Resource Efficient & Cleaner Production Experiences

Gujarat Cleaner Production Centre
Established by Industries & Mines Department
(Government of Gujarat)

Ministry of Environment, Forest & Climate Change
(Government of India)

Forests and Environment Department
(Government of Gujarat)

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Foreword

Gujarat Cleaner Production Centre (GCPC) is a regular member of Global Resource Efficient and Cleaner Production Network (RECPnet) at UNIDO and UNEP, is continuously committing to achieve sustainable development in the State of Gujarat. GCPC is contributing sustainable industrial development promoting RECP concept, tools, methodology, policies and practices across various sectors by conducting CP orientation programmes, awareness programmes, CP assessment projects and dissemination programmes through its knowledge, experience and expertise.

Along with this cleaner production/cleaner technology concept, the center is working on providing the solution regarding the financial barriers that industries faces while implementing cleaner production/cleaner technology.

GCPC has compiled success stories of resource efficient and cleaner production (RECP) implemented by various RECPnet members across the globe, with the objective to replicate and disseminate the technologies adopted in different countries. This publication may be useful to the industries of India as reference material for RECP implementation in their industries and will also help industries to move towards "Pollution Prevention" rather than its control at the "End-of-Pipe", which ultimately helps them to improve environmental and economical performance.

Hope this will be useful to all the concern. Feedback and Comments are invited.

Dr. Bharat Jain
Member Secretary
Gujarat Cleaner Production Centre

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The efficient and environmentally sound use of materials, energy and water - coupled with the minimization of waste and emissions - makes good business sense. Resource Efficient and Cleaner Production (RECP) is a way to achieve this in a holistic and systematic manner. RECP covers the application of preventive management strategies that increase the productive use of natural resources, minimize generation of waste and emissions, and foster safe and responsible production. Benefits are eminent in many enterprises, regardless of sector, location or size, as demonstrated by the experiences of Jinchuan Fengxing Chemical Co., Ltd. in China.

Achievements at a Glance

Resource Efficient and Cleaner Production (RECP) implemented at Jinchuan Fengxing Chemical Co., Ltd. led to annual savings and increasing benefits of around RMB 19,530,980 (USD 3,130,816) compared with the traditional production process, , by investing RMB 100,000,000 (USD 16,130,000). The company also got a fund of RMB 10,000,000 (USD 1,613,000) from the local government.

Compared with the traditional production process, the company has significant reduction in acid use by more than 83%, water use by more than 90%. Thus they reduce 90% waste-water. The waste-water can be treated to meet the national discharge standard using a common wastewater treatment technology. Moreover, the company not only produces diosgein products, but also gains starch products after implementation of RECP measures.

Now, Jinchuan Fengxing Chemical Co., Ltd. becomes the biggest and advanced diosgenin producer in the world with 450 workers, which takes up about 20% of the total world market.

Note: new equipment installed at the plant

Overview

Jinchuan Fengxing Chemical Co., Ltd, managed by a male entrepreneur, was ever a small scale private family owned enterprise with an annual production capacity of 300 tons of diosgenin, and had about 100 workers in 2012. After the implementation of RECP measures, it becomes the biggest and the most advanced diosgenin producer in the world with 450 workers.

The main target of the RECP programme implemented at Jinchuan Fengxing Chemical Co., Ltd. was to achieve the reduction of acid consumption, waste-water generation and COD generation.

The implementation of RECP options allows the company to decrease waste of resources, and treat waste-water to meet the national discharge standard using a common waste-water treatment technology.

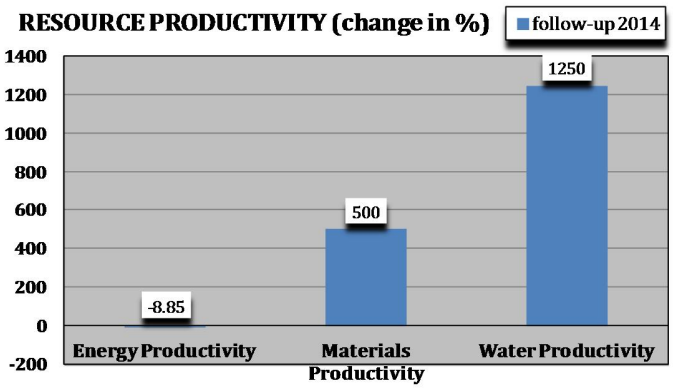
Benefits

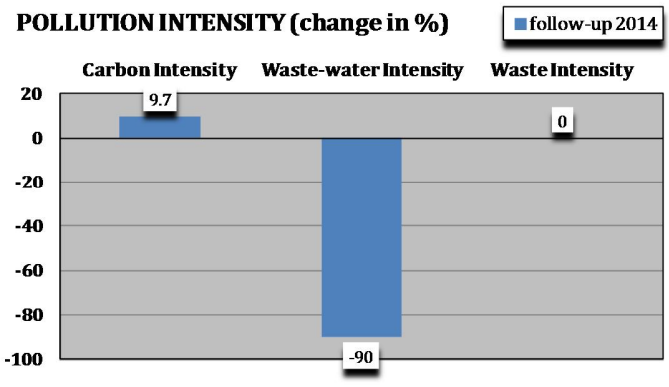
The RECP programme was mainly focused on reducing waste-water generation, acid and COD in waste-water through improving the production process. These technique advances including separation and refinement of starch, reuse of acid and mechanical washing of acid hydrolysate. RECP not only enabled Jinchuan Fengxing Chemical Co., Ltd. to achieve savings from the decreased use of energy and resources, but also made it possible for the company to decrease their pollution and to act in a more responsible way. On the other hand, another product, starch was obtained after the RECP programme, making the economic benefit increase greatly.

Absolute Indicator	Change (%) Year 1	Relative Indicator	Change (%) Year 1
Resource Use		Resource Productivity	
Energy Use	9.7	Energy Productivity	-8.85
Materials Use	-83.33	Materials Productivity	500
Water Use	-92.59	Water Productivity	1250
Pollution Generated		Pollution Intensity	
Air emissions (global warming, CO_2 equivalent)	9.7	Carbon Intensity	9.7
Waste-water	-90	Waste-water Intensity	-90
Waste	N/A	Waste Intensity	N/A
Production Output	700 t/a diosgenin, 8400 t/a starch		

Note: The *absolute indicators* provide a measurement of how much resource use/pollution output has changed in absolute terms e.g. units of energy used or tons of waste generated. A negative percentage indicates a decrease and a positive percentage indicates an increase. The *relative indicators* provide a measurement of changes in resource use/pollution in relation to production output. *Resource productivity* provides a measurement of how much product output can be produced per unit of resource use, from a sustainability perspective, productivity should increase. *Pollution intensity* provides a measurement of how much pollution is generated per unit of production output, from a sustainability perspective, intensity should decrease.

RECP Profile





Note: The RECP profile provides a visual overview of resource productivity and pollution intensity shown as change in % compared to the baseline values. Environmental performance is improved when resource productivity increases and when pollution intensity decreases.

Resource Efficient and Cleaner Production (RECP)

Resource Efficient and Cleaner Production (RECP) entails the continuous application of preventive environmental strategies to processes, products and services to increase efficiency and reduce risks to humans and the environment.

RECP addresses three sustainability dimensions individually and synergistically:
- *Production efficiency*
  > Through improved productive use of natural resources by enterprises

- *Environmental management*
  > Through minimization of the impact on nature by enterprises

Human development
> Through reduction of risks to people and communities from enterprises and supporting their development

Success Areas

The results were achieved through the implementation of the following measures:
- Reducing the generation of COD by separating starch prior to acid hydrolysis.
- Gaining starch products by separating and refining starch.
- Decreasing the use of acid by reusing acid.
- Reducing the use of water by applying multiple countercurrent washing steps.
- Realizing automated management.
- Improving production processes with the purpose of reducing losses.

TABLE 2: OPTIONS IMPLEMENTED

Principal Options Implemented	Benefits			
	Economic		Resource Use	Pollution generated
	Investment [USD]	Cost Saving [USD/yr]	Reductions in energy use, water use and/or materials use (per annum)	Reductions in waste water, air emissions and/or waste generation (per annum)
Separation and refinement of starch 1. Reducing the generation of COD 2. Gaining starch products	645,200	2,032,380	N/A	14,700 tons of COD reduced
Concentration and reuse of acid 1. Reducing the consumption of acid 2. Reducing the residue acid in waste water	483,900	1,016,190	Reduction of acid consumption by 10,500 tons	10500 tons of acid in waste water reduced
Multiple countercurrent washing steps 1. Reducing the use of water	1,613,000	4,113,150	Reduction of water consumption by 2,520,000 m^3	2,520,000 m^3 waste water reduced

Approach taken

In China, the major producers of diosgenin are small-scale enterprises and discharge a great deal of wastewater. The waste-water with high acidity and high content of organic pollutants is difficult for treatment, and the treating cost is quite high. Therefore, the Discharge Standard of Water Pollutants for Sapogenin Industry (GB 20425-2006) is hardly met. It is worth noting that the diosgenin production distributes in the water resource of the middle line of the South-to-North Water Transfer Project, one of the largest trans-century projects in China. And the water of this area will go to Beijing. To protect the water resources, Chinese government has shut down the majority of diosgenin production factories.

Jinchuan Fengxing Chemical Co., Ltd. also used the traditional process to produce diosgenin, so it would be closed if not carrying out RECP transformation. In this context, the owner of the company pushed over the traditional production line, and wanted to establish a new CP line. Firstly, China National Cleaner Production Center (CNCPC) helped the company build a new production line with the RECP process (output 200t/a) in 2012. After that, the company saw the benefits of the implementation of RECP. So in 2013, a new RECP production line (output 700t/a) which had a higher RECP level was built with the help of CNCPC. At the same time, the company got the support of funds (supported by the Ministry of Environmental Protection (MEP), National Development and Reform Commission (NDRC), Ministry of Industry and Information Technology (MIIT)) to implement these improvements.

RECP programme has enabled the company to reduce the waste of starch, acid and water, harvest starch product, reduce waste water generation, and reduce acid and COD in waste water. The work at the company illustrates that a backward and heavy-polluting industry can survive to meet the strict environmental requirements and create a better future through a series of technical innovations.

Business case

Although the programme was mainly focused in reduce waste of materials and minimize generation of waste, an indirect positive consequence was also obtained, which has enabled the company to treat waste-water to meet the national discharge standard using a common wastewater treatment technology. RECP not only allows companies to achieve savings from decreased resource use and benefits from by-product, but also decreases pollution to the environment.

