# KWAN KEE ELECTROLY DYEING FACTORY (HongKong)

## ABOUT THE COMPANY

**The Kwan Kee Electroly Dyeing Factory** is located in a multi-story industrial building in the Tsuen Wan industrial area to the south west of Hong Kong's Kowloon peninsula. The factory undertakes anodizing and dyeing of aluminium articles such as apparel accessories and electronic components. It has 13 staff and a production area of about 50 $m^2$.

## WHY GP?

### DEMONSTRATION

Kwan Kee worked with the Hong Kong Productivity Council (HKPC) to implement GP in its factory. By establishing a demonstration site in a small, local establishment, the project partners aimed to motivate other factories to adopt GP as a business strategy to achieve environmental and productivity improvements. It is hoped that the experience gained at the factory can provide a reference and example for other factories that have not yet defined appropriate environmental strategies.

### ENVIRONMENTAL IMPROVEMENT

The majority of the processes carried out in the Kwan Kee factory are 'wet' in nature and produce many different types of wastes such as acidic fumes, acidic waste water, dying wastes etc. If these wastes are not carefully dealt with they can pose health risks to workers and create problems of non-compliance with environmental regulations. It was hoped that GP would provide a cost-effective approach to the avoidance of such environmental problems.

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

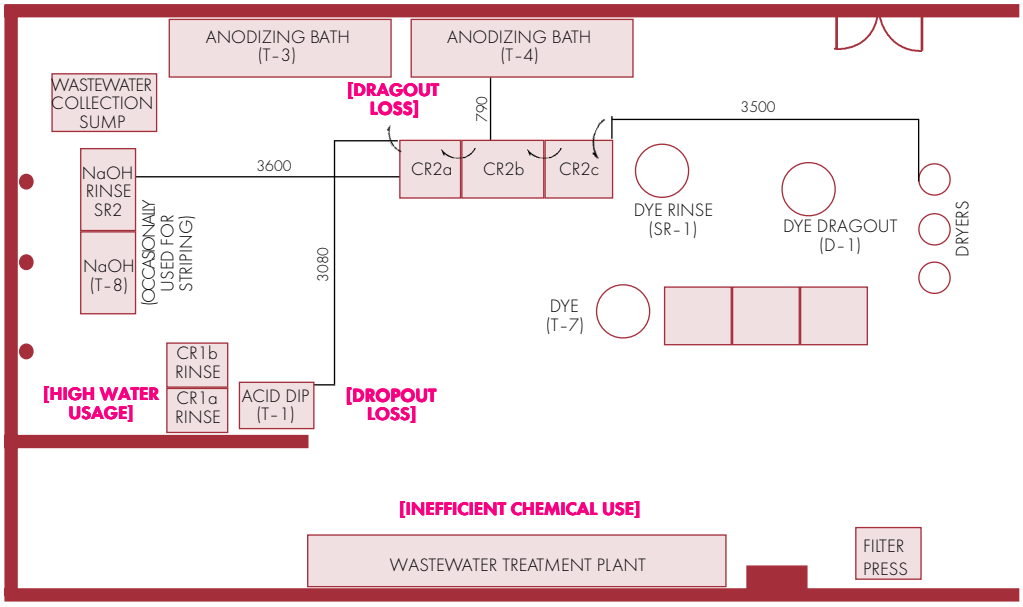
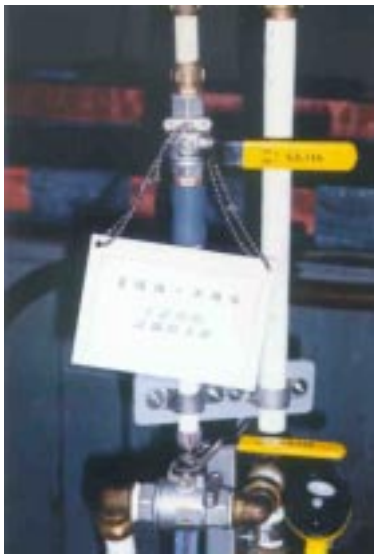



Fig 1: Eco-map of Plant Layout

# MAIN ISSUES



A preliminary review of Kwan Kee's factory showed that the operating sequence consisted of the following main steps:

- Acid dipping
- Anodizing
- Dyeing / Coloring
- Drying
- Packaging

The waste audit — comprising field visits, inspection and sampling and analysis — identified a number of pollution issues at each stage of the production process. In particular, there was excessive drag-out loss of acid chemical solutions as products were treated in the acid dipping and anodizing areas. It was found that 75% of all acid loss occurred in the acid dip area. This was due to insufficient drain time being allowed after the parts had emerged from the tank.

The audit also found that rinse water usage was excessive. This was due to rinses running unattended during idle times in both the acid dip and anodizing areas and to the inappropriate design and poor maintenance of the rinsing tanks. For example the dyeing rinse only used a single-rinse tank which was considered inefficient in terms of water use.

