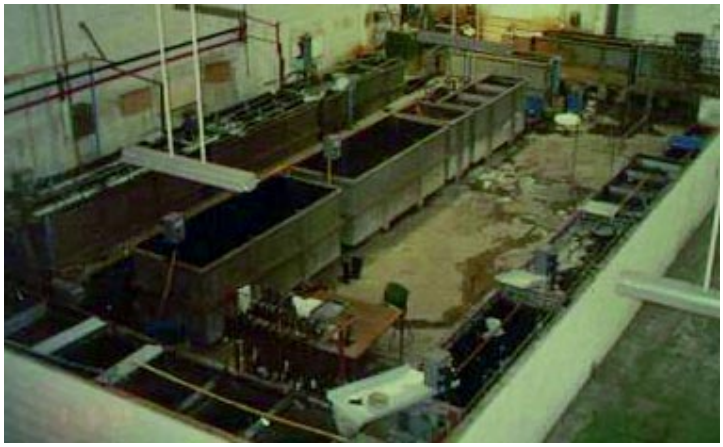
BANGPLEE CHROMIUM CO. LTD. (Thailand)

ABOUT THE COMPANY

Bangplee Chromium Co. Ltd. is a small scale electroplating company located in the Bangplee Industrial Estate, Samuthprakarn, Thailand. The plant employs over 20 full-time workers and handles the complete plating process from preparation to packing.

The company specializes in the plating of two major component types. These are the steel jackets of irons and the inner jackets of rice cookers. Bangplee does not prepare any reagents or chemicals itself, but buys in all necessary raw materials from outside suppliers.



WHY GP?

ENVIRONMENTAL IMPROVEMENT

The electroplating industry is a major contributor to environmental pollution. In particular, untreated waste water from electroplating factories can contain toxic metals such as copper, nickel and chromium which are hazardous to the natural environment and human health. The GP demonstration project in Bangplee aimed to show how such problems can be dealt with effectively in the context of a small / medium-sized enterprise (SME).

COST EFFECTIVENESS

As an SME, Bangplee faces the usual financial constraints of most small-scale companies. These limit the

investments it can make in environmental protection. The GP project was initiated to find solutions which combined cost-effectiveness with production improvements — showing that factory size and turnover need not stand in the way of high environmental standards.

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

MAIN ISSUES

As the main environmental challenge faced by the electroplating industry is waste water quality, the pre-assessment audit looked especially closely at the sections of the production process where rinse waste water is generated. The following was found:

CHEMICAL LOSS

There were substantial losses of process chemicals from both the nickel and chromium plating baths. These chemicals were being transferred to the rinsing tanks and so to the waste water stream. This was due to drag-out when work pieces were moved from tank to tank. It was also found that the solutions in these tanks were not at the optimal concentrations for efficient operation.

Bad housekeeping was resulting in poor and unhealthy work conditions and spillage losses. Such problems were compounded by insufficient training.

WASTE WATER DISCHARGE

Water use and waste water discharge were not measured or recorded. This resulted in excessive water consumption. Material usage was also poorly recorded.

Water in the plating tanks contained considerable amounts of salt and had a conductivity of about 2,000 ms/cm. This resulted in poor plating quality.

INEFFICIENCIES

The existing layout and the production sequence was found to be inefficient. There were large gaps between successive production stages, equipment layout was poor and there were a number of significant time bottlenecks.

Process parameters such as temperature and solution concentrations were not adequately controlled. Process efficiency was checked by visual observations rather than by technical monitoring. These problems resulted in excessive resource use.

The discharge area for nickel rinse and chromium rinse waste waters was not properly maintained. Collection drums were choked and overflowing.

GP SOLUTIONS/IMPLEMENTATION

To deal with waste water problems, the following changes to the nickel and chromium drag-out recovery and rinse tanks were recommended and implemented:

- The nickel drag-out tank was modified to make it more accessible and to reduce the distance work pieces had to move — so reducing drag-out losses and improving chemical recycling.

- The dipping system of the chromium drag-out and rinse tanks was improved and a spray rinsing system implemented to bring performance up to an optimum level — again reducing drag-out losses and allowing more chemicals to be recycled.