Testimony Box
China National Cleaner Production Centre (China NCPC)
The China National Cleaner Production Center (China NCPC) was established in December 1994, by the Ministry of Environmental Protection and today provides not only comprehensive support for CP activities in China, but also technical support for CP training and consulting in the Asia-Pacific region and other neighboring developing countries. In addition, the China NCPC also supports the Ministry of Environmental Protection (MEP), the National Development and Reform Commission (NDRC) and the Ministry of Industry and Information Technology (MIIT) in policy advice and promotion of CP in China.
Contact Details
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English Abstract (where applicable)
N/A

RECP Experiences at Distillery "Agustín Rodríguez Mena"

The efficient and environmentally sound use of materials, energy and water - coupled with the minimization of waste and emissions - makes good business sense. Resource Efficient and Cleaner Production (RECP) is a way to achieve this in a holistic and systematic manner. RECP covers the application of preventive management strategies that increase the productive use of natural resources, minimize generation of waste and emissions, and foster safe and responsible production. Benefits are eminent in many enterprises, regardless of sector, location or size, as demonstrated by the experiences of DISTILLERY "AGUSTÍN RODRÍGUEZ MENA", CUBA.

Achievements at a Glance

Distillery "Agustín Rodríguez Mena" saved around USD 126,244.00 with the implementation of RECP options. In terms of environmental performance in the industry the resource productivity was increased and the pollution intensity was reduced. The best relative indicators were got in year 2010. The percentage of changes was 51 % energy productivity, 6 % materials productivity, 51 % water productivity, -34 % carbon intensity, -70 % waste-water intensity and -62 % waste intensity.

The positive change in energy productivity was, mainly, due to the insulation of equipments and the distribution steam pipes; the installation of an automatic control system for the steam generation and distillation processes and the appropriated use of compressed air. The reduction of the fuel oil and electricity consumption led to the decrease of carbon emissions. The result of material productivity was achieved implementing a management waste procedure. Water productivity is bound up with waste-water intensity. The waste-water generated in the distillation process was characterized and reused in the same process as dilution water and re-reused too to feed the steam generator diminishing the water and also the steam consumption.

Figure 1. Insulated distillation columns

Figure 2. Insulation the steam distribution line

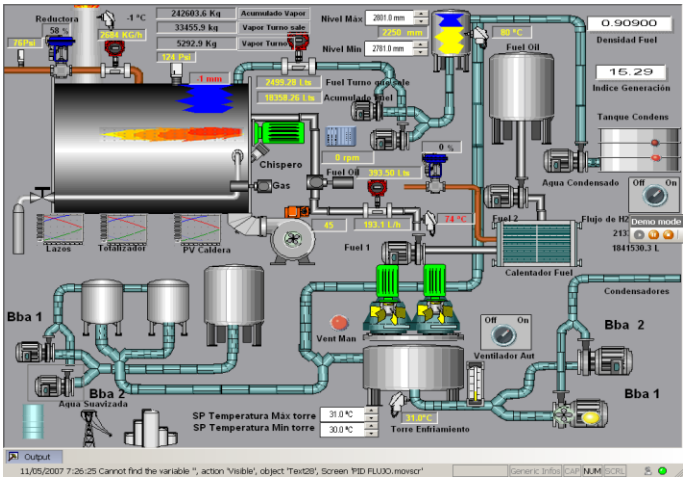

Figure 3. Control system of steam production process

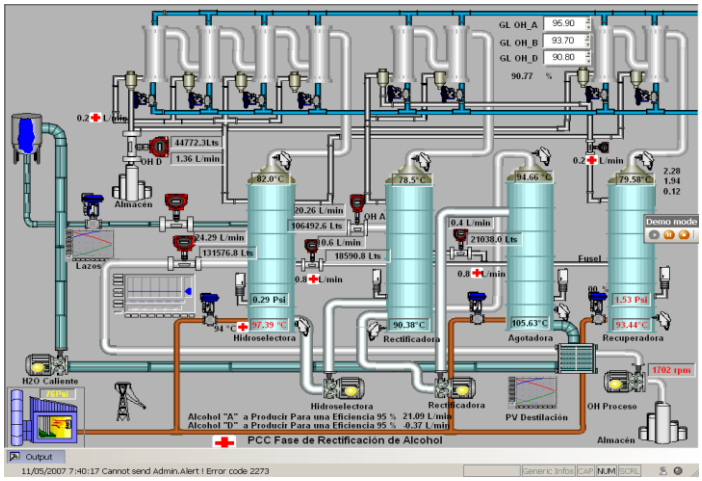

Figure 4. Control system of the distillation process

Figure 5. Control system of steam production process

Figure 6. Technical discussion with the company's manager

Overview

The Distillery "Agustín Rodríguez Mena" located in Villa Clara province, Cuba, is a business unit of the Central Rum Company belongs to the joint venture, Cuba Ron S.A. and it produces a high quality alcohol "A" used as raw material to the elaboration of liquor base for rums with the trade marks Havana Club and Cubay. The unit has 12 workers and annually makes an average of 50,000 hL of alcohol "A". Its strength resides, mainly, in the experience of their employees, their high sense of responsibility with the environment, and the applications of the concept of continuous improvement.

This Distillery is an industry with tradition in the solution of environmental problems that has taken them to obtain several recognitions from the provincial government. They adopt the RECP focus with the intention of reducing the generation of wastewater, to save water and energy resources, looking for to upgrade their environmental acting and competitiveness.

Benefits

The RECP assessment embraced the processes of alcohol refining, production and supply of steam and compressed air and also

the production of soft water by means of ionic exchange with resins of sodium cycle. It was focused on the input and output streams of selected processes.

The industry reached progress in the environmental acting on each one of the evaluated years compared to the baseline. The Table 1, show the changes in per cent get by the distillery in the years 2006, 2007 y 2010 after implementation RECP.

Table 1. Results at a glance.

Absolute Indicator	Change (%) 2006	Change (%) 2007	Change (%) 2010	Relative Indicator	Change (%) 2006	Change (%) 2007	Change (%) 2010
Resource Use				**Resource Productivity**			
Energy Use	-26	-37	-26	Energy Productivity	41	51	51
Materials Use	3	-7	5	Materials Productivity	2	2	6
Water Use	-4	-8	-26	Water Productivity	8	2	51
Pollution Generated				**Pollution Intensity**			
Air Emissions (global warming, CO_2 eq.)	-26	-37	-26	Carbon Intensity	-29	-33	-34
Waste Water	-28	-32	-67	Waste-water Intensity	-31	-29	-70
Waste	-46	-60	-58	Waste Intensity	-48	-58	-62
Product Output	4	-5	11				

Absolute Indicators measure basic data in a given time frame (one year). The absolute production indicator covers the product output created by the industry.

Relative Indicators are a measurement of absolute consumption or emission figures relative to reference data. In terms of environmental performance, productivity and intensity ratios are central relative indicators. A negative percentage indicates a decrease and a positive percentage indicates an increase. *Resource Productivity* provides a measurement of how much product output can be produced per unit of resource use, from a sustainability perspective, productivity should increase. *Pollution Intensity* provides a measurement of how much pollution is generated per unit of production output, from a sustainability perspective, intensity should decrease.

RECP Profile

Changes in the three resource-productivity indicators and the three pollution-intensity indicators are collectively presented in an RECP profile (Figure 7).

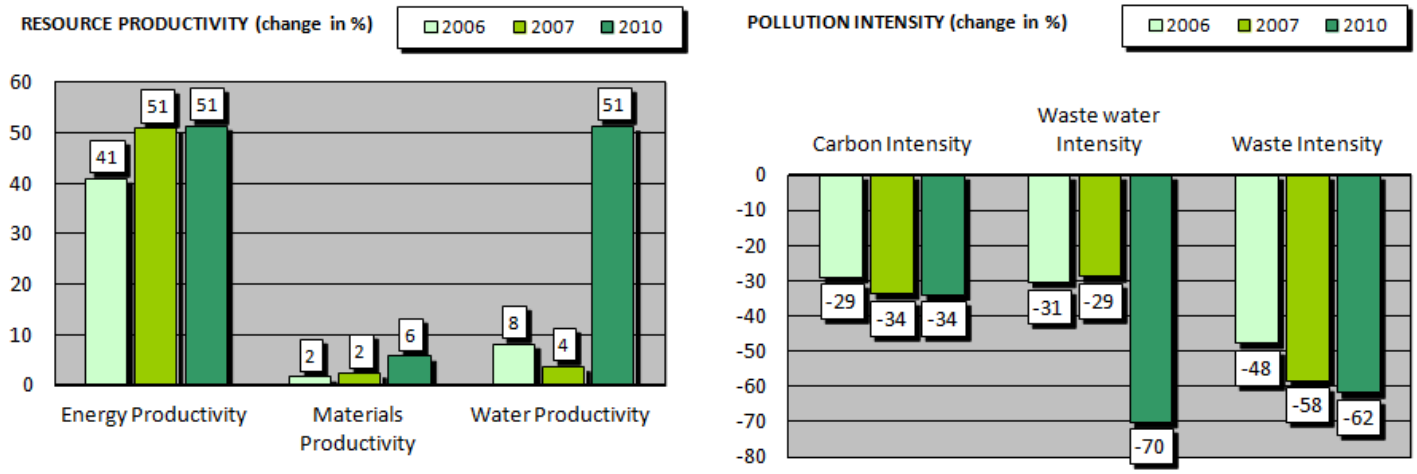

Figure 7. RECP profile for the years 2006, 2007 and 2010.

Resource Efficient and Cleaner Production (RECP)

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Success Areas

Principal Options Implemented	Benefits			
	Economic		Resource Use	Pollution generated
	Investment [USD]	Cost Saving [USD/yr]	Reductions in energy use, water use and/or materials use (per annum)	Reductions in waste water, air emissions and/or waste generation (per annum)
Insulation of the steam distribution line to reduce the energy losses.	2,560	1768	Energy: 409,058 MJ Fuel: 12.6 tons	Carbon emission: 31.8 tons CO_2 eq.
Change the agitation system of the brine solution tank, installing two pipes in cross shape with small orifices in the bottom of the tank reducing the air consumption and improving the homogenization of the brine solution	477	8064	Energy: 322,560 MJ	Carbon emission: 77.32 tons CO_2 eq.
Change of air entrance valve used into the brine solution tank, by a globe valve allowing the appropriate control of the air flow.	12			
Regular monitoring to the preventive maintenance of the compressor	Nil			
Insulation of the heat exchanger and pipes of the alcohol distillation process.	870	961	Energy: 222,472 MJ Fuel: 6.9 tons	Carbon emission: 17.3 tons CO_2 eq.
Installation an automatic control system in the steam generation and distillation processes.	6700	9100	Energy:1 ,280,772 MJ Fuel: 39.5 tons Water: 1238 m^3 Crude alcohol: 542 m^3	Carbon emission: 99.6 tons CO_2 eq.
To reuse the liquid wastes of the distillation columns as feed to the boiler and as dilution water feed to distillation process.	200	6,465	Energy: 4,542,273 MJ Water: 12,403 m^3	Carbon emission: 353 tons CO_2 eq. Waste-water: 12,403 m^3
Reparation and modernization of the distillation columns.	167,307	35,919	Crude alcohol: 275 m^3 Better quality of product Energy: n.a Water: n.a	Carbon emission: n.a.
Elaboration and implementation a waste management procedure.	-	7,478 CUP	-	Waste: 72 kg

Approach taken

A complete RECP assessment was conducted by the Focal Point-IIIA (FP-IIIA), belonging to the National Cleaner Production Network (NCPN) of Cuba, using the cleaner production methodology proposed by UNEP that consists of five stages: (1) Planning and organization, (2) pre-assessment, (3) assessment, (4) feasibility analysis and (5) implementation and continuation. A group of employees were trained in CP and they worked together with the FP-IIIA team in the identification and implementation of improvement opportunities. The distillery after the application of RECP has strengthened collaboration with nearby community. They carry out activities there where give to know their advances in the environmental protection acting; they distribute bulletins with information on good practices to preserve the natural resources to help to elevate the environmental responsibility of the neighbors of the industry.

