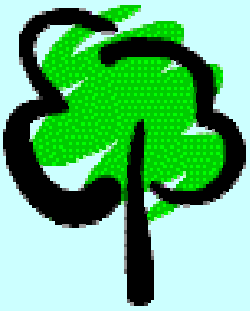
United Nations Environment Programme
Division of Technology, Industry and Economics
UNEP Profiting from Cleaner Production

Strategies and Mechanisms For Promoting Cleaner Production Investments In Developing Countries



Introduction to Capital Budgeting and Financing of Capital Projects

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Exercise Solution

Cleaner Production

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The United Nations Environment Programme
Division of Technology, Industry and Economics
Production and Consumption Branch

`Presents a Training Series

Strategies and Mechanisms for Promoting Cleaner Production in Developing Countries

Introduction to Capital Budgeting and Financing of Capital Projects

Exercise Solution

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* Acme Electroplaters: Case Study and Exercise SOLUTION

I. ANSWERS TO QUESTIONS

Question 1 – Annual Operating Costs for the Existing Rinse Step

Please list any annual operating costs that you think are relevant for the existing static rinse system shown in the figure above. Use the table below to record your answers. Use only the first column of this table to answer Question 1 – the other columns will be used to answer Question 2 later.

Question 2 – Annual Operating Costs for the Proposed New Rinse Step

Compare the proposed new rinse system (Figure 3) to the existing rinse system (Figure 2). If the new rinse system is adopted, how will this impact the annual operating costs for rinsing, which you listed for Question 1? Which annual operating costs might increase? Which might decrease? Which might stay the same?

Can you think of any completely new annual operating costs that might be relevant with the new rinse system?

Of the annual operating costs that would change upon adoption of the proposed new rinse system, which might be the most significant for project profitability?

You can record your answers in the same table used to record your answers to Question 1.

The top half of Table 1 presents the actual operating cost items considered in the Acme electroplating case study. Table 2 presents the actual calculated costs. Note the high costs associated with fresh water consumption and with the discharge of treated wastewater to the municipal sewer. These costs are significantly reduced following the implementation of the cleaner production project involving the installation of a new counter-current rinsing system.

The bottom half of Table 1 presents other costs, some intangibles, that could also play an important role when calculating the profitability of a cleaner production project such as this. It is expected that the costs associated with the purchase of fresh water and the off-site treatment of the wastewater will increase significantly in the future. This situation makes this cleaner production project even more profitable than is presented here.

Table 1 Solutions for case study and exercise

QUESTION 1	QUESTION 2	
In the column below, list any annual operating costs that you think are relevant for the existing static rinse system (see Figure 2 above)	If the new system is adopted, does the cost *increase*? *decrease*? *stay the same*?	Which of these are the most significant for project profitability?
Cost items actually quantified by Acme		
Fresh water consumption	Decrease (new system rinses more efficiently)	**X**
Sewer fees for wastewater discharge	Decrease (reduced water use = reduced wastewater generation)	**X**
Energy consumption	Increase (new rinse water pumping costs)	
Maintenance costs	Increase (pumps, etc. of new system require maintenance)	
Operating labour	Same	
Revenues	Increase (due to fewer product rejects because of improved rinsing)	
Additional cost items not quantified by Acme that might be important		
In-house wastewater treatment costs	Decrease (smaller amount of wastewater would require smaller amount of treatment chemicals)	
Wastewater sludge disposal costs	Decrease (smaller amount of treatment chemicals would produce less treatment sludge)	
Savings resulting from avoided sewer fees in the future	Increase (sewer fees expected to rise significantly in the future, making the new system even more valuable)	**X**
Company image	Improve (reduced water use and discharge improve environmental improvement and image in the community and with regulators and customers)	