The layout and design of the factory was also found to be non-optimal (see Fig. 1). In particular, the layout of the dyeing / coloring area required excessive movement back-and-forth between tanks. In addition, the floor operations were generally wet posing safety risks to workers.

At the company's pollution control facilities, maintenance was poor and the treatment chemicals were used inefficiently. The results of sample analysis revealed a high aluminium content in the treated effluent. After a detailed investigation it was found that this was due to inadequate flocculation. This resulted in large amounts of solids carrying over in the final discharge to the sewer.

# GP SOLUTIONS

Based on the findings of the waste audit a number of targeted waste reduction measures were identified. Prior to finalization, all measures were discussed thoroughly and agreed with relevant personnel. This was to ensure that the recommendations were both compatible with conditions in the factory and were acceptable to the staff who would implement them. The following key changes were implemented:

## REDUCING CHEMICAL LOSS

To increase production efficiency and reduce the amount of chemicals lost due to product drag-out, stainless steel drain boards were fixed between the acid bath and the rinse tanks in the acid dipping area and drip bars were installed above the anodizing baths (see fig. 2).

## WATER CONSERVATION

Water conservation was achieved by constructing multi-stage counterflow rinsing tanks in both the acid dipping and anodizing areas (see fig. 2). The addition of water to both areas was controlled by installing a flow restrictor and a valve — allowing immediate water cut off in idle periods.

A spray gun mechanism and rinsing tray was installed in the dyeing area so that rinsing after dyeing could be performed. The tray allowed waste water to be collected in a sump.

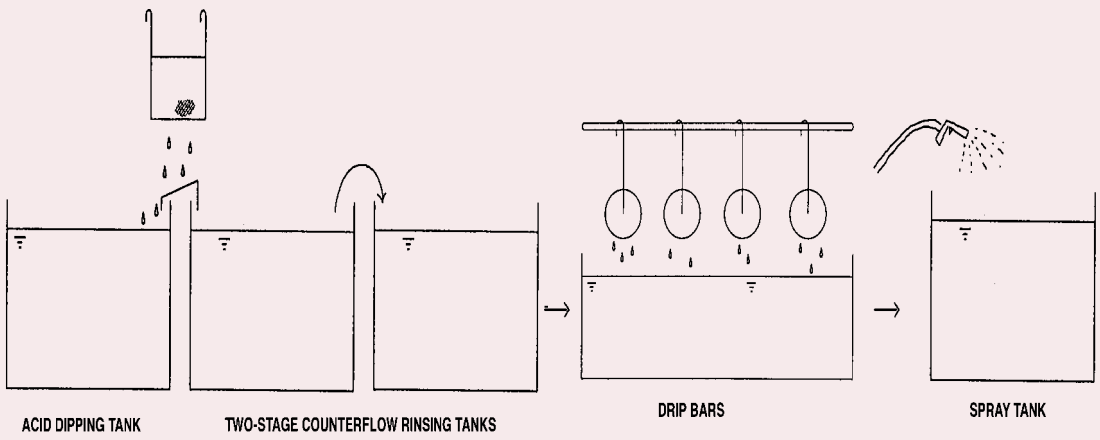



Fig. 2: Water and Chemical Conservation Measures

## POLLUTION REDUCTION

The shop floor was renovated to keep it dry and waste water sources were connected through pumps to a sump. This minimized the safety and health risks to workers. Rearrangement of the process tanks and chemical storage areas also reduced inherent safety hazards.

Operation and maintenance procedures were devised to optimize the operation of the pollution control facility and to conserve chemicals. These included a systematization of the operation of the air scrubbing system and waste water treatment system, along with a rationalization of troubleshooting and maintenance procedures.

# GP IMPLEMENTATION/BENEFITS

The main benefits of the GP program at Kwan Kee's factory were chemical cost savings due to reduced drag-out loss in the acid dipping and anodizing areas, reduced rinsing water consumption and reduced volumetric loading of the waste treatment plant.

## MATERIAL SAVINGS

The following specific benefits were gained:

- Consumption of nitric and sulphuric acid was reduced by 16%.
- Consumption of phosphoric acid was reduced by 17%.
- Consumption of polymer for the treatment plant was reduced by 27%.
- Consumption of caustic soda was reduced by 28%.
- Water consumption was reduced by 15%.

Net annual savings on chemicals was HK$ 40,176 (US$ 5,153) and on water was HK$ 4,217 (US$ 541).

# CONCLUSION

This project showed that optimizing both waste reduction measures and the functioning of pollution control measures can bring economic and productivity benefits to the dyeing sector. It should be noted, however, that the GP options adopted by the factory were only those that were considered as priorities and were in no way comprehensive. To further improve its environmental performance the company is now using on-going reviews and assessments to identify where new improvements can be made.

***"Despite an initial capital outlay, we found that the savings produced by the GP program made the system profitable.***

***We found that we can reduce both costs and pollution and anticipate that we can earn back the investment capital within one to two years."***

**Mr Andy Yau**
**Director**
**Kwan Kee Electroly Dyeing Fty. Ltd.**

Video available for this case study from:

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