Business case

The results reached contributed so that the company obtained the recognition of the Cuban Ministry of Food Industry and this experience served as starting point to begin the introduction of RECP in the remaining three industries of Cuba Ron S.A.

Testimony Box
National Cleaner Production Centre (NCPC)
The NCPN of Cuba was established in May 2001, in the framework of the CP Program developed by UNIDO with support of the Austrian Government for 6 years. It operates currently with three Focal Points hosted by the Institute for Research of Sugar Cane Derivates (ICIDCA), the Institute for Research on Food Industry (IIIA) and the Research Institute of Tropical Fruits (IIFT). The NCPN is being coordinated by the representative of UNIDO Focal Point in Cuba. The Network's mission is setting in motion, coordinating and supporting national efforts in applying the RECP concept in the industrial and service sectors, in order to improve their economic and environmental performance, contributing to a higher industrial productivity and competitiveness, while decreasing the emission of pollutants. The NCPN performance is highly recognized in the country, especially by the industry sector and the environmental authorities. Since its creation, the NCPN has developed many activities in the most important sectors in Cuba, contributing to increase the efficiency, productivity and environmental performance.
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Ms. Bárbara Ivette Tortosa Ferrer NCPN coordinator, representative of UNIDO Focal Point in Cuba Calle 18, No. 110, entre 1ra y 3ra, Playa, La Habana, Cuba, CP 11 300 b.tortosaferrer@unido.org; ivetteb77@yahoo.com Contact for this experience: Ms. Yeniseis Pérez Fajardo, IIIA Focal Point coordinator, yeniseis@iiia.edu.cu
English Abstract (where applicable)
N/A

ABOUT *RECP EXPERIENCES*

Through the joint Resource Efficient and Cleaner Production (RECP) Programme, the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Programme (UNEP) cooperate to improve the resource productivity and environmental performance of businesses and other organizations in developing and transition countries. The Programme is implemented in partnership with the Global Network for Resource Efficient and Cleaner Production (RECP*net*). This series of enterprise success stories documents the resource productivity, environmental and other benefits achieved by enterprises in developing and transition countries through the implementation of RECP methods and practices.

These successes were achieved with the assistance of the National Cleaner Production Centres, which are part of RECP*net* established with support of the UNIDO and UNEP. The success stories employ the indicator set described in *Enterprise Level Indicators for Resource Productivity and Pollution Intensity*, UNIDO/UNEP, 2010. The primer with accompanying calculator tool and further case studies are available at www.recpnet.org, as well as on www.unido.org/cp and www.unep.fr/scp/cp.

RECP Experiences at ASFALCA

Resource Efficient and Cleaner Production (RECP) implementation at ASFALCA led to annual savings of USD 13,694, an investment of USD 678,002.00, and improved product quality and a new product line of Cold Asphalt Mixtures with sales the first year of USD 506,752.00. While the initial intent of the company was to address the problem of Chemical Management, the RECP programme enabled the company to also improve their Energy Efficiency and reduce the quantity of GHG emissions generated per unit of production.

ASFALCA has demonstrated that taking care of materials, energy, water, waste and emissions, the enterprises may increase the competitiveness and make good business sense. RECP covers the application of preventive management strategies, which increase the productive use of natural resources, minimize generation of residues, waste and emissions, and foster safe and responsible production. Benefits are eminent in many enterprises, regardless of sector, location or size.

Achievements at a Glance

In a simple glance is possible to see the improvements obtained in ASFALCA on chemical management with the implementation of a new acid storage. Also the management of chemical products has improved as seen in the photographs.

HCl old storage

HCl new storage

Overview

ASFALCA is a company that formulates asphalt mixtures which are used in road construction or their maintenance; however its main products are Cold Asphalt Mix and Asphalt Emulsions. The first product is a combination of stone aggregates of different size or grain with asphalt. The second product Asphalt emulsions are byproducts of the heated asphalt mixture, hot water and emulsifier which are deposited between the bitumen and water and serves to stabilize the emulsion depending on the type required. The company is located in Sonsonate, in the west of the country, and has 41 workers and is able to supply the local market and the exports.

The main target of the RECP programme implemented at INCALSA was the management of its chemical substances and wastes. Although the company increased its production by more than 25%, energy productivity increased by 64%. The options implemented allowed the company significantly to increase its production capacity. Moreover, the implementation of RECP options generated annual savings of USD 13,694, an investment of USD 678,002.00, and improved product quality and a new product line of Cold Asphalt Mixtures with sales the first year of USD 506,752.00.

The company implemented a new processing plant for Cold Asphalt Mixtures; this allowed the improvement of the process and the increase in production, helping to improve the sales of this mixture.

The company also improved the HCl storage conditions with a significant impact on the health and safety of workers as well as a

photovoltaic system which reduced electric energy consumption and emissions.

Benefits

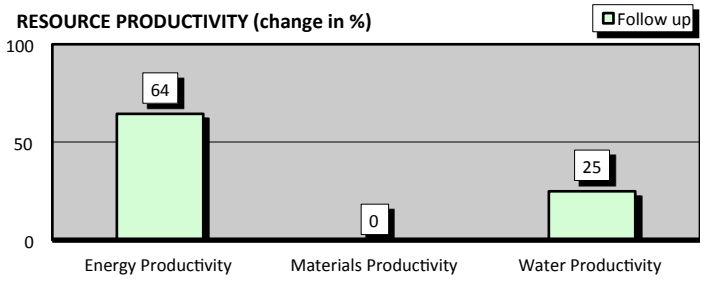
The safety feasibility can be the amount of HCl is to avoid lose or acid waste due to inadequate handling or in case of an accident, which is 1,046 gallons. This measure also reduces the risk of potential accidents that can affect workers; it had an investment of USD 1,725. The economic benefit will be focused on the likelihood of an accident occurring and the entire product that is currently stored improperly which is USD 2,520.

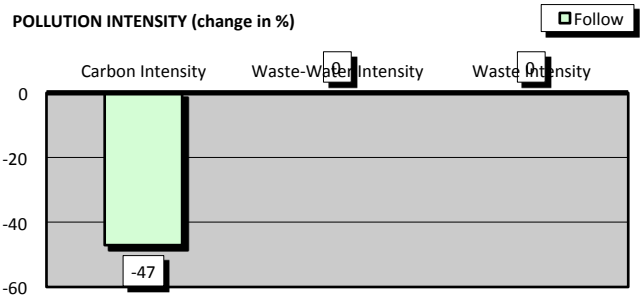
The photovoltaic system produces around 20,000 kWh/ year and is directly used in the company's activities. This represents annual savings of USD 4,062. Also the new asphalt plant for cold mixtures has energy saving around 29,221 kWh per year and 5,102 diesel gallons. This savings represent USD 7,382 and the expected sales are USD 506,800 with a 5% increase per year.

Absolute Indicator	Change (%) Year 1	Relative Indicator	Change (%) Year 1
Resource Use		**Resource Productivity**	
Energy Use	-23.98	Energy Productivity	64.43
Materials Use	N/A	Materials Productivity	N/A
Water Use	N/A	Water Productivity	25
Pollution Generated		**Pollution Intensity**	
Air emissions (global warming, CO_2 equivalent)	-57	Carbon Intensity	-47
Waste-water	N/A	Waste-water Intensity	N/A
Waste	N/A	Waste Intensity	N/A
Production Output	25		

Note: The absolute indicators provide a measurement of how much resource use/pollution output has changed in absolute terms e.g. units of energy used or tons of waste generated. A negative percentage indicates a decrease and a positive percentage indicates an increase. The relative indicators provide a measurement of changes in resource use/pollution in relation to production output. Resource productivity provides a measurement of how much product output can be produced per unit of resource use, from a sustainability perspective, productivity should increase. Pollution intensity provides a measurement of how much pollution is generated per unit of production output, from a sustainability perspective, intensity should decrease.

RECP Profile





Note: The RECP profile provides a visual overview of resource productivity and pollution intensity shown as change in % compared to the baseline values. Environmental performance is improved when resource productivity increases and when pollution intensity decreases.

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Success Areas

The results of the implemented measures by INCALSA

Principal Options Implemented	Benefits			
	Economic		Resource Use	Pollution generated
	Investment [USD]	Cost Saving [USD/yr]	Reductions in energy use, water use and/or materials use (per annum)	Reductions in waste water, air emissions and/or waste generation (per annum)
New HCL Storage	1,700	2,250	1,050 gal HCl/year	-
Generate electricity from a solar photovoltaic system	58,000	4,062	20,000 kWh / year	13.81 TonCO2/year
Cold asphalt plant	618,302	7,382 Plus sale increase of 506,752	39,221 kWh/year 5,102 gal diesel/year	43.33 ton CO2

Approach taken

ASFALCA was approached to conduct an innovation assessment to determine the three basic technical components of increasing material and energy efficiency to produce more products with correspondingly less waste and pollutants generation, a reduction in toxicity of materials used and safety and risk reduction. Particular focus lied on the innovative solutions in these areas which were generated, implemented, monitored and documented together with the company representative.

Business case

Although the programme was mainly focused in chemical management, a direct positive consequence was also obtained to optimize energy consumption in the dyeing process, which has increased the value of the final products. RECP not only allows companies to achieve savings and optimize resource use, but also decreases pollution to the environment, which benefits the surrounding community.

Testimony Box
National Cleaner Production Centre (NCPC)
The NCPC El Salvador was established in 1998 with the economic support of the Swiss Federal Government and administered by the United Nations Industrial Development Organization (UNIDO). Our organization has almost sixteen years of experience in the implementation of Cleaner Production Programs in El Salvador´s industrial sector and up to this date it has provided assistance to over 600 enterprises in different areas, such as: water management, energy efficiency, renewable energy, chemical management, environmental management sytem, solid waste treatment and disposition of different sectors and environmental management systems amongst other services rendered.
Contact Details
El Salvador NCPC Av. La Capilla 355 Colonia San Benito, San Salvador, El Salvador Tel: +503 22643210, Fax +503 22643210 www.cnpml.org.sv Email: cnpml@cnpml.org.sv

ABOUT *RECP EXPERIENCES*

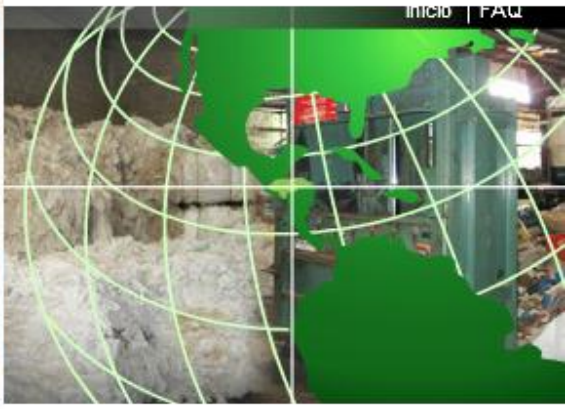
Through the joint Resource Efficient and Cleaner Production (RECP) Programme, the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Programme (UNEP) cooperate to improve the resource productivity and environmental performance of businesses and other organizations in developing and transition countries. The Programme is implemented in partnership with the Global Network for Resource Efficient and Cleaner Production (RECP*net*). This series of enterprise success stories documents the resource productivity, environmental and other benefits achieved by enterprises in developing and transition countries through the implementation of RECP methods and practices.

