants in effluent rather than removing them.

The hair on hides and skins is a rich source of the protein called keratin, the presence of which produce high levels of BOD and COD in effluents. Thus if

hair can be removed and not dissolved during unhairing, BOD and COD levels can be lowered dramatically.

Machinery manufacturers have developed specialised equipment for hair-saving unhairing processes but chemical conditions must be exact. Moving into the area of post-unhairing preparatory treatments, products designed as substitutes for ammonium salts, which are undesirable constituents in effluent, are now widely available. Additionally, a low salt-containing bating agent in liquid medium is also on the market. The appearance of chromium in tannery liquid and solid wastes presents the problem of either reducing or eliminating the quantity of chromium which is used during tanning.

One approach is to use products and processes which are designed to maximise the uptake of chromium by the leather, thus leaving less in the used tanning liquor"s. An alternative approach is to use a pretannage with a chromium/syntan complex which gives a leather containing only 0.5 per cent chromium oxide but which can be split and shaved and then retanned with chromium, vegetable extracts or syntans. It is claimed that the system gives a much better total exhaustion of chromium.

It is noteworthy that the development of the wet-white concept is continuing. Alumium, syntans and aldehydes are used as stabilising agents in the leather for splitting and shaving before tannage with chromium or vegetable extracts alone or in combination with syntans.

Suppliers of vegetable extracts have increased their range of extracts to assist vegetable tanned leathers to improve the cost-effectiveness of their tanning processes. These companies are also paying more attention to chrome tanners to demonstrate the effectiveness of their newer products as a means of producing low chrome leathers.

The array of chemical products for retanning, dyeing and fatliquoring includes newer products which reflect concern for environmental preservation and customer preference for softer, more water resistant shoes and stain resistant garment and upholstery leathers.

In the area of dyeing liquid dyes, which are particularly suitable for computer controlled dyeing, are becoming more common. Metal complex and sulphur dyes are advised to obtain a high degree of fixation to the leather fibre.

The heavy impact that has been made by environmental considerations uponfinishing is demonstrated by the swing towards the use of water-borne systemsin place of those in which organic solvents are used. Coupled with theuse of water-based finishes is the employment of newer methods ofapplications such as roller coating which assist in the reduction ofgaseous emissions.

CAPACITY UTILISATION AND EXPANSION PLANS

The global recession of the last few years has ensured that the leather industry has generally worked at well below capacity and has shelved any expansion plans it may have previously planned.

There are exceptions, of course. The meat packers in the USA, who are a major source of wet-blue (part processed leather) continue to develop their ability to process the hides they obtain from their abattoirs while US tanners, whose shoe leathers in particular but also upholstery leathers for automobiles, have enjoyed wide popularity, have fared much better than one could reasonably expect in the face of low cost competition. Their success shows the value of not only producing a technically superior leather but also one which meets the whimsical and fickle fashion mood of the moment. European tanners appear to have fared less well with much spare capacity available in all the major producing countries. Eastern European tanners have faced the most difficult time since the ordered economy of the old Comecon disappeared overnight and converting to a market-led economy has proved extremely difficult. Only those tanneries able to respond effectively to market forces will survive. The general problem is one of lack of capital. Five decades of ordered socialism without much investment in new technology, environmental protection plant, marketing expertise or quick response to fashion seasons have not given East European tanners much of a headstart. Much of East Germany's tanning capacity has already been closed down and if buyers cannot be found for many of the remaining plants, they will suffer the same fate. Joint Ventures are being set up in many Eastern European countries but they have not enjoyed the same explosive growth as seen in Asia.

Taiwan have perhaps had their day and are now facing the same set of problems which beset the West but many others - China, Thailand, Indonesia, India, Pakistan, Malaysia - are still on the way up. Some such as Vietnam are right at the bottom of the hill but there are signs that the country is ready for exploitation and industrialisation.

