

THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF ENGINEERING TECHNOLOGY
MASTER OF TECHNOLOGY IN INDUSTRIAL ENGINEERING - LEVEL07
FINAL EXAMINATION - 2005/2006
MEX 7124 - CLEANER PRODUCTION FOR WASTE MANAGEMENT
DATE : 25 April 2006
TIME : 0930 hrs - 1230 hrs
DURATION : Three (03) hours



029

Answer any five (05) questions. All questions carry equal marks.

1.
 - a. What are the advantages of "Cleaner Production" over "End of Pipe Treatment"?
 - b. "There is a need for a Policy on Cleaner Production". Discuss in detail the merits /demerits of the above statement.
2. In cheese manufacturing, milk is coagulated to curd, which is processed further to form cheese. A liquid by-product of this process, whey, must be drained from the curd. The whey can be sold as a food grade additive.

After the whey is drained to form the curd, salt is added to the curd to remove additional whey. Then, the salt whey is drawn off. Because of its salt content, this cannot be used as a food- grade additive.

The salt whey had been land spread on nearby agricultural land, a common practice for cheese facilities that are unable to discharge their high strength wastewater to a publicly-owned treatment facility.

The neighbors have complained to the environmental authority about the pollution of the agricultural land and the authority has informed the company to take necessary actions to stop pollution; if not they will have to stop the factory operation. You are newly recruited by the company to take care of this matter.

- a) Discuss your approach in solving the above issue.
- b) What out comes you expect at the end?

3.

A food processing company decided to install a sophisticated temperature control oven for baking their food items in order to reduce their wastes due to improper baking in the conventional oven. The cost of installing the new system is Rs. 3,000,000/- (3 million).

- a) Calculate the annual saving and payback period using the data given below.

	Raw material input	Waste generation
With the conventional system	15,000 kg/month	1,000 kg/month
With the new system	14,050 kg/month	50kg/month

Cost of manufacturing inputs (Rs/kg)		Cost of waste handling/disposal (Rs/kg)	
Raw materials	50	Labour	2
Energy	3	Water treatment	3
Water	2	Solid waste management	2
Labour	1.5		

- b) After installing the new system what type of changes you expect in the above costs.
- c) If the company considers a simple pay back hurdle rate as 5 years will they consider this project as profitable? Explain.
- d) If the average discount rate is considered as 10% based on the NPV calculations, will it be still profitable by the end of 5 years?

4. Describe in detail the "Evolution Approach" to environmental protection.

5. Write notes on the following:

- Eco Efficiency
- Waste minimization
- Pollution prevention
- Green productivity

6. What is sustainable development? Discuss the role of Cleaner Production in achieving sustainable development.

7.
 - a) "Municipal garbage problem can be solved through the application of Cleaner Production Concept". Give points to support this statement
 - b) Discuss the barriers to cleaner production adoption by industry.

8.
 - a) Briefly describe the parameters which determine the quality of liquid waste.
 - b) Eco-design is a tool used in the product development process. Explain how you can apply this approach to design a specific product.

END.