These successes were achieved with the assistance of the National Cleaner Production Centres, which are part of RECP*net* established with support of the UNIDO and UNEP. The success stories employ the indicator set described in *Enterprise Level Indicators for Resource Productivity and Pollution Intensity*, UNIDO/UNEP, 2010. The primer with accompanying calculator tool and further case studies are available at www.recpnet.org, as well as on www.unido.org/cp and www.unep.fr/scp/cp.

RECP Experiences at RECIGROUP-Honduras

The efficient and environmentally sound use of materials, energy and water - coupled with the minimization of waste and emissions - makes good business sense. Resource Efficient and Cleaner Production (RECP) is a way to achieve this in a holistic and systematic manner. RECP covers the application of preventive management strategies that increase the productive use of natural resources, minimize generation of waste and emissions, and foster safe and responsible production. Benefits are eminent in many enterprises, regardless of sector, location or size, as demonstrated by the experiences of RECIGROUP.

Achievements at a Glance



Overview

RECIGROUP is **a** company with 150 employees; the main process is recycling polyethylene and polypropylene plastics for industrial use. They produce products for different companies in Honduras and exported to Central American, United States, Mexico and Asian Countries.

Among the weaknesses that were found in the company they are:

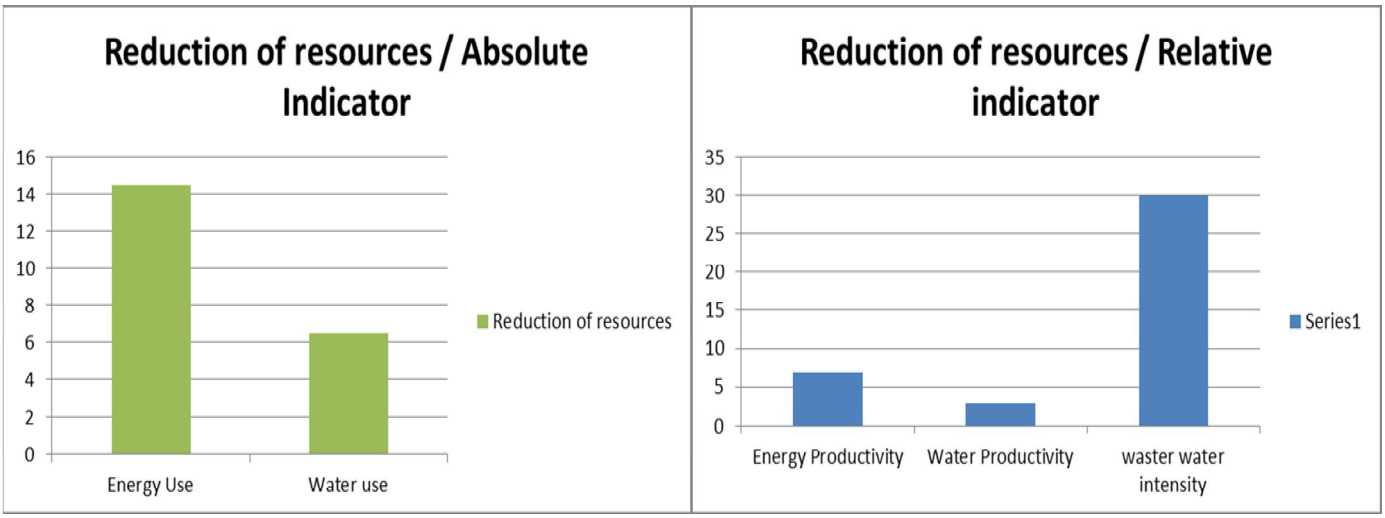
- High energy consumption in the process
- High generation of waste water

Benefits

- Increase the efficiency in the company RECIGROUP.

Absolute Indicator	Change (%) Year 1	Change (%) Year 2	Relative Indicator	Change (%) Year 1	Change (%) Year 2
Resource Use			Resource Productivity		
Energy Use	14.5		Energy Productivity	8.2	
Materials Use	N/a		Materials Productivity	N/a	
Water Use	7.2		Water Productivity	4.5	
Pollution Generated			Pollution Intensity		
Air emissions (global warming, CO_2 equivalent)	10.8 Ton per year		Carbon Intensity	8 %	
Waste-water	N/a		Waste-water Intensity	30%	
Waste	N/a		Waste Intensity	N/a	
Production Output					

RECP Profile



Resource Efficient and Cleaner Production (RECP)

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RECP addresses three sustainability dimensions individually and synergistically:
- *Production efficiency*
  > Through improved productive use of natural resources by enterprises

- *Environmental management*
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Human development
  > Through reduction of risks to people and communities from enterprises and supporting their development

Success Areas

The company implemented the following options:

Principal Options Implemented	Benefits			
	Economic		Resource Use	Pollution generated
	Investment [USD]	Cost Saving [USD/yr.]	Reductions in energy use, water use and/or materials use (per annum)	Reductions in waste water, air emissions and/or waste generation (per annum)
Replacing the lighting system with LED technology at both plants.	$ 17000.00	$ 5500.00 / yr.	14.5 %	10.8 Ton
Replacing three-ton air conditioning technology SEER 16	$ 2000.00	$ 1600.00 / yr.		
Replacement engine for high-efficiency equipment	$ 5000.00	$ 4000.00 / yr.		

Principal Options Implemented	Benefits			
	Economic		Resource Use	Pollution generated
	Investment [USD]	Cost Saving [USD/yr.]	Reductions in energy use, water use and/or materials use (per annum)	Reductions in waste water, air emissions and/or waste generation (per annum)
Implementation of a water recirculation system	$ 3500.00	$ 1500.00 / yr.	7.2%	6,000 m³ / year

Approach taken

The principal approach was:

- Reduce the consumption of energy.
- Reduce the generation of waste water.
- reduce the consumption of water

Business case

As initial diagnostic stage, we worked on the identification and damping of the main environmental aspects related to the operation of the company:

- Energy efficiency: after an inspection in engines, compressors and air conditioners, they could identify potential energy saving measures; these measures consisted of replacing lighting system with LED technology at both plants, replace air conditioning equipment and replacing engine for high-efficiency equipment

- Water efficiency: after analyzing recommend measures to optimize water use by implementing a system of water recirculation.

Testimony Box
National Cleaner Production Centre (NCPC)
National Cleaner production Centre of Honduras.
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Daniel Ayes : dirtec@cnpml-honduras.org
English Abstract (where applicable)

RECP Experiences in M/s. Atul Limited (Aromatic Division), Gujarat, India

Achievements at a Glance

Gujarat Cleaner Production Centre (GCPC) is working with M/s. Atul Ltd (Aromatic Division) in Gujarat. The total investment is USD 7355834.72 (One time) and saving was USD 1514681.4(Yearly) with total revenue generation from waste upto USD 920236.113 (yearly). The RECP involves the improvement targeting resource efficiency, process improvement, energy efficiency and reduced environment impacts, by employing appropriate technologies, both environment and economic gain as achieved.

Overview

M/s. Atul Limited (Aromatics Division) is the largest manufacturer of p-Cresol in the world located at Ankleshwar, Gujarat. Aromatics Division is also the largest producer of p-Anisic Aldehyde and p-Anisyl Alcohol in the world and also the leading manufacturer of Manganese Sulphate and Sodium Sulphite.

Initially the company was having Effluent Treatment Plant (ETP) with activated sludge process. To upgrade the ETP, second stage biological activated sludge process system was introduced. Further up-gradation was done by replacement of surface aerators by 484 in numbers. OTT make submerged diffusers in the first stage activated sludge process of treatment for better degradation efficiency. The effluents generated from various manufacturing plants were coming to ETP by gravity through underground drains. As a first step of the improvement, the characterization of different effluent streams was done based Chemical Oxygen demand (COD) & Total dissolved solid (TDS) value.

The segregation of high and low TDS effluent streams were done through over head pipe lines with installation of measurement devices. Flow of each and every stream coming from different plants was measured by a magnetic flow meter. Based on the analysis of various stages of operation, it was found that efficiency of bio-logical oxidation is being affected due to high TDS streams getting mixed in the common incoming line and giving shock load to ETP disturbing ETP performance. It was found and concluded that the high TDS effluent was hindering biological treatment of waste with lower degradation efficiency in ETP. Hence, a proposal was put up to the Top Management for installation of a Multiple Effect Evaporator (MEE) for treating high TDS effluent streams separately to enhance the efficiency of bio-logical oxidation in ETP and improve the quality of liquid discharge to FETP (Final Effluent treatment Plant).

1. MEE plant of Atul Ltd (AR Div)

2. Waste Recovery Plant of ATUL (AR)

3. Reverse Osmosis (RO) Plant

The DCS controlled based Quadruple Multi-Effect Evaporation (MEE) plant having capacity 250 M3/day was installed successfully for handling high TDS liquid effluents. The plant was designed and installed in a professional way. Condensate coming out from MEE operation is mostly recycled back in the process and partly sent to ETP. Solid coming out from MEE plant was of yellow colour powder containing mixed salts and 5 to 6 % moisture which was considered to be a solid waste and not saleable in the market because it was containing mixed salts. It had been disposed off at common secured landfill site.

It was found that the total operating expenses of MEE plant was high. This was a very expensive proposition for the business and not a sustainable solution in long run. Therefore, various options were explored for value creation from this Solid Waste generated.

Benefits

1. Creation of 'Wealth from Waste'

Transforming the solid waste coming out from MEE operation into a saleable product i.e. 99% anhydrous Sodium Sulphate powder (Na_2SO_4) as a long term strategy, Green technology was introduced. A Global platform technical meeting had been conducted , participating Eminent technocrats from the country and world. Techco-economical feasible solution of converting the waste for making 99% pure anhydrous Sodium Sulphate was concluded. A DCS automated 'Waste Recovery Plant' had been installed for converting waste into Sodium Sulphate. Company has recovered large amount Sodium sulphate powder. Introduction of new eco-friendly technology has helped us to increase the productivity of p-Cresol and others downstream products in a sustainable way.