MANUFACTURING CAPACITY IN DEVELOPING COUNTRIES

While the tanning capacity in the developed countries is gently slipping away, certainly so far as finished leather capacity is concerned, the developing

countries are increasing theirs. Two moves are evident: the heady days of expansion seen in the 1960s no longer exist as the concept of building tanneries to handle local raw material, without regard to all the other factors which go towards successful leathermaking, has proved unworkable. Thus the move now is an upgrading in facilities, sometimes through renovation but also through the wholesale movement of tanneries into new, purpose-built industrial areas. This can bring about quite a startling increase in capacity just by productivity improvement. Secondly, the tanning capacity in developing countries is being extended downstream. Impositions on the export of raw material were followed by impositions on the export of part- processed leather - and this has had the effect of encouraging the production of fully finished leather, sometimes for export but also for the benefit of the domestic leather-using industries. More recently, however, we are seeing a far more open approach to business coming into operation in many developing countries in both Asia and South America. Many restrictions do exist still, of course, but more liberal regimes are helping the flow of materials and machines to where they are needed. Developing countries are being allowed, indeed in some cases encouraged, to import the machines, semi-processed and finished leathers they need to foster the continued development and upgrading of their leather product manufacturing industries. Equally, in many cases, export of raw and semi-processed materials, once banned, is allowed once more. Various forms of joint venture, not necessarily between Eastern and Western companies but often Eastern with Eastern companies, such as Koreans and Indonesians, @d0e become a common feature of many aspects of the leather industry in many parts of the world.

Argentina

The leather and leather products industries rank fourth in Argentina's export league. About 70 per cent of the industry's output is exported. With the implementation of free market economies, import duties have been lowered to the point where raw hides and skins can enter duty-free, semi-processed leather at 10 per cent and leather manufactured goods at a maximum of 22 per cent. In June 1992 the government also lifted the ban on exports of raw hides although an export tax has been imposed.

Argentina has suffered in its exports of crust and finished leathers to Eastern Europe but during 1992 leather export levels were maintained through an

increase in business to East Asia. Exports of leather, mainly in the crust conditions, in 1991 were valued at about US$500 million and exports of shoes and leather products earned about $300 million. Even though there is a 20 per cent tax imposition, Argentinian crust is still being sold to US tanners. Chilean and Uruguayan tanners buy it and Brazil is the market for 20 per cent of Argentina's crust leather exports.

Tanners are expected to reduce their reliance on exports of crust leather in the future. Currently these account for 70 per cent leather exports, the remainder being finished leather. Exports go to over 50 countries. The USA leads the field, followed by Italy, East Asia, the CIS and Brazil. Argentinian raw hides have the best quality in Latin America. Now that export prohibitions are over, countries nearby with large tanning industries are eager to import them despite the 15 per cent export tax. However, there is a problem of availability. The capacity of Argentinian bovine tanneries is 40 per cent greater than the kill of just over 12 million head.

So far tanners have not been tempted to import raw materials in regular quantities but this may change. The leather industry has been investing in new plant and premises to the tune of $700 million. Technology in the leading tanneries is as advanced as in Europe.

Bangladesh

The leather industry is passing through difficult times on account of the world recession. The prices being obtained for exported leather are deemed inadequate which has led to crust leather exports sinking to a new low.

Bangladesh stopped exports of wet-blue leather in June 1990 and now 80 per cent of leather exports are crust and 20 per cent finished. Two tanneries, Appex and H & H Leather Industry are producing finished leather and a new tannery, RIF Leather at Chittagonj is also producing finished leather. For the first time in the country's history a national leather policy has been drawn up by the government. This will be introduced in the 1993/94 fiscal year. The policy focuses on shifting leather production from Hazaribagh to elsewhere, to ease red tape and favour export-import activities.

Bangladesh has insufficient raw material for its leather industry and there is a strong demand for imported raw material. Already cattle hides are being imported from Dubai and after processing to crust are being exported to Italy. Some tanneries are also processing sample quantities of wet-blue.

The vertical integration of leathermaking and leather product manufacturing is beginning to be seen in Bangladesh. It is already a common occurrence in Pakistan, India and many other Asian countries. Leather garment manufacture is currently only on a small scale but there are plans for some tanneries to expand along this path. Appex Tannery has championed the idea of an export-orientated modern shoe industry and their venture, Appex Footwear, has built up to a production level of 1,000 pairs a day in only two years.

Pollution from tannery effluent is a major problem in Bangladesh with some 15,000 cubic metres and five tonnes of sludge discharged every day. Plans to move the industry away from Hazaribagh to a new purpose-built zone would obviously provide the opportunity to solve this problem but the industry is still awaiting the availability of US$150 million which is estimated Ithe move would cost. Meanwhile, financial assistance has been offered by various donor agencies to build an effluent treatment plant at Hazaribagh and action is awaited.

