

INTRODUCTION TO CLEANER PRODUCTION (CP) CONCEPTS AND PRACTICE

CASE STUDIES

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CLEANER PRODUCTION PROJECT IN A TANNERY, AFRICA

Example of technology change

Background

The company is one of the best in the country in terms of technical level and production figures. It is located in a heavy industrial area. There are no complaints from the neighbours concerning the operations of the company. The company employs 200 people.

Main products and markets. The Company buys salted hides from local and foreign (e.g. Brazil, Australia) suppliers, and also processes hides provided by individual customers. The company imports about 25% of wet blue and also exports the same amount. The half of the sales is local.

Production capacity and utilities. The plant processes 15 tones of raw hides daily: 25% of the production is wet-blue and 75% is finished leather. A drum has capacity of 7.5 tones. Tannery works 9 hours per day for 5 days a week (250 days a year). Soaking and Tanning departments have double shifts, which occasionally extend to weekends. The plant discharges about 450 m³/day of wastewater into Municipal sewerage system.

CP Assessment

The Company has major problems with the high chemical oxygen demand (COD) levels in wastewater caused by the use of sulphides in the unhairing process and associated significant pollution fees.

The hair-save unhairing technology is used in many developed countries. The advantage of hair-save unhairing system is the potential reduction of COD load approximately by 25%. The hair-save process adjusts the conditions of alkalinity and the reducing agent in such a way that the hair comes out of its hair follicle not being pulped. As the hair is not being broken, both hair and chemicals are not transferred to wastewater.

A number of investigations on the use of hair in agriculture has been carried out around the world and demonstrated that hair can be used as organic fertilizer. Therefore, the company plans to adopt the hair-save unhairing technology (fig. 1).

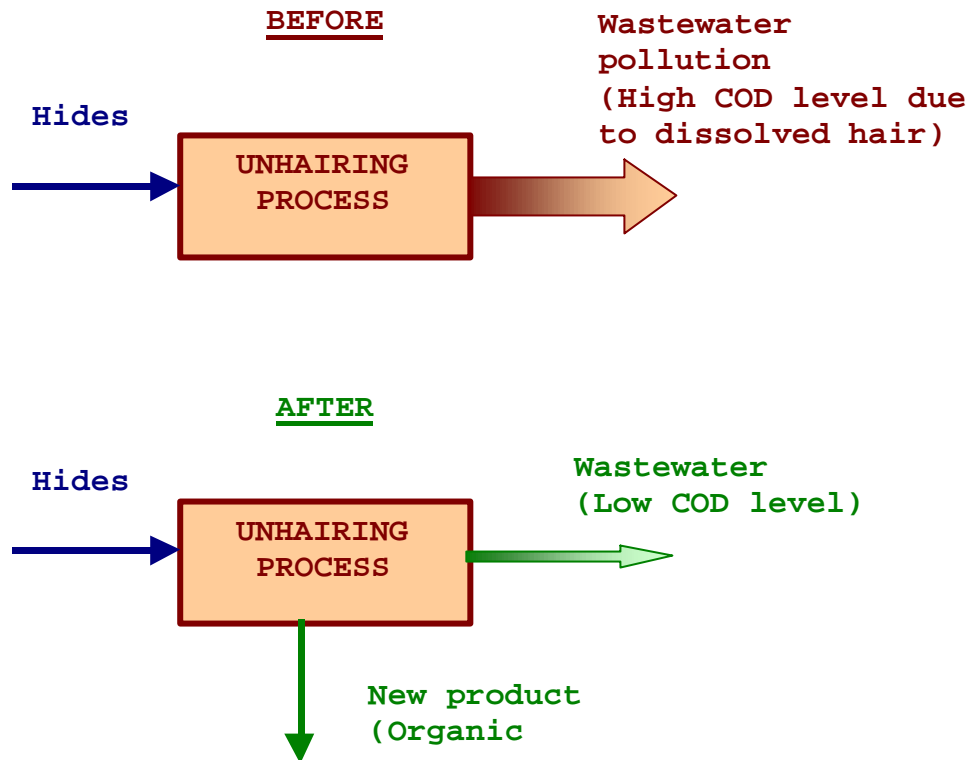


Fig. 1. Example of technology change

Estimated CP project results

Environmental benefits:

COD reduced by 3250 mg/l

Consumption of NaOH reduced by 1.9 t/year

Consumption of sodium sulphhydrate reduced by 22.5 t/year

Consumption of sodium sulphide flakes reduced by 33.8 t/year

Economic savings

Disposal costs reduced by 14 543 USD (disposal costs of saved hair included)

Total project costs 40 670 USD

Pay back period 3.45 years

Internal Rate of Return (IRR) 19 %.