Other improvements suggested during the pre-assessment included modifications in the layout and organization of the production process and changes to some of the equipment used. The following key recommendations were among those implemented:

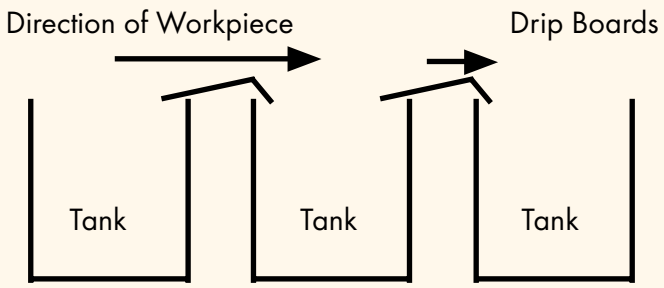


Fig. 1: Drip Boards

- The layout of the plant was improved to make the work-flow pattern more effective.
- Temperature control devices and timer clocks were installed to control immersion times. Lab facilities were set up for sample analysis.
- The configuration of the soak cleansing tanks was improved and the gas heating systems replaced by more efficient and safer electrical devices.
- The sequence of alkaline electro-clean tanks was changed to improve the surface preparation process.
- The acid dip rinse pattern was simplified and dipping time optimized.
- Drip boards were installed at all junction points between tanks to reduce spillage loss (See Fig. 1).
- A reverse osmosis filtration system was installed to produce water that was of almost de-ionized (DI) quality. This was found to be a more economical way to deal with water quality problems than the purchase of de-ionized water from an outside supplier.

The need for end-of-pipe treatment for rinse water from the metal plating lines was also highlighted.

BENEFITS OF GP

MATERIAL SAVINGS

Improvements made to the nickel and chromium plating and rinse tanks increased the amount of chemicals recycled and substantially reduced the amount of chemicals used — as shown in Table 1.

	Materials Saved Kg/day	Equivalent to Kg/day	Unit Cost Baht/Kg (US$/kg)	Total Savings Baht/day (US$/day)
Nickel	1.64	7.85 $NiSO_4 7H_2O$	70 (1.7)	550 (13.5)
Chromium	1.46	1.40CrO_3	80 (1.9)	112 (2.7)
Total	-	-		662 (16.3)

Table 1: Chemical Savings Due to GP Implementation

PRODUCT QUALITY

Improvements made to both the nickel and chromium plating and rinse tanks drastically improved the efficiency of the equipment's operation and gave an improved surface finish to all products.

ECONOMIC SAVINGS

Total savings of 313,030 Baht (US$ 7,738) per year were achieved. These savings were calculated in the following way:

- Savings of 32,580 Baht/year (US$805/year) due to replacement of gas burners with electric heaters.

Expenditure on gas:	5,040 Baht/month
Expenditure on electricity:	2,325 Baht/month
Savings:	2,715 Baht/month
Capital cost of electric heaters:	10,000 Baht
Payback period:	4 months

- Savings of 81,850 Baht/year (US$2,023/year) due to the installation of membrane filtration system for DI water.

Capital Cost:	225,000 Baht
Annual Operating Expenditure:	38,150 Baht
Net Annual Savings:	81,850 Baht
Payback period:	2.7 years

- Savings of 198,600 Baht/year (US$4,909/year) due to material savings.

"I personally gained benefits not only in the field of waste prevention but also in the field of new plating process technique applications.

Once they have observed GP implementation in our process, I think that both the public and plating entrepreneurs will gain more confidence that waste prevention is a viable technique."

Mr. Prayut Chongkol
Owner
Bangplee Chromium

CONCLUSION

GP implementation in Bangplee highlighted a number of problems specific to environmental improvement in small scale factories. These included the challenge of achieving substantial waste reduction gains in a situation where there is a lack of machine and process automation. It also highlighted the particular challenge of improving disorganized and judgment-based process activity.

Through its success, however, the project showed that a systematic audit approach can be modified to suit the requirements and objectives of an SME and that this approach can bring about significant reductions in the amount of materials used in the production process and lost in the waste water stream. By showing that GP can help solve a small-scale electroplating company's key environmental challenges, the project highlighted the importance of this concept to the sector as a whole.

Video available for this case study from:

THAILAND PRODUCTIVITY INSTITUTE (FTPI)
12th - 15th Floor, Yakult Building
1025 Phahonyothin Road, Samsennai
Phayathai, Bangkok 10400, Thailand
Phone: (66-2) 619-5500, 619-8087
Fax: (66-2) 619-8099
E-mail:info@ftpi.or.th
Web site: http://www.ftpi.or.th (Thai language)