Brazil

Brazil has 596 tanning companies corporately handling 223 million hides per year, an average of 80,000 per day. This is by far the largest contribution in the four Mercosul countries - Brazil, Argentina, Uruguay and Paraguay - which between them process 40 million hides a year, accounting for 20 per cent of world output. Brazil's exports of wet-blue hides have jumped dramatically to 3.5 million from one million. Crust exports have also increased. East Asia has become an important market, particularly Korea, Taiwan, Hong Kong and China. Export business to Indonesia, Thailand and India is currently being developed. Europe remains an important customer, mainly the shoe producing countries of Spain, Portugal and Italy.

The increase in exports to East Asia has compensated for the drop in sales to the USA. Sales to East Asia are expected to top $120 million in 1992 compared with $80 million in 1992. Expectations for leather sales in 1992, according to one

industry leader, were $306 million an increase of 10 per cent on the 1991 figure. This value represents the export of about six million pieces. A definite trend in the last ten years has been the change from fully integrated tanneries to tanneries concentrating on processing from raw to wet-blue and tanneries processing from wet-blue to finish, much of the latter being done on contract to tanneries in the finished goods markets.

In common with many other countries, environmental awareness is increasing in Brazil and tanneries are being increasingly obliged to deal with their effluent in a responsible manner. As an example, tanneries are beginning to group together to share common effluent treatment plants. In Franca, where men's footwear production is centred, three tanneries have moved to new premises on this basis and this has resulted in a threefold increase in the capacity compared with their former plants.

China

China is enjoying a period of economic boom with an enormous increase in both foreign investment and trade. Attracted by cheap labour, cheap land, readily available factories and extensive tax concessions, no less than 42,000 foreign joint ventures, cooperatives and wholly owned enterprises ha4 been approved by the end of 1991. More would have been added to this in 1992. In 1991, China's leather.-based industries became the second largest earners of the 21 industries under the supervision of the central Ministry of Light Industry. Today, leather exports account for approximately US$1.65 billion.

The success of the leather sector has been largely led by the unprecedented growth of the country's footwear industry which is today the largest producer and exporter in the world. By 1990 there were more than 10,000 shoe factories of all sizes in the mainland. The Chinese tanning industry claims a large supply of raw materials at its disposal with which to support the footwear and leather products sectors - up to 20 million cattle hides, 46 million sheep and goatskins and 81 million pigskins. By 1995 the government forecasts that 57 million hides and 65 million pigskins will be tanned in China. By the year 2000 these figures are expected to rise to 65 million and 85 million respectively. Overall, it is estimated that there will be a further 35 per cent increase on 1995 figures by the turn of the century. A survey of the Asian leathergoods industry conducted by

the Asian Sources Media group indicates a high degree of confidence from Hong Kong in the Chinese market.

Ninety per cent of senior executives from 680 companies considered China the best place to invest in the next two years. Their interest, one assumes is somewhat stimulated by the less stringent pollution laws applying there which may be all right for now but which bode ill for the future, particularly with the rush to industralise.

Hong Kong and Taiwanese companies are the largest foreign ivestors in the Chinese leather industry but they are not the only ones. At the end of July 1992 a total of 158 Korean firms were operating 268 projects in China, 30 of which are in the tanning, footwear, garment and leathergoods sectors.

The Chinese leather industry is arguably the most integrated of any in the world with factories within factories manufacturing virtually everything required to produce the finished range of articles. There has been some move away from this approach with the influence of foreign collaborators and partners but the Chinese approach is solidly to follow their traditional path.

India

One country with unbounded optimism in its ability to improve its share of the world's leather industry is India. It has plans to increase its share of the global market for leather products from 3.5 per cent in 1992 to 10/12 per cent by the end of the decade. This will obviously imply an increase in tanning capacity but the established trend of importing good quality part-processed leather is likely to increase as well. During the five months from April to August 1992, exports of leather and leather products from India recorded a 34 per cent increase over the realisations of the same months of the previous year, to reach a level of just over Rs.14 billion. In the view of the Council for Leather Exports, the trend indicated by these figures should provide confidence that the target of Rs.42 billion for the financial year ending March 1993 will be achieved. Against the optimism of the CLE, the figures for the exports of leather shoes to Germany, which is India's largest market for leather and leather products, seem to reveal that the impact of recession might have eventually affected footwear and leather goods exports to that country. Between January and June 1992, Indian shoe exports

to Germany were valued at DM81 millio as against DM106 million for the same months of 1991. Environmental and packaging considerations might also be the reason for this decline. The Indo-German Export Promotion Project authorities have been constantly informing Indian exporters of the set-back which could occur if the stringent norms in respect of the PCP content in Indian leather sector exports were not met. Despite the Indian government having banned the production and sale of PCP within the country, it appears that some consignments of leather bags were rejected by a German buyer because the PCP content was above the permissible limits, and were returned forthwith.