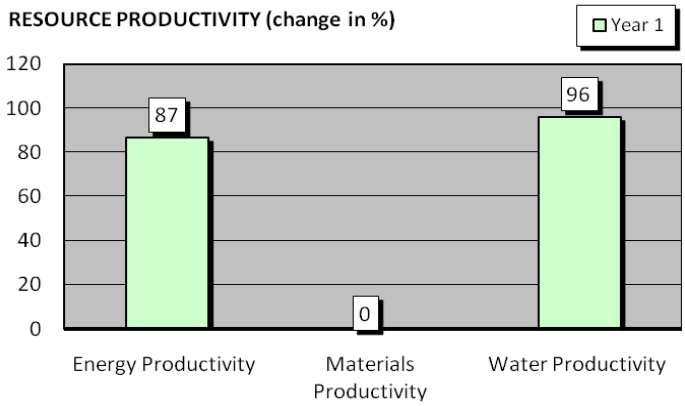
2. Introduction of reverse osmosis (RO) technology to recycle the entire treated waste water in the process and conserve natural resource in order to attain zero liquid discharge (zld)

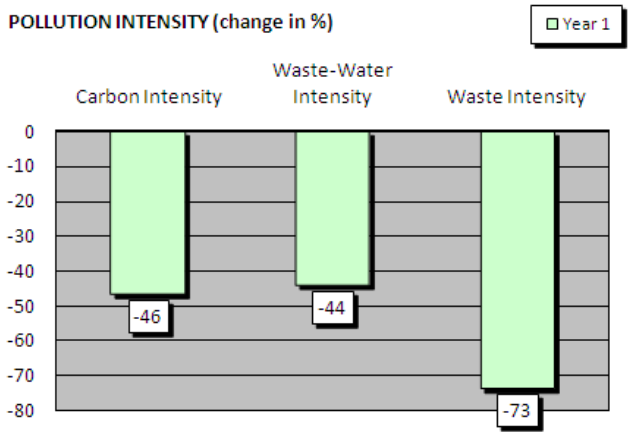
The DCS based RO plant of 700 m^3/day capacity has been Installed. Treated Waste Water coming from ETP tertiary treatment is again pre-treated to remove hardness, oil/grease etc. The Pre-treated water is then passed though a Dual Media Filter (DMF) followed by Ultra Filtration system (UF). After UF, water is fed through RO system in multi stages and clear water having very low TDS"(ie, upto 25 ppm) is recovered as permeate for recycling in the process.

The RO plant has been successfully commissioned resulting in complete stoppage of Waste Water discharge in the common pipe line and achieving Zero Liquid discharge (ZLD) objective. The reject water having high TDS is sent to a multi-effect evaporator system for removal of solids through Centrifuge. The solid coming out from reject stream is non-toxic & non-hazardous and used in secured land fill. It is not only a technological success but also classic example of Conservation of Natural Resource (water) for a sustainable solution.

ABSOLUTE RECP INDICATORS					
Indicator	**Unit**	**Baseline (B) (Before RECP intervention)**	**Year 1 A (After RECP implementation)**	**Change (C) C=100*(A-B)/B** [%]	**Difference Between A and B**
Resource use					
Energy Use	[kWh/yr]	24,550,963.00	30,106,592.00	22.63	5,555,629.00
Materials Use	[ton/yr]			0.00	0.00
Water Use	[m3/yr]	433,366.00	505,894.00	16.74	72,528.00
Pollution					
Carbon dioxide	[ton CO_2-eq/yr]	205,246.05	251,691.11	22.63	46,445.06
Waste-Water	[m3/yr]	129,299.00	166,277.00	28.60	36,978.00
Waste	[ton/yr]	7,525.00	4,575.00	-39.20	-2,950.00
Product Output					
Product Output: P	[ton/yr]	25,468.00	58,312.12	128.96	32,844.12

RECP Profile





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Success Areas

- Creation of 'Wealth from Waste' through high revenue generated from waste.
- Transforming solid waste into a saleable product, Anhydrous Sodium Sulphate powder (Na_2SO_4).
- Reduction and recycling for treated waste water.
- Conservation of Natural Resource (ie. water) for a sustainable solution.

- Improvement on overall environment management system (EMS).
- Implementation of 'Clean and Green Technology'.
- Reduction in TDS load and COD with greater efficiency of ETP.
- Achieved Zero liquid discharge concept and recycle the entire water into process as well as utility.

Table 2: Options implemented

Principal Options Implemented	Benefits			
	Economic		Resource Use	Pollution generated
	Investment [USD]	Cost Saving [USD/yr]	Reductions in energy use, water use and/or materials use (per annum)	Reductions in waste water, air emissions and/or waste generation (per annum)
For putting up a 250 m^3/day MEE for handling only high TDS effluent	USD 998940.518	USD 0	22.63% deduction in energy requirement.	Carbon intensity decreased by 46%
For putting Waste Recovery Plant for converting impure Sodium Sulphate into 99% pure Na2SO4 through Technology innovation.	USD 3632510.97	USD 1210836.99	Purity of Sodium Sulphate is 99% which is saleble product for the industry	Recovery of waste in to saleble product
For putting up RO & MEE for recycling of Teated waste water in Process and conserve natural resource and achieve.	USD 1589223.55	USD 303844.407	Water productivity increased upto 96 %	Increase in water productivity up to 90 %
Installation of another 330 m^3/day stand-by MEE for sustainability of above.	USD 1135159.68	USD 0	Energy productivity increased upto 87 %	Reduction in energy consumption

Approach taken

The overall objective of the programme is to facilitate promotion of Resource Efficient and Cleaner Production without entailing excessive cost in Chemical industry so as to strengthen environmental management and pollution control in the industry. Cleaner production methodology was taking as an approach for this project which includes List Process Steps, Identify Wasteful Processes, Process Flowchart, Material and Energy Balance, Identify Cause of Waste, Technical-Financial- Environmental Feasibility, Implementation of Cleaner Production Solution etc.

Resource Efficient and Cleaner Production means the most effective and advanced stage in the development of activities and their methods of operation which indicates the practical suitability of particular techniques for providing the basis for emission limit values and other permit conditions designed to prevent and where that is not practicable, to reduce emissions and the impact on the environment as a whole.

Testimony Box
Gujarat Cleaner Production Centre (GCPC), Gujarat, India
The Gujarat Cleaner Production Centre (GCPC) has been established by Industries & Mines Department, Govt. of Gujarat under Gujarat Industrial Development Corporation (GIDC) in the year 1998 with technical guidance of UNIDO and since then the centre is actively engaged in the promotion of Cleaner Production (CP)/Clean Technology (CT) through its various activities such as orientation/awareness programmes, CP and CT Assessment Projects etc. Contributions of GCPC over the years towards promotion of Cleaner Production in the state of Gujarat to improve the productivity and the environmental problems faced by SMEs have been significant. GCPC had also played active role in framing Industrial Policy 2003, 2004, 2009 and 2015, also supported in developing many financial assistance schemes pertaining to CP/CT. GCPC is also member of RECP of UNIDO and Climate Technology Centre and Network (CTCN), a working arm of UNFCCC. GCPC have so far conducted more than **200 Orientation Programmes** in different colleges, organizations and industries associations. The centre has successfully completed more than **100 CP Demonstration Projects** in various sectors like Textile, Dairy, Pulp & Paper, Chemical, Petrochemical, Pharmaceutical, Fish Processing, Ceramic etc.
Contact Details
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English Abstract (where applicable)

RECP Experiences at National Cleaner production Center

The efficient and environmentally sound use of materials, energy and water - coupled with the minimization of waste and emissions - makes good business sense. Resource Efficient and Cleaner Production (RECP) is a way to achieve this in a holistic and systematic manner. RECP covers the application of preventive management strategies that increase the productive use of natural resources, minimize generation of waste and emissions, and foster safe and responsible production. Benefits are eminent in many enterprises, regardless of sector, location or size, as demonstrated by the experiences of National Cleaner Production Centre in Pakistan.

Achievements at a Glance

NCPC is working on the principles of Cleaner Production; through continuous application of integrated, preventive and proactive strategies. Using its internal technical experts, NCPC implemented RECP approaches in recycling of kitchen wastewater as an alternate source to reduce the consumption of water.

This achievement is a reflection of activities in all of the expertise offered by NCPC all over the Pakistan. RECP implementation in recycling of kitchen wastewater led to water saving up to 2100 liters per day from total consumption of 4000 liters per day by investing US$ 8,500 on civil structure and other accessories. NCPC has demonstrated that applying the cleaner production at source led to taking care of materials, energy, water and waste makes good business sense. RECP covers the application of preventive management strategies that increase the productive use of natural resources, minimize generation of waste and emissions.

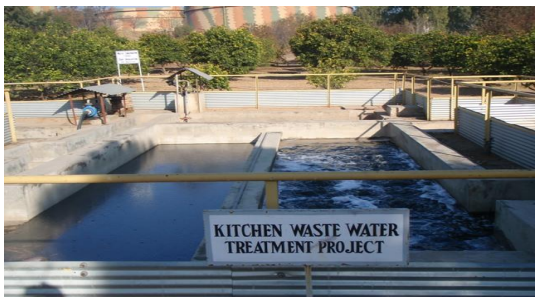
Overview

NCPC is working as a non-profit organization with the ultimate aim to improve the environmental conditions which in turn contributes to the welfare of community. NCPC is carrying out the broad categories of environmental services, energy conservation services, and analytical services to meet National Environmental Quality Standards (NEQS), waste management services to dispose off hazardous waste and multi discipline trainings to build organizational capacity.

Benefits

The RECP programme mainly focused on the fact that the waste water from the kitchen was recycled for achieving progressive objectivity mainly targeting at conserving water by adhering to the Eco Recycle concept, i.e. making available the supply of water by reusing after treatment the kitchen waste water against the everyday increasing demands, and minimizing the release of oil contents thereby reducing the harms encountered to the bio-system. Its cost effectiveness is the highlighting feature with an effective technological combination towards reducing the demands on potable sources of freshwater. In most cases, the quality of the wastewater, as an irrigation water supply, is superior to that of well water. Lawn maintenance and golf course irrigation is facilitated in resort areas. By undergoing this programme NCPC was able to understand the specific requirements of material, fuel, water and other resources necessary for production.

Kitchen Wastewater Recycling Plant:



Drip Irrigation is being used to supply recycled wastewater to agricultural fields.

Absolute Indicator	Change (%) Year 1	Relative Indicator	Change (%) Year 1
Resource Use		Resource Productivity	
Energy Use	-	Energy Productivity	-
Materials Use	-	Materials Productivity	-
Water Use	-4000 l/d	Water Productivity	-2100 l/d

Note: The absolute indicators provide a measurement of how much resource use has changed in absolute terms e.g. units of energy used or tons of waste generated. A negative percentage indicates a decrease and a positive percentage indicates an increase. The relative indicators provide a measurement of changes in resource use in relation to a specific process.

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Success Areas

This entire project was cost effective with capital costs ranging from low to medium. For most systems they are recoverable in a very short time only excluding systems designed for direct reuse of sewage water.

- Operational and maintenance are relatively simple and inexpensive except in direct reuse systems
- System is ideal for areas facing shortage of water. If this technology gets replicated in water scarce areas then the societal groups of that respective area can get indulged in fruits and vegetable production by utilizing the treated waste water. This will not only help them save an equivalent amount of fresh water but also will help in the production of fresh edible commodities. The fruits and vegetables produced in excess can also lead them towards subsistence agriculture i.e. selling the excess produce. The sold products will generate economic benefits thus enhancing the stability and well being of the community.
- In most cases, the quality of the wastewater, as an irrigation water supply, is superior to that of well water and the plantation being irrigated get's enriched in return. The enrichment level refers to the improvement of the nutritious content of edible commodities being irrigated thus, leading towards a healthy society.

Principal Options Implemented	Benefits			
	Economic		Resource Use	Pollution generated
	Investment [USD]	Cost Saving [USD/yr]	Reductions in energy use, water use and/or materials use (per annum)	Reductions in waste water, air emissions and/or waste generation (per annum)
Kitchen Wastewater Treatment Plant	5,000	1,825	Water consumption decreased up to 50%	Waste Water generation decreased up to 50%
Drip Irrigation System	3,500	-	-	-

Approach taken

The project was designed to treat refinery canteen wastewater. The goal of which was to value the precious resource and reutilize the waste water for beneficial aspects such as gardening purpose. The average consumption of Refinery canteen water is 4,000 liter/day and the objective of the project was to bring out a maximum output which turned out to be approximately 2,100 liter per day. The main purpose of this project remains at affording immense guidelines and awareness opting this method of kitchen waste-water treatment in an environment friendly manner.

Business case

Although the RECP programme was mainly focused on reduction of resource use, but also an alternate water use is provided for agricultural purposes which benefits the surrounding community and builds the credibility of the industry.

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English Abstract (where applicable)

Wastewater treatment has gained importance worldwide, but there is an immense need to develop a low cost treatment system for recycling wastewater which can be used in agriculture sector. Grey water is wastewater from urban areas including water from showers, washing activities and kitchens etc. it is recommended proper treatment of wastewater before using it for irrigation purposes. It can be concluded that the adapted system is applicable to a small-scale pilot project, primarily in areas where there is a shortage of water for supply purposes. However, this technology can be applied to larger-scale projects also. Large-scale wastewater reuse can only be contemplated in areas where there are reticulated sewerage and/or storm water systems. (Micro-scale wastewater reuse at the household or farmstead level is a traditional practice in many agricultural communities that use night soils and manures as fertilizers.) Urban areas generally have sewerage systems, and, while not all have storm water systems, those that do are ideal localities for wastewater reuse schemes. Wastewater for reuse must be adequately treated, biologically and chemically, to ensure the public health and environmental safety. The primary concerns associated with the use of sewage effluents in reuse schemes are the presence of pathogenic bacteria and viruses, parasite eggs, worms, and helminthes (all biological concerns) and of nitrates, phosphates, salts, and toxic chemicals, including heavy metals (all chemical concerns) in the water destined for reuse

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RECP Experiences at Sadolin Paints (U) Ltd

The efficient and environmentally sound use of materials, energy and water - coupled with the minimization of waste and emissions - makes good business sense. Resource Efficient and Cleaner Production (RECP) is a way to achieve this in a holistic and systematic manner. RECP covers the application of preventive management strategies that increase the productive use of natural resources, minimize generation of waste and emissions, and foster safe and responsible production. Benefits are eminent in many enterprises, regardless of sector, location or size, as demonstrated by the experiences of Sadolin Paints (U) Ltd.

Achievements at a Glance

Since Resource Efficiency and Cleaner Production implementation in 2011 in Sadolin Paints (U) Ltd, the company has achieved a total saving of USD 101,052.00 for a total investment of USD 233,677.30 and BODs and CODs have reduced from 7.510tons/yr and 24.595tons/yr to 0.069tons/yr and 0.15tons/yr respectively. During RECP implementation, Sadolin Paints (U) Ltd; established a well trained RECP Team (18 members) to control its energy consumption and the energy productivity has improved by 50% and increased awareness on the effective use of resources including water and materials and as a result, material and water productivity has increased by 1% and 13% respectively. RECP has also enabled the company to simultaneously decrease waste quantities by 25% and reduce the amount of greenhouse gas emissions by 6%. The company emerged as the 2nd runners-up Raw materials management in the Regional RECP Award 2014 and an overall winner of materials Management award in the National RECP Award 2013

Production floor before and after installation of translucent sheets under RECP Implementation

Overview

Sadolin Paints (U) Limited is the leading manufacturer of quality paints in Uganda established in 1963, and owned by a group of Kenyan investors. Sadolin Paints (U) Ltd has traditionally concentrated on premium quality decorative products. It also manufactures medium quality decorative finishes, varnishes, and industrial paints, automotive refinish paints and road marking paints. Sadolin Paints (U) Ltd produces about twenty two million litres annually with a team of about 320 employees. With an aim

of improving productivity and reducing operating costs through improved efficiency and addressing the issues of ISO 14001 and ISO 18001 prior to certification, the company top management decided to implement Resource Efficiency and Cleaner Production in the entire factory.

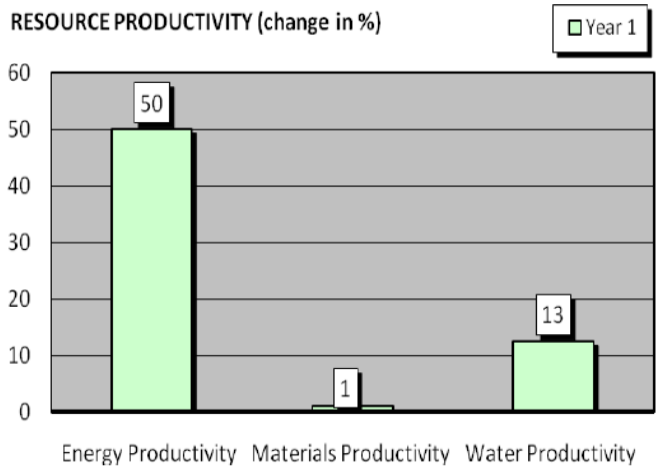
Benefits

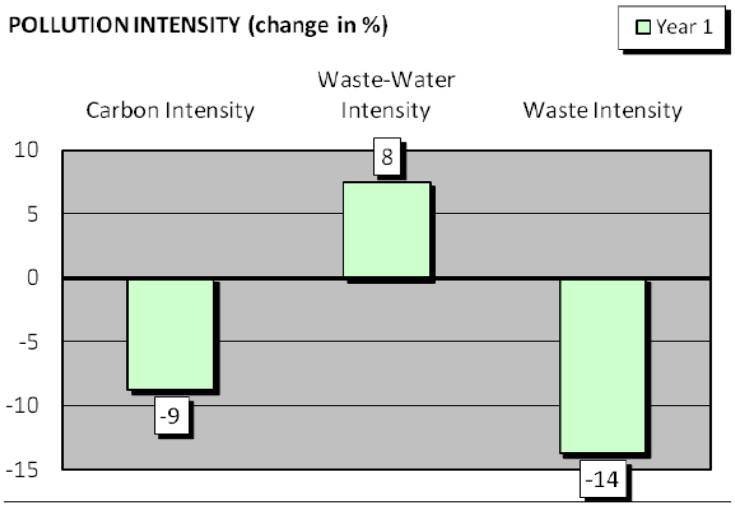
Resource Efficiency and Cleaner Production programme has helped Sadolin Paints (U) Ltd to control its energy consumption (i.e. energy costs reduction), conserve water, improve on storage/ handling of raw materials so as to prevent losses and accidents, understand and know that pollution is equivalent to profit and quality reductions and further understand the need to conserve the environment. Sadolin Paints (U) Ltd has greatly improved its energy use by 22.43%, one of the major inputs in paint production

Absolute Indicator	Change (%)	Relative Indicator	Change (%)
Resource Use		**Resource Productivity**	
Energy Use	-22	Energy Productivity	50
Materials Use	15	Materials Productivity	1
Water Use	3	Water Productivity	13
Pollution generated		**Pollution Intensity**	
Air Emissions (global warming, CO2 eq.)	6	Carbon Intensity	-9
Waste-Water	25	Waste-Water Intensity	8
Waste	0	Waste Intensity	-14
Product Output	16		

Note: The absolute indicators provide a measurement of how much resource use/pollution output has changed in absolute terms e.g. units of energy used or tons of waste generated. A negative percentage indicates a decrease and a positive percentage indicates an increase. The relative indicators provide a measurement of changes in resource use/pollution in relation to production output. Resource productivity provides a measurement of how much product output can be produced per unit of resource use, from a sustainability perspective, productivity should increase. Pollution intensity provides a measurement of how much pollution is generated per unit of production output, from a sustainability perspective, intensity should decrease.

RECP Profile





Note: The RECP profile provides a visual overview of resource productivity and pollution intensity shown as change in % compared to the baseline values. Environmental performance is improved when resource productivity increases and when pollution intensity decreases.

Success Areas;

Resource Efficient and Cleaner Production (RECP)

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> Through reduction of risks to people and communities from enterprises and supporting their development

Table 2: Some of the Opportunities implemented

Principal Options Implemented	Economic Investments (USD/Yr)	Economic savings (USD/Yr)	Benefits: Resource Use	Benefits: Environmental Impact
	Investment [$]		Reductions in energy use, water use and/or materials use (per annum)	Reductions in waste water, air emissions and/or waste generation (per annum)
Water Management				
1. Recycling and awareness to workers	3.11	324.76	0.132 m^3 / ton of paint	Reduced water and soil pollution
Wastewater Management				
1. Installation of a high pressure cleaner	1,487.04	313.50	288 m^3	Reduced water and soil pollution
Materials Management				
1. Reduction in printing papers	0.00	4,355.56	840 Reams	Reduced waste generation
Energy Management				
1. Replaced ordinary bulbs with energy saving bulbs 2. Cleaned/ Increased number of translucent sheets/ 3. Corrected capacitor bank	1,481.48	95,140.51	591.04 MJ/ ton of paint	Reduce air emissions

Approach Taken;

Following the RECP training workshop in 2011, company top management agreed to implement RECP at Sadolin Paints Ltd. This decision was sparked off by the considerable cost saving benefits that could be realised, anticipated improved efficiency of production and that cleaner production implementation is a great input towards certification in ISO 14001 and/or ISO 18001. A CP team was formed at Sadolin Paints Ltd and this team was taken through a series of trainings by UCPC on RECP. In order to identify and quantify opportunities for improvement, the UCPC team and the CP team for Sadolin Paints Ltd conducted an in-depth RECP assessment in the entire factory. UCPC presented the findings of the assessment to the top management and CP team for implementation. In order to facilitate smooth implementation of the identified RECP options, UCPC further organised an awareness raising seminar for the shop floor workers. UCPC team has always continued providing technical assistance to Sadolin Paints Ltd in addition to involving the company in workshops and seminars for more knowledge acquisition.

Business case

As a result of RECP implementation, staff members have been motivated to carry on their activities with an aim of reducing costs and increasing efficiency and productivity. Every eye is looking for opportunity for continual improvement in the areas of health, safety and environment besides production increase, better product quality, turn over increase and new markets and job creation. Therefore motivated staff resulted in positive attitude towards work and improved productivity.

Testimony Box
National Cleaner Production Centre (NCPC)
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English Abstract (where applicable)
N/A

ABOUT *RECP EXPERIENCES*

Through the joint Resource Efficient and Cleaner Production (RECP) Programme, the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Programme (UNEP) cooperate to improve the resource productivity and environmental performance of businesses and other organizations in developing and transition countries. The Programme is implemented in partnership with the Global Network for Resource Efficient and Cleaner Production (RECP*net*). This series of enterprise success stories documents the resource productivity, environmental and other benefits achieved by enterprises in developing and transition countries through the implementation of RECP methods and practices.

These successes were achieved with the assistance of the National Cleaner Production Centres, which are part of RECP*net* established with support of the UNIDO and UNEP. The success stories employ the indicator set described in *Enterprise Level Indicators for Resource Productivity and Pollution Intensity*, UNIDO/UNEP, 2010. The primer with accompanying calculator tool and further case studies are available at www.recpnet.org, as well as on www.unido.org/cp and www.unep.fr/scp/cp

RECP Experiences at J & S Ferretería Industrial

Chemical Innovation Case

This experience was developed as part of the project *Innovative Solutions for environmentally sound management of Chemicals and chemical wastes supported by UNIDO.* The aim of this project is to facilitate the implementation of innovations in the production and application of chemicals to achieve a reduction in the consumption of chemicals, energy and water; improvements in the safe management of chemicals and risk reduction related to chemical accidents. Resource efficient options and technologies will be addressed as well as replacement of hazardous chemicals by chemicals with lower risk, as demonstrated by the experiences of Peru.

Achievements at a Glance

J & S Ferretería Industrial (Universal Colors) was able to reduce its solvents consumption by 80% as a result of the RECP programme. New and more environmental friendly paints were developed through the substitution and reduction of hazard chemicals and solvents. RECP enabled the company to reduce solvent emissions, improve working conditions and access new markets.

Universal Colors products

Tests with the new varnish

The ecological product line from Universal Colors

Overview

The J & S Ferretería Industrial (Universal Colors) is a Peruvian company dedicated to the formulation and manufacture of paints, latex, coatings, sealants and varnishes for construction and industrial use. Over the past 10 years, the enterprise has developed traffic, marine, domestic and automotive paints for peruvian market. The company has 15 workers and has assets of around USD 2,000,000.

The main target of the Resource Efficient and Cleaner Production (RECP) programme implemented at J & S Ferretería Industrial was the formulation of new and more environmental friendly paints by the substitution or reduction of hazard chemicals and solvents.

Benefits

Universal Color was able to develop a water-based varnish for metallic surfaces that is effective for the aim of the end-user enterprise.

Achievements of the new product were:

- A water-based product with good covering properties for metallic surfaces.
- Lower content of solvent, preliminary formulation achieved more than 50% of reduction.

Lower risk for handling and storage, diminishes risk of accidents for employees and improve working conditions.
Reduction of solvent emissions – better working climate for the end-users.
Access to new markets, potentially increase revenue and expand market share.

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Success Areas

An alternative formulation, water-based varnish for metallic surfaces, was developed by Universal Colors. This product was presented as a substitute for common varnishes available in the national market; which have a high solvent content and are considered hazardous for its volatility and inflammability.

To incentive the use of cleaner products and promotes the introduction of low environmental impact paints, the NCPC presented an end-user enterprise interested in reducing the impact of solvent-based varnishes. The two companies are working together to adapt the alternative formulation to the necessities of the client. The aim is to develop a high quality product that fulfills the standards of the former product and reduces significantly the solvent content in metallic varnishes.

Table 1: Results of the development of new formulations

Clean Technology	Environmental/Safety benefits	
	Chemical consumption (gallon)	
	Solvents [% w/gal)] old/new	% reduction
Water-based varnish for metallic surfaces	50 % / 10 - 15%	80 %

Approach taken

J & S Ferretería Industrial was approached to conduct an innovation assessment to determine the three basic technical components of increasing material and energy efficiency to produce more products with correspondingly less waste and pollutants, a reduction in toxicity of materials used and safety and risk reduction. Particular focus lied on the innovative solutions in these areas which were generated, implemented, monitored and documented together with the company representative.

Business case

The implementation of RECP programme allowed the company to see other markets that value low environmental impact paints; as a result, J & S Ferretería Industrial has the potential to increase its competitiveness and profitability. Company plans are to produce free Lead paints for domestic use in order to achieve future quality standards that the health authority will require.

Testimony Box
National Cleaner Production Centre (NCPC)
The CER Peru was established in 2002, and is hosted by the non-governmental organization Grupo GEA. The centre offers services in the areas of Resource Efficient and Cleaner Production (RECP), Corporate Social Responsibility (CSR) and carbon neutral markets. By mid-2010, the centre had conducted cleaner production assessments, including carbon footprint measurements, in 55 enterprises and helped 28 enterprises with CSR related strategic planning. The centre was is actively working with ministries and local governments and participates in the administration of the Green Credit Trust Fund (supported by the Swiss State Secretariat for Economic Affairs) which has financed investments in 23 enterprises - amounting to a total of USD 8.75 million.
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N/A

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RECP Experiences at Leather Industries of Uganda

The efficient and environmentally sound use of materials, energy and water - coupled with the minimization of waste and emissions - makes good business sense. Resource Efficient and Cleaner Production (RECP) is a way to achieve this in a holistic and systematic manner. RECP covers the application of preventive management strategies that increase the productive use of natural resources, minimize generation of waste and emissions, and foster safe and responsible production. Benefits are eminent in many enterprises, regardless of sector, location or size, as demonstrated by the experiences of Leather Industries of Uganda Ltd

Achievements at a Glance

Investing in Cleaner Production, to prevent pollution and reduce resource consumption has proven to be more cost effective than continuing to rely on increasingly expensive 'end-of-pipe' solutions. The environmental benefits of Cleaner Production can be translated into market opportunities for 'greener' products. Since 2010, RECP implementation in LIU has led to a total saving of USD 2,236,450.50 against a total investment of USD; 1,676,120.85 and BODs and CODs have reduced from 268,070.600tons/yr and 376,055.850tons/yr to 39.66tons/yr and 79.056tons/yr respectively.

LIU has demonstrated that implementation of RECP results in improved productivity while reducing the environmental impact of the activities of industries. RECP covers the application of preventive management strategies that increase the productive use of natural resources, minimize generation of waste and emissions, and foster safe and responsible production. Benefits are eminent in many enterprises, regardless of sector, location or size.

Photo 1; Old leaking drums before RECP

Photo 2; New installed drums of RECP

Photo 3; WWTP Before RECP

Photo 4; WWTP after RECP Implementation

Overview

Leather Industries of Uganda (LIU) is a private limited liability company initiative under Aga Khan Development Network (AKDN) and a sole processor of hides and skins up to finished stage in Uganda. It has an installed capacity of processing 1000 pieces of raw hides and 5000 skins per day and exports 95% of its produce to different parts of the world. Currently, LIU processes 800 pcs of hides /day and Consumes approx. 600m³ of water/ day, releases 99% of the consumed water as effluent/day and generates averagely 2000kgs of Solid waste /day which has to be disposed off. Driven by the objectives of addressing the pressing environmental challenges at that time and increasing productivity and competitiveness, LIU decided to implement RECP in the entire processing factory.

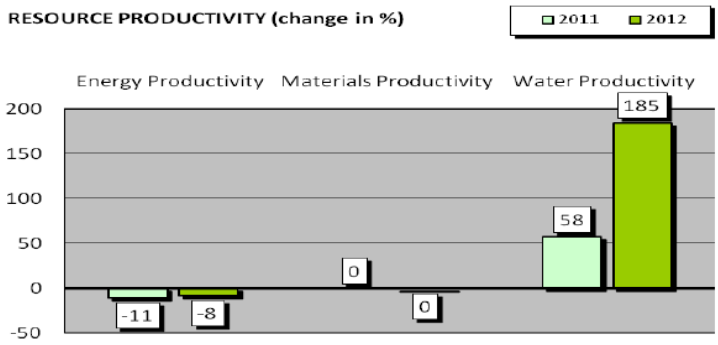
Benefits

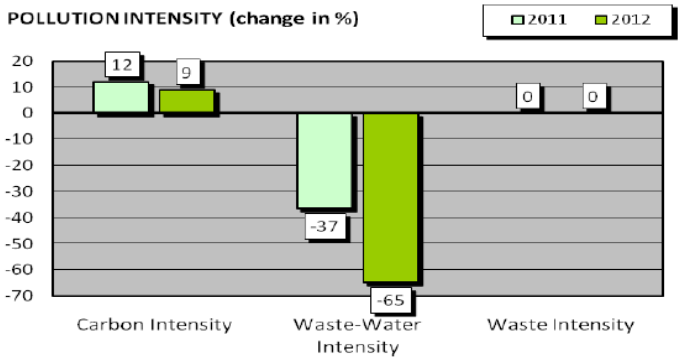
LIU has been able to achieve tremendous improvement because of profound top management commitment but also team spirit from the employees. Notable CP options have been implemented in the beam house, tanning yard, dye house, occupational health and safety, effluent treatment, waste management, energy management, chemical management, water use etc.

Absolute Indicator	Change (%) year 1	Change (%) year 2	Relative Indicator	Change (%) year 1	Change (%) year 2
Resource Use			**Resource Productivity**		
Energy Use	15	-20	Energy Productivity	-11	-8
Materials Use	2	-27	Materials Productivity	0	0
Water Use	-35	-74	Water Productivity	58	185
Pollution generated			**Pollution Intensity**		
Air Emissions (global warming, CO2 eq.)	15	-20	Carbon Intensity	12	9
Waste-Water	-35	-74	Waste-Water Intensity	-37	-65
Waste	2	-27	Waste Intensity	0	0
Product Output	2	-27			

Note: The absolute indicators provide a measurement of how much resource use/pollution output has changed in absolute terms e.g. units of energy used or tons of waste generated. A negative percentage indicates a decrease and a positive percentage indicates an increase. The relative indicators provide a measurement of changes in resource use/pollution in relation to production output. Resource productivity provides a measurement of how much product output can be produced per unit of resource use, from a sustainability perspective, productivity should increase. Pollution intensity provides a measurement of how much pollution is generated per unit of production output, from a sustainability perspective, intensity should decrease.

RECP Profile





Note: The RECP profile provides a visual overview of resource productivity and pollution intensity shown as change in % compared to the baseline values. Environmental performance is improved when resource productivity increases and when pollution intensity decreases.

Success Areas

Resource Efficient and Cleaner Production (RECP)

Resource Efficient and Cleaner Production (RECP) entails the continuous application of preventive environmental strategies to processes, products and services to increase efficiency and reduce risks to humans and the environment.

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Table 2: some of the Opportunities implemented

Principal Options Implemented	Benefits			
	Economic Investments (USD)	Annual Economic Savings (USD/Yr)	Annual reductions in Resource Use	Environmental Impact
Water Management				
• Installed new drums to replace the old worn out leaking drums.	22000	10000		• Reduced chemical loss
Wastewater Management				
• Construct a secondary waste water treatment plant	297,860	500,000		• Reduced pollution load and Environmental Legal compliance
Materials Management				
• Recycle chrome and tanning bath solutions	50,000	13,700		• Reduction in the chemical pollution load of the effluent.
Energy Management				
• Installation of iron sheets with translucent sheets in the beam house and tanning yard	280	300		• Reduction in input costs
• Installation of energy savers for all lights and security lights	320	8,000		• Reduced energy consumption
• Raise the main water supply tank and make use of gravity to supply water to the factory instead of using electric pumps.	4,000	48,434		• Reduction of energy used for pumping water
Solid Waste Management				
• Obtain equipment to process animal feed from fleshings and green trimmings • Ensure proper treatment and disposal of organic waste	50,000	2,736		• Legal compliance, Reduced soil/water contamination, Odour management, Improved aesthetics (beauty), Reduced public complaints, Income generation

Approach taken

Driven by the commitment for sustainable productivity and growth, LIU was introduced to RECP by UCPC staff in 2010. A CP team was formed at LIU and this team was taken through a series of trainings by UCPC on RECP. In order to identify and quantify opportunities for improvement, the UCPC team and LIU CP team conducted an in-depth RECP assessment in the entire factory. UCPC presented the findings of the assessment to the top management and CP team for implementation. In order to facilitate smooth implementation of the identified RECP options, UCPC further organised an awareness raising seminar for the shop floor workers. UCPC team has always continued providing technical assistance to LIU in addition to involving LIU in workshops and seminars for more knowledge acquisition. LIU has evolved a well defined environment management policy and sound environment practices for minimizing environmental impact arising out of tanning operations and preserving the natural ecology. The policy also envisages efficient utilisation of resources, thereby minimising waste, maximising chemical utilisation and providing a green belt all around the plant for maintaining ecological balance.

Business case

Realizing the importance of protection of the environment, LIU has constituted different groups on the production chain to carry out specific environment related functions. The Environment Management Groups (EMG's) implement measures to mitigate the impacts of production processes on the environment and preserve ecology in the vicinity of the factory. The environment friendly approach to leather tanning has already begun to show results in conservation of natural resources such as; water and energy as well as control of environmental pollution through reduced chemical consumption. With better awareness and appreciation towards ecology and environment, LIU is continually looking for innovative and cost effective solutions to conserve natural resources and reduce wastes. Some of the measures include: Reduction in land requirements for sludge disposal area by directly applying it on land as manure for our green belts, Reduction in water requirement for main plant through process optimization and reduction of water wastages and Efficient use of Energy and reduction in energy requirement through more efficient processing and adoption of better technologies such as automated switches on drums.

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RECP Experiences at Cassva Starch Industry (Anning)

The efficient and environmentally sound use of materials, energy and water - coupled with the minimization of waste and emissions - makes good business sense. Resource Efficient and Cleaner Production (RECP) is a way to achieve this in a holistic and systematic manner. RECP covers the application of preventive management strategies that increase the productive use of natural resources, minimize generation of waste and emissions, and foster safe and responsible production. Benefits are eminent in many enterprises, regardless of sector, location or size, as demonstrated by the experiences of Anning Starch Co., Ltd. in China.

Achievements at a Glance

Resource Efficient and Cleaner Production (RECP) implementation in Anning Starch Co., Ltd. led to annual savings and increasing benefits of around RMB 14,000,000 (USD 2,258,200), and improved product quality. The RECP programme also enabled the company to increase its starch recovery rate by more than ten percentages, and water productivity by 90%, while decrease waste-water intensity by 45%.

Anning Starch Co., Ltd. has proved that the promotion of cleaner production is a better option for Chinese backward industries to meet stricter environmental requirement and realize higher resource efficiency and economic benefits.

Note: new equipment installed at the plant

Overview

Anning Starch Co., Ltd. a company producing native starch, modified starch and alcohol in China, was established in 1998. Its production capacity of native starch is 20,000 t/a, of modified starch is 20,000 t/a, and of alcohol is 30,000 t/a. The company has 237 workers, covers an area of 50,000 m^2 and has fixed assets of around RMB 85,000,000 (USD 13,710,500).

The main target of the RECP programme implemented at Anning Starch Co., Ltd. was to achieve the reduction of freshwater consumption, waste-water generation, COD generation, and the increase of starch recovery rate through improving production technologies. The CP production process implemented at Anning Starch Co., Ltd. allows the company to significantly improve its resource efficiency, minimize generation of waste and emissions.

Benefits

The RECP programme was mainly focused on improving the native starch production process. RECP not only enabled Anning Starch Co., Ltd. to achieve savings from the decreased use of energy and resources, but also made it possible for the company to decrease their pollution and to act in a more responsible way.

Absolute Indicator	Change (%) Year 1	Relative Indicator	Change (%) Year 1
Resource Use		Resource Productivity	
Energy Use	-35.24	Energy Productivity	54.42
Materials Use	-11.11	Materials Productivity	12.5
Water Use	-47.37	Water Productivity	90
Pollution Generated		Pollution Intensity	
Air emissions (global warming, CO_2 equivalent)	-35.34	Carbon Intensity	-35.34
Waste-water	-45	Waste-water Intensity	-45
Waste	-11	Waste Intensity	-11
Production Output	20,000t/a		

Note: The *absolute indicators* provide a measurement of how much resource use/pollution output has changed in absolute terms e.g. units of energy used or tons of waste generated. A negative percentage indicates a decrease and a positive percentage indicates an increase. The *relative indicators* provide a measurement of changes in resource use/pollution in relation to production output. *Resource productivity* provides a measurement of how much product output can be produced per unit of resource use, from a sustainability perspective, productivity should increase. *Pollution intensity* provides a measurement of how much pollution is generated per unit of production output, from a sustainability perspective, intensity should decrease.

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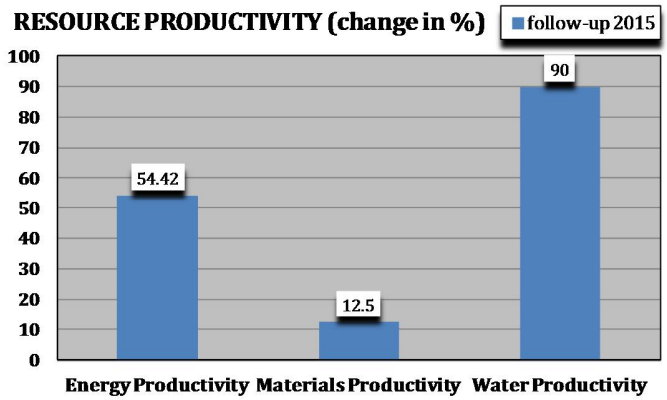

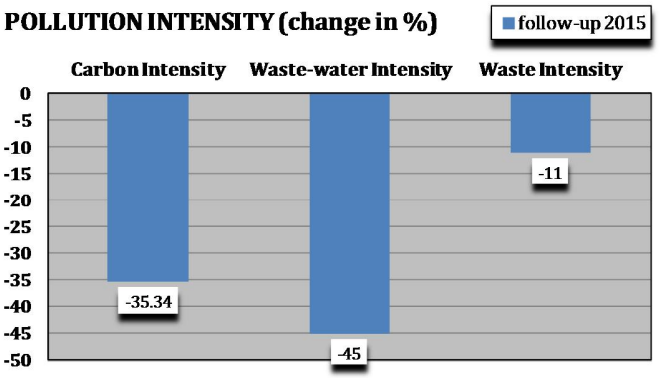

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Success Areas

The results were achieved through the implementation of the following measures:
- Improving production processes with the purpose of reducing losses.
- Recycling water from different processes.
- Reducing the use of water in the extraction unit by using horizontal centrifugal screen
- Reducing the use of water in the refining unit by applying multi-stage hydrocyclone station
- Increasing the starch recovery rate by using rasper in the crushing unit.
- Realizing automated management.
- Reducing the use of cassava roots and the generation of pollutants by increasing resource utilization.

TABLE 2: OPTIONS IMPLEMENTED

Principal Options Implemented	Benefits			
	Economic		Resource Use	Pollution generated
	Investment [USD]	Cost Saving [USD/yr]	Reductions in energy use, water use and/or materials use (per annum)	Reductions in waste water, air emissions and/or waste generation (per annum)
Hammer mill + vertical centrifugal screen is replaced by hammer mill + rasper + horizontal centrifugal screen 1. Reducing the consumption of clean water 2. Improving the crushing effect of cassava root 3. Reducing the loss of starch in the residues	0.43 million	0.149 million	Reduction of cassava roots consumption by 1080 t Reduction of water usage by 123,400 m^3	123,400 m^3 water reduced 48 t of waste (dry basis) reduced
The disc centrifuge is replaced by the multi-stage hydrocyclone station 1. Reducing the consumption of clean water 2. Reducing the loss of starch 3. Improving the product quality	0.19 million	0.79 million	Reduction of cassava roots consumption by 8920 t	3,220 t of COD will be reduced 396 t of waste (dry basis) reduced

Approach taken

The managers of Anning Starch Co., Ltd. were worried about that the factory could not meet the requirements of increasingly strict environmental protection regulations due to the huge generation of pollutants. In this context, the managers wanted to improve the production process and eliminate backward equipment of the factory, thus raise the starch recovery rate and reduce

the water usage and waste-water generation. The company got the support from the Cleaner Production Special Funds (a fund supported by the Ministry of Industry and Information Technology, MIIT, and the Ministry of Finance, MoF) in 2013 to implement these improvements. So, with the support of the CPSF as well as its own fund, several advanced Cleaner Production technologies and equipment were implemented in the factory.

RECP is a great cost-saving tool that has enabled the company to reduce the waste of raw materials and energy. Through the implementation of measures, the company has been able to improve the operating efficiency of the plant, improve product quality and recover a part of materials that were wasted. The work at the company illustrates the principle of Pollution Prevention Pays especially since the investments needed to achieve improvements had short payback times (a few months to 2 year).

Business case

Although the programme was mainly focused in improving resource efficiency, minimize generation of waste and emissions, a direct positive consequence was also obtained in the product quality, which has increased the price of the final products. RECP not only allows companies to achieve savings from decreased resource use and benefits from increased product value, but also decreases pollution to the environment.

Testimony Box
China National Cleaner Production Centre (China NCPC)
The China National Cleaner Production Center (China NCPC) was established in December 1994, by the Ministry of Environmental Protection and today provides not only comprehensive support for CP activities in China, but also technical support for CP training and consulting in the Asia-Pacific region and other neighboring developing countries. In addition, the China NCPC also supports the Ministry of Environmental Protection (MEP