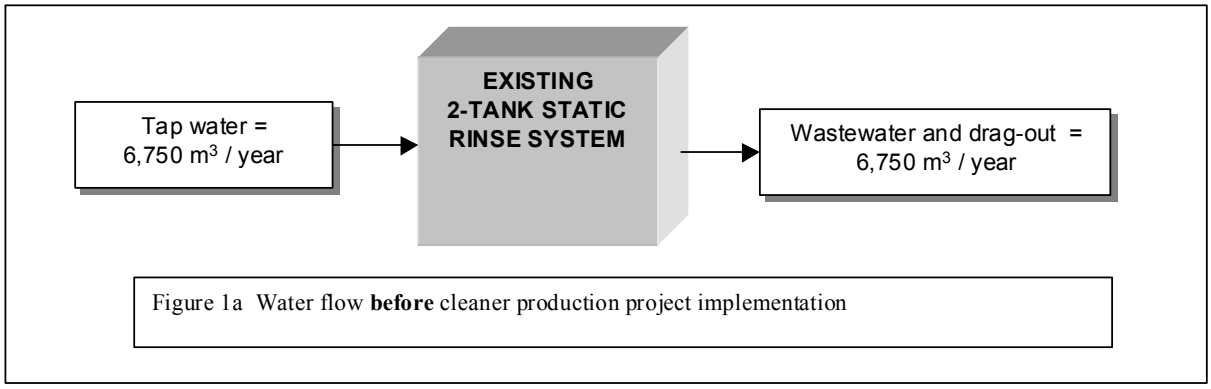

Figure 1a Water flow **before** cleaner production project implementation

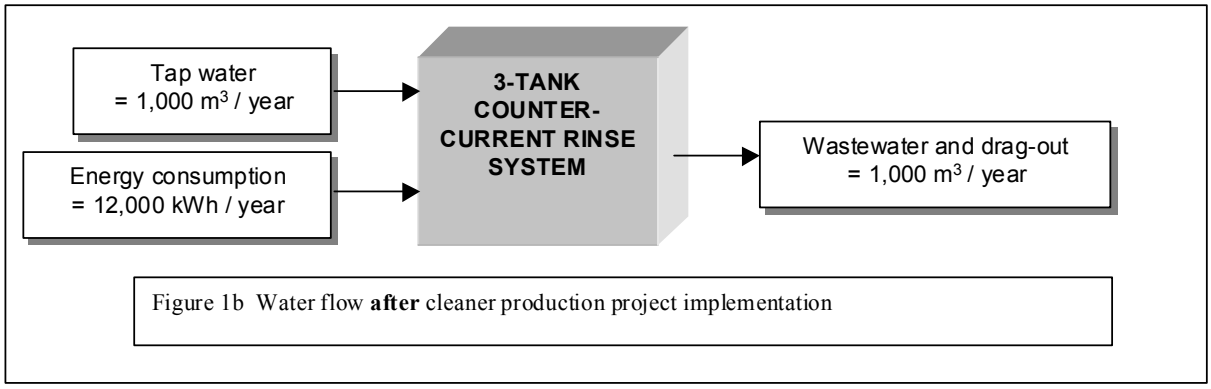

Figure 1b Water flow **after** cleaner production project implementation

Table 2 Annual operating costs before and after project

Before project implementation	**Costs (USD)**
Fresh water consumption 6,750 m^3 / year @ \$0.75/m^3	\$ 5,063
Wastewater treatment 6,750 m^3 / year @ \$0.85/m^3	\$ 5,737
Labour: 8 employees @ \$0.40/hour × 44 hours per week x 52 weeks / year	\$ 7,322
Total annual costs	**\$ 18,122**
After project implementation	**Costs (USD)**
Fresh water consumption 1,000 m^3 / year @ \$ 0.75/m^3	\$ 750
Wastewater treatment 1,000 m^3 / year @ \$0.85/m^3	\$ 850
Energy consumption 12,000 kWh / year @ \$0.05/kWh	\$ 600
Labour: 8 employees @ \$0.40/hr for 44hrs/week x 52 weeks/year	\$ 7,322
Annual maintenance costs	\$ 500
Total annual costs	**\$ 10,022**
Increased annual revenues due to fewer product rejects	**\$1,500**
Annual Cost Saving	**\$ 9,600**

Question 4 – Initial Investment Costs for the Proposed New Rinse System

Assume that Acme is interested in replacing the existing static-rinse system for all of its production lines with the new counter-current rinse system. In addition, assume that only one existing rinse tank from each production line can be adapted for use with the new system. Please list the types of initial investment costs that you would expect to be relevant for this capital project. You may use the table below to record your answers.

Table 3 shows the actual initial investment costs for the Acme project.

Table 3 Initial investment costs of the proposed counter-current rinsing system

Item	Cost (USD)
6 new steel tanks	$ 5,400
Rubber lining of 6 tanks	$ 3,800
Steel pipe, brass water taps	$ 1,000
1 large overhead storage tank, lined, with cork	$ 2,300
Overhead tank construction materials	$ 1,000
4 small pumps, one per production line	$ 2,200
Subtotal:	**$ 15,700**
Installation costs (5%)	$ 800
Contingencies (10%)	$ 1,500
Total initial investment costs:	**$ 18,000**

II. CONCLUSION

The facility in this case study, Acme Electroplaters, represents an actual cleaner production project which was successfully implemented by the company. The costs presented above reflect the actual initial investment costs as well as "before" and "after" operating costs encountered by the facility. At the point in time when the case study was written, this was the first cleaner production project financed and implemented at this facility. It demonstrates the benefits that cleaner production investments can offer a facility in terms of both cost savings and environmental protection.