On what appears to be a random projection of improving the Indian share of world trade in leather products from the current level of 3.5 per cent to between 10 and 12 per cent by the year 2000 AD, the CLE has arrived at targeting an annual growth of 30 per cent in respect of footwear exports, and 25 per cent for other products over the ensuing seven years. In the context of present conditions, these could be looked upon as ambitious. Furthermore, the widening of the manufacturing infrastructure to meet such targets will be appreciable, not to mention the considerable emphasis on appropriate marketing techniques which will be called for. In addition, the Indian industry and planners will have to keep a close watch on how some of the competing countries go about aspiring for a larger share of the global trade in these items. According to CLE estimates, by 2000 AD the exports of Indian footwear will require to rise to 400 million pairs, that of leather garments to 30 million pieces and small leather goods to something like 140 million pieces. In addition to fully utilising the abundant supplies of raw hides and skins available in India, an extremely significant quantity of raw material will have to be sourced from around the world. This will be a major exercise, as can be imagined, and will call for careful planning and the adoption of clear-cut strategies. The establishment of joint ventures in the leather manufacturing area in parts of Africa and perhaps even in Europe could fall within the perceptions being entertained. In the kind of scenario which the CLE has envisaged total Indian exports from the leather sector should escalate to a value of US$7 billion by the year 2000 AD.

The Council is in the process of implementing a comprehensive programme aimed at enhancing the export capabilities of the Indian leather industry. This is to include an effective marketing and image building campaign for exports. Such an exercise will be conducted in the USA in 1993 after which it will be the turn

of Western Europe. To facilitate joint manufacturing ventures being set up in India, prospective investors in selected countries are being identified for which professional consultants are being enlisted. Meanwhile, there are plans and aspirations to improve the location and siting of India's tanning capacity. One example is provided by the offer of UNDP to help fund the setting up of an integrated leather complex in Calcutta. The idea is to relocate the existing tanneries in new premises and solve the pollution problems which currently trouble local inhabitants. According to preliminary estimates, the project will cost nearly Rs3 billion and will take at least five years to complete. The complex could spread over one thousand acres housing some 300 tanneries processing around 55,000 pieces of hide and skin every day. It is anticipated that the creation of a new tanning site will provide an opportunity to not only solve pollution problems but also modernise production methods, upgrade quality and encourage more international participation.

INDONESIA

The quantity and value of footwear produced and exported from Indonesia has raced ahead but the country's leather industry has yet to react to the opportunity which this development has produced.

The export of raw hides has practically vanished since the government imposed prohibitive duties on the@ export in the late 1980s. This policy has given Indonesian tanners a captive supply of raw hides and skins but it has not meant that they are plentiful. Indeed, tanners face a shortage. Importation on a sizeable scale has yet to catch on although dealers recognise that the country offers considerable potential.

Indonesian tanners do buy wet-blue and this is mainly for the quality of material rather than for environmental consideration reasons. Although new tanneries must comply with environmental regulations before they open their doors, many older tanneries are hardly scrutinised. Besides, environmental regulations are hardly strict by international standards.

The government has placed a five per cent duty on the export of finished leather and this has gradually reduced the quantity of leather leaving the country. From 1989 to 1990 the value of leather exports dropped 7.4 per cent from US$68.6

million to $63.5 million. Not only is more leather staying in the country - to be subjected to value-added through conversion into products - but more leather is also being manufactured in Indonesia.

There are currently 62 tanneries, primarily producing bovine leathers. The government reports another 14 tanneries are under construction. This would add 14,453 tonnes of additional capacity.

Korea

The Korean leather industry prospered on the back of the success of the footwear and leather garments sectors which rose to great heights in the 1980s but which have since become shadows of their former selves on account of rapidly rising labour costs.

Leather production peaked in 1990 at 1266 million square feet worth more than US$2000 million. It is highly likely that this figure will now decrease under the combined impact of the world recession and the fact that Korean leather product exports no longer enjoy the global markets they once did. A move by Korean leather product manufacturers to move offshore to less expensive locations will contribute to the decline.

Korea's success was built on a small raw material base - annual hide production of 700,000 pieces is equivalent to only 4.6 per cent of the 15 million hides imported into the country in 1991.