CLEANER PRODUCTION PROJECT IN A FOUNDRY, AFRICA

Example of on-site recycling

Background

This is a small company producing electric motor components and stoker links from iron scrap, iron, steel and additives. The company is located in a heavy industry area and is surrounded by food and chemical industry companies. Number of employees is 100.

Main products and markets. Castings in grey iron to produce electric motor components, stoker links and other products. Approximately 50 % of production is exported. The company mainly produces items ordered by its customers.

Production capacity and utilities. The annual production capacity is 1 700 tonnes, when operating in full capacity. However, annual production of the company in 1998 was only 340 tonnes of castings. The company has designed and built most of the production equipment including the two cold blast cupola furnaces. The company consumes approximately 137 MWh of electricity and 12 448 t of sand per year.

CP Assessment

The iron is melted in two furnaces with two rows of tuyeres through one wind belt. All moulds are made in blocks using alkaline/phenolic sand system.

The sand for the larger blocks is mixed in a wing one screw sand mixer using 50 % of reclaimed sand and 50 % of new sand, and additives. The sand for small flat blocks constitutes of 10% of reclaimed sand and 90 % of new sand.

After shake out, about 30 % of the sand is reclaimed through a crusher and manually loaded with the new sand to the hopper of the screw sand mixer. The rest part of the sand is being stockpiled due to lack of adequate sand reclamation facilities. Therefore, losses associated with unrecycled sand occur. Moreover, the sand contains phenolic resin, which contaminates the soil and the underground water.

The company plans to introduce the sand reclamation processes (Fig. 2). The sand will be taken from the cast moulds, crushed back to sand particles and burned to remove the resin residues. However, attrition tends to reduce the average size of the grain particles over reuse. Too small particles will be removed by the cyclones and approximately 20% of new sand will be added.

The sand reticulation and reclamation process will enable to reclaim approximately 80 % of the used sand. The system will also be extended to reclaim stockpiled sand. Hence, the need for new sand will decrease. The sand reclamation plant would enable to process all sand stockpiled next to the plant. The company may even be able to sell some excess processed sand to neighbouring foundries.

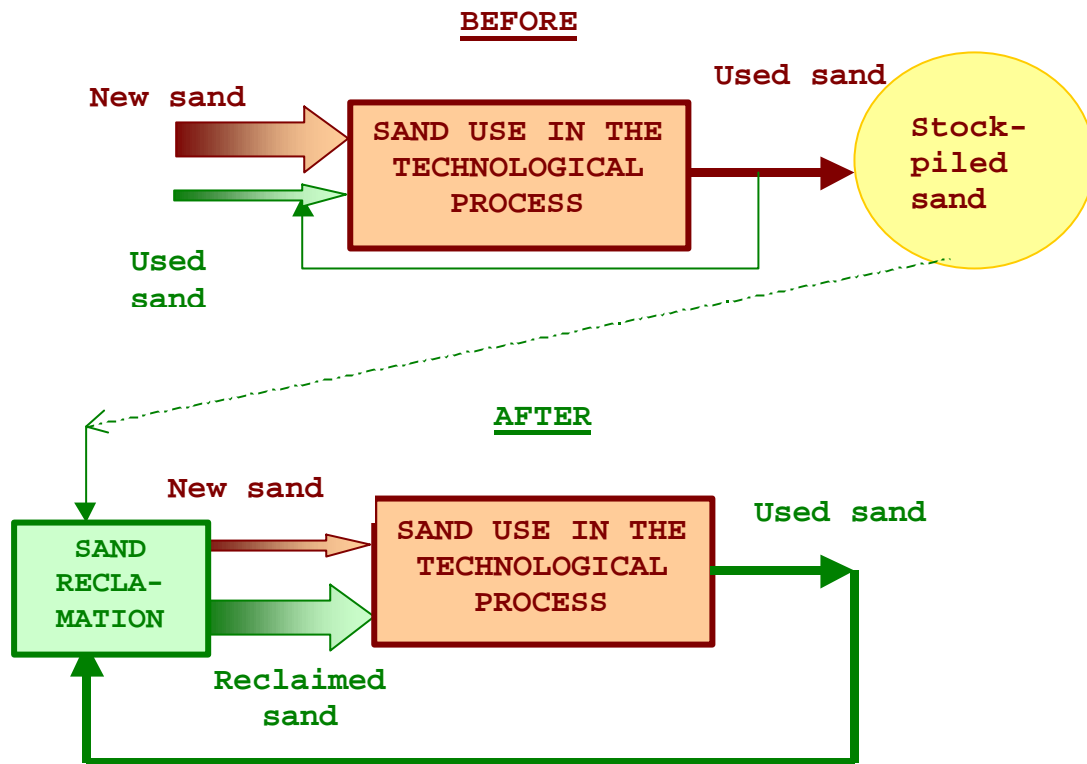


Fig. 2. Example of on-site recycling

Estimated CP project results

Environmental benefit:

Consumption of new sand reduced by 710 t/year
 Consumption of resin binder reduced by 4 t/year
 Consumption of resin hardener reduced by 2 t/year
 Amount of solid waste (sand) reduced by 688 t/year
 Air pollution (dust) reduced by 22 t/year

Economic savings

Labour costs reduced by 5 040 USD/year
 New sand costs reduced by 10 650 USD/year
 Binder and hardener costs reduced by 2 500 USD/year
 Eliminated sand drying process – savings 2 390 USD/year.

<u>Total Project Costs</u>	<u>20 730 USD</u>
<u>Pay back period</u>	<u>1.7 years</u>
<u>Internal Rate of Return (IRR)</u>	<u>34 %.</u>

CLEANER PRODUCTION PROJECT IN ELECTRONICS COMPANY, EASTERN EUROPE

Example of efficient use of energy resources

Background

The company is one of the biggest companies in Lithuania in terms of size and annual turnover. It is located in industrial suburb of one Lithuanian cities. There are no complaints from the neighbours concerning the operations of the company. The company employs 3970 persons.

Main products and markets. The company produces glass components (screens, cones), particularly 14, 20 and 21 inches colour picture tubes. In 1998, a new 21FST model flat screen tube was designed and produced. In response to the customer needs, the company produce a variety of tubes with different parameters. Approximately 84 % of the production is exported to the Western Europe and Asia.

Production capacity and utilities. The company uses about 300 different types of chemicals in the technological processes. Production volume in 1999 was 1474 thousands of TV tubes.

CP Assessment

Currently, substantial amount of thermal energy (0.52 Gcal/h) from organic film baking and funnel and panel sealing furnaces is not being utilised.

The technological process in the phosphor preparation rooms and area of panel coating requires specific microclimate conditions. Currently, microclimate in these areas is maintained by air conditioner KTC – 2A – 125 with capacity of 125 000 m³/h. The air conditioner demands 2.12 Gcal/h of thermal energy for the preheating section and only partially satisfies the requirements for the microclimate.

The utilisation of the wasted thermal energy for the preheating section of the conditioner is impossible without the system reconstruction due to its technical characteristics and status. The system reconstruction would require high investments.

After modernisation of the tube production processes (three technological lines instead of two lines fully satisfy the demand of the production), use of the existing conditioner became economically detrimental.

Therefore, after CP assessment it was decided to install a new conditioner (capacity 80.000 m³/h), which fulfils the microclimate requirements (temperature: +22 ± 2 °C; humidity: 60 ± 2%) for phosphor preparing rooms, panel coating and newly installed frit preparation and frit application rooms.

Installation of the conditioner will enable to use thermal energy (0.52 Gcal/h) from organic film baking and funnel and panel sealing furnaces for preheating section of the conditioner. Utilisation of the thermal energy will be performed with glycol heat exchanger (fig. 3.).

CLEANER PRODUCTION PROJECT IN A CONSTRUCTION MATERIALS PRODUCTION COMPANY, EASTERN EUROPE

Example of input substitution

Background

This is middle size company situated in industrial area, which employs 150 persons.. There are no complaints from the neighbours concerning the operations of the company.

Main products and markets. The company produces reinforced concrete, concrete and building constructions. All production is sold in domestic market.

Production capacity and utilities. Production capacity – 12 000 m³ of reinforced concrete and concrete. Company's production line is equipped with 16 powerful cranes and other stationary equipment. The company has its own pit of raw materials with stationery equipment. The territory of the pit is 48.9 ha.

CP Assessment

After analysis of the problems, it was discovered that the forming shop is currently one of "hottest points". In the forming shop, reinforced concrete products are formed in the metal forms. To prevent product sticking with the form, metal forms are lubricated with the oil products. After forming, the forms are placed into evaporation chambers. Part of the oil products stay on the shop floor and bigger part from the evaporation chamber with the condensate pollutes the wastewater. Additionally, the reinforced concrete products are stored in the open area. The rain washes the residues of oil from the products and pollutes the territory and storm water. Therefore, it was decided to change lubricating oil products into new more effective lubricant REBAtren, to install injectors for lubrication and filter EuroPek for segregating oil from water. Cleaned oil will be recycled in technological processes (Fig.4).

The new lubricant REBAtren has much better lubricating parameters and is less harmful to the environment than oil products used previously. Additionally, the required input of REBAtren is 10 times less. This change will help to reduce total oil consumption and emissions to the wastewater by 16,2 t/year. It will reduce wastewater pollution with the oil products by 90 %. Moreover, work conditions will be improved.

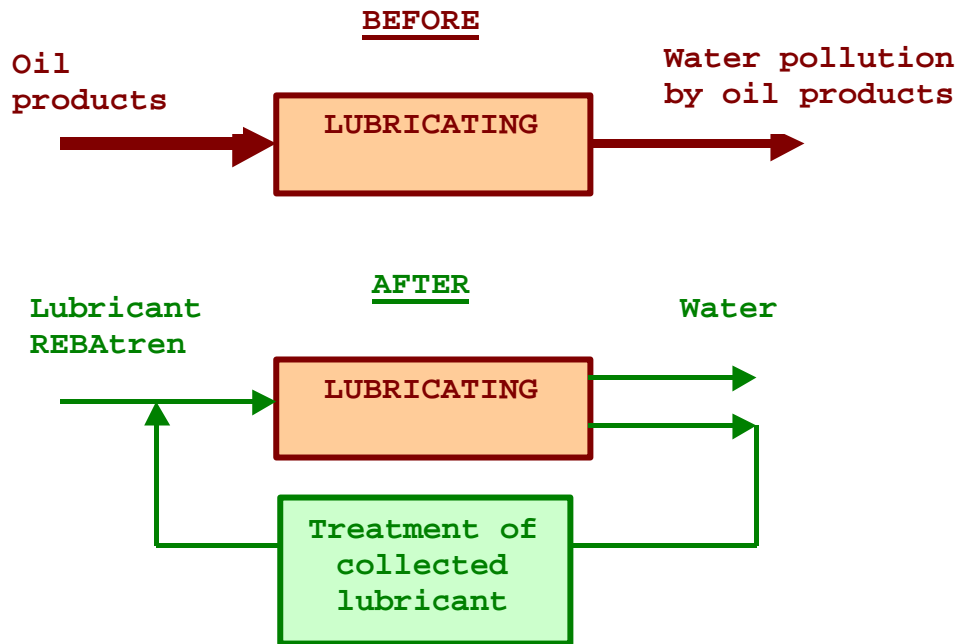


Fig. 4. Example of input substitution

Estimated CP project results

Environmental benefits:

Decrease of oil consumption	16.2 t/year;
Decrease of water pollution by oil products	90 % (till 5mg/l)

Economic savings

Environmental fees reduced by	1 900 USD/year
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<u>Total Project Costs</u>	<u>11 175 USD</u>
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<u>Pay back period</u>	<u>1.7 years</u>
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<u>Internal Rate of Return (IRR)</u>	<u>51.4 %.</u>
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