



# SHUI-HUA LEATHER INDUSTRIAL CO. LTD. (Taiwan)

## ABOUT THE COMPANY

**Shui-Hua Leather Industrial Co. Ltd.** is one of the largest and most successful tanneries in Taiwan. It has been supplying fine quality leather since 1975 and Shui-Hua products are used by ‘household name’ manufacturers around the world.

Shui-Hua processes all types of leathers for shoe uppers, handbags, attaché cases and many other consumer goods. Its current plant comprises a 10 acre tannery located in Tainan Hsein, Taiwan, ROC. This employs over 200 workers and has a daily production run of some 2,000 pieces of Texas Steer hide — equivalent to about 9% of Taiwan’s total production.

The company has invested extensively in advanced machinery — its capital investments total some NT\$ 195 million (US\$ 6.25 million). Rigorous quality control based on the ISO 9002 standard, ensures high standards are maintained and contributes to annual sales of more than NT\$ 1 billion (US\$ 32.1 million).

## WHY GP?

### ENVIRONMENTAL IMPROVEMENT

The leather tanning industry in Taiwan is a significant source of pollution. In particular, waste water from the sector can contain strong alkalis, bio-wastes and high concentrations of heavy metals such as chromium. If not treated properly, this poses a significant risk to the environment and human health.

Increased international demand for good environmental performance and steadily tightening effluent standards



mean that the domestic industry must look for ways to reduce its pollution impact. However, about 78% of tanning in Taiwan is done by small or medium-sized enterprises. Such companies are hampered by outmoded technology, financial constraints, land restrictions and other problems and are unwilling to invest in projects related to environmental improvement.

By implementing GP, Shui-Hua aimed to show that good internal management and waste reduction measures can effectively prevent pollution and that such solutions can bring production and economic benefits.

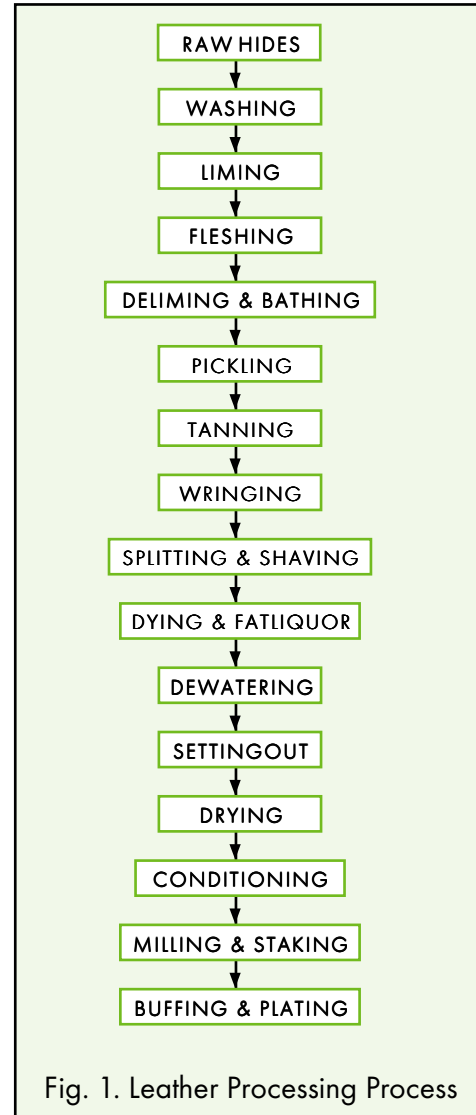
To implement GP, the company used the methodology described in the introductory chapter.

## MAIN PROBLEMS

Shui-Hua's manufacturing process (see Fig. 1) begins with the batch treatment of raw hides by washing, soaking and liming them in a rotating drum. The wetted hides are then treated to remove residual meat from the skin — a process known as 'fleshing'. Defleshed hides are transferred onto a second rotating drum for delimiting and bating, pickling, tanning and wringing. After splitting and shaving, the hides are loaded onto a third rotating drum for dyeing and the fat liquor dewatering process. The finishing stage includes drying, coating, conditioning, milling, buffing and plating. The audit of this process revealed the following key issues:

### WASTE WATER

Shui-Hua generates about 1,000 m<sup>3</sup> of waste water a day. This includes periodic high concentrations from the discharge of batch drums and a continuous effluent stream from cleaning processes.



WASTEWATER	POLLUTION SOURCE
Pre-soaking, Soaking, Liming	First Rotating Drum: The wastewater after the pre-soaking & liming treatment process
Chrome Tan	Second Rotating Drum: The wastewater after the pickling & tanning treatment process
Coloring, Fatliquoring	Third Rotating Drum: The wastewater after the coloring & fatliquoring process
Drying, Coating	In addition to above three sources

The waste water was found to contain spent soaking, tanning and chromic acid solutions and other related acidic/alkaline solutions. It carried high concentrations of COD, suspended solids, salt, sulfide, chromium and color. Furthermore, it contained various toxic substances that inhibit the growth of microorganisms, thus complicating downstream waste water treatment.

To cope with this high load of pollution the company has a waste water treatment facility with a capacity of 1,500 tons/day. However it was clear that there was considerable scope for waste reduction at source and for improvements in water use efficiency.

### SOLID WASTE

It was found that about a third of all raw materials were discarded during the production process and that about nine tons of solid waste was generated per day. This waste stream included waste hair from the soaking and liming treatment, waste flesh and other bio-wastes. 15 tons of sludge per day was also produced by the wastewater treatment process.

## WASTE GAS

It was found that the coating and other finishing operations resulted in the emission of volatile organic compounds (VOCs). Some of these vapors had a relatively high toxicity. Chemical accidents and spills were also highlighted as potential sources of air pollution that could be harmful to human health and the environment. Odour — from the decomposition of organic matter and sulfide emissions from wastewater — was also a problem.

## GP IMPLEMENTATION AND BENEFITS

Experts from Taiwan and Japan reviewed the production process of the Shui-Hua site and developed eight main GP improvement options. These were implemented within the framework of an ISO 14001 environmental management system. This strategy has delivered a number of significant environmental and economic benefits. The improvement options and associated benefits were:



### PROCESS IMPROVEMENT.

The 'hair save' process was introduced. This involved a change in the composition of chemicals used in the soaking and liming processes so that hairs are removed and collected intact rather than dissolved. This has reduced the waste water pollution load and treatment costs and has allowed a higher price to be charged for the finished product. Although it entailed additional chemical and solid waste treatment costs, overall it has given substantial savings of over NT\$ 72 million/year (US\$ 2.3 million). As the improvements cost NT\$ 1.5 million (US\$ 48,150), the saving translates into payback period of just a quarter of a month.

### IMPROVED HOUSEKEEPING

A systematic approach was applied to the improvement of day-to-day operations. This included the implementation of periodic waste audits and improvements in operating procedures and equipment maintenance. For example, good operational management was implemented in the spray and coating operations. This change included keeping the spraying area enclosed, improving equipment maintenance and enhancing ventilation. These measures significantly reduced VOC emissions.

### SEPARATION OF WASTE WATER STREAMS

Waste water was segregated into three different streams: soaking, coloring and fat liquoring waste water; pickling and tanning waste water (containing chrome) and; lime and de-lime waste water (containing sulfate). This allowed specific treatment techniques to be applied to each stream so making overall waste treatment more effective and efficient.

### RECOVERY OF CHROME

After analyzing ways to reduce the amount of chromium in the waste water, it was found that a chrome recovery system was less cost-effective than the alternative high fixation process. The company implemented such a process using techniques such as short float, increased temperature and basification. This reduced the amount of chrome in the wastewater from 3,000-4,000 mg/l to 1,520-2,260 mg/l.





## DESALINATION

A patting machine was installed to shake off the salt from hanging hides. This reduced the sodium chloride content in the waste water and so improved subsequent biological treatment.

## RESOURCE RECOVERY

Every effort was made to retrieve waste materials for re-use. For example: shavings and trimmings were sent to a fertilizer manufacturer and fleshings were sent to a soap plant for the extraction of tallow and grease. This is estimated to have saved about NT\$ 660,000 (US\$ 21,186) a year in disposal costs.

## RATIONALIZATION OF WATER USAGE

Water consumption was rationalized and reduced through the installation of meters and stop valves. Currently the water consumption efficiency of Shui Hua's factory is about 80% of the average figure for Japanese leather tanneries. Potential savings of another 20% are thought possible. This type of improvement could result in savings of about NT\$ 1.55 million (US\$ 50,000).



## CONCLUSION

Due to the small scale of most leather production companies and the significant pollution problems they face, it is vital that any environmental improvements are cost effective. GP implementation in Shui-Hua has demonstrated that this can be the case and that waste minimization linked to good environmental management provides a workable, profitable and effective solution.

The challenge now remains to promulgate these findings to the leather tanning industry at large. This is a problem given the fact that many artisans employed in the industry have gained their skills from experience and generally lack understanding of the concept of industrial safety, environmental protection and waste minimization. However, it is clear that, given escalating environmental awareness and global competition, owners of leather tanning plants will have little choice but to solve their pollution problems or go out of business. As Shui-Hua has shown, GP offers them a way forward.

***"From this experience, I personally believe that implementing Green Productivity methodology is the best way to reduce the environmental burden of an organisation and at the same time improve its productivity."***

**Mr Ching-Tsung Cheng**  
**GP Demonstration**  
**Project Manager**

Video available for this case study from:

### **CHINA PRODUCTIVITY CENTER (CPC)**

2nd Fl., No. 79, Sec. 1, Hsin-Tai-Wu Road  
 Hsichih, Taipei Hsien 221, Taiwan, Republic of China  
 Phone: (886-2) 2698-2989  
 Fax: (886-2) 2698-2976  
 E-mail: 0092@cpc.org.tw  
 Web site: <http://www.cpc.org.tw/english/homepage.htm>