Another contributing factor to the Korean leather industry's problems is anti-pollution legislation. This is now more heavily enforced than in the past. So far the government is reported to nave closed down 30 tanneries. An interesting device to control tanneries is to colour code them according to their performance. If a company has a history of offending it is coded red and checked frequently. Lesser offenders are coded yellow and checked on a monthly basis while good performers are coded blue and checked only annually.

The government does offer financial assistance through low interest loans to help companies instal effluent treatment facilities and, in common pressure for

special leather producing sites where state of the art technology can be employed to control pollution through effluent.

Pakistan

Pakistan intends to increase its share of the international market for leather and leather products over the next five years by tripling exports. Mohammad Naseem, speaking as chairman of the Pakistan Tanners Association, has also said that Pakistan's production capacity for tanning leather as well as for leather products manufacturing is likely to increase considerably in the near future. It is likely to increase by some 50 per cent over the next three years on the basis of expansion plans which are planned or currently in hand.

Much of the development is centred in the north of the country on Lahore whose importance in the country's leather industry could well increase. Pakistan's current production capacity is 64,93 million square metres of chrome tanned leather and 19.75 million kg of vegetable tanned leather. The Leather Industry Development Organisation (LIDO) reports that the are currently 449 tanneries in Pakistan located mainly at Karachi, Multan, Kasur Faisalbad, Peschawar, Gujranwala and Sialkot.

There is no doubt that Pakistan has made considerable progress in developing its leather industry over the last decade. The all-leather sector - leather and leather products - exports increased from US$269 million in 1986 to $557 million in 1991, of which half were leather products.

Government policy has made an enormous contribution towards the industry's progress through liberalising rules on equity participation and providing credit facilities. The government has also initiated foreign exchange reforms.

Development of the industry has not been without its problems, however. To take one example, effluent from tanneries at the Korangi industrial area, Karachi, is generally not treated but finds its way to the neighbouring Phitti and Korangi creeks through drainage pipes. Here, according to a recent study, it is seriously harming the fragile coastal ecosystem. The effluent is also seeping through broken drainage pipes and contaminating the sub-soil. The study has recommended halting further expansion of tanning capacity at Korangi, the introduction of an effluent

treatment plant at Korangi as well as a solid waste disposal system and a new drainage system.

Turkey

The leathermaking industry in Turkey is long established and one major cluster of tanneries at Kazlicesme, originally built some 500 years ago on the then outskirts Oi Istanbul, has become isolated within a general industrial and residential area.

Plans for establishing a new industrial area for leathermaking7to which the tanners at Kazlicesme could move, go back to 1981 and are at last coming to fruition.

A new site has been established at Tuzla about 60km from Istanbul. It covers some 6500 million square metres and the area being built on for tanneries is 2200 million square metres. By the time it is finished it will be one of the largest concentrations of leathermaking in the world.

The target for the number of tanneries to be finally established at Tuzla is said to be 220 with raw material inputs ranging between two and ten tonnes a day. When on full production, raw material input requirements will be around 1000 tonnes a day which will require more hides and skins to be imported to supplement domestic production and that already imported from Russia, South America and Pakistan.

At present (February 1993) 60 tanneries have been relocated at Tuzla and many more are in the final stages of construction. The major services, including roads and the general infrastructure)are already in place and in operation and should be completed this summer. The support industries for leather manufacture should be established next year but full completion of the site still some way off.

Other age-old clusters of tanneries are located in a number of other @lac.,Z.5 in Turkey and if the move of leathermaking from Istanbul to Tuzla is successful, it is not unlikely that the exercise will eventually be repeated at other sites. A single effluent treatment plant is situated at Tuzla to treat the

total effluent generated by the tanneries. The capacity of this plant is approximately 38,000 cubic metres and is among the largest tannery effluent treatment plants constructed. The proposed mode of operation is for the waste waters from each tannery to be discharged down three separate channels: one for chromium salts, the second for sulphide containing liquors and the third general washings. This allows for the individual treatment of the effluent components for precipitation of chrome, with the possibility of chrome regeneration. Sulphide liquors can be oxidised and settled for the removal of gross solids, and the more dilute washings can be settled and aerated to remove residual sulphides. Blending is to follow this selective treatment, and the plant is designed for full biological treatment of the settled effluent with the potential to meet high standards for final discharge. At the present the plant is being used for settling only and awaits aeration and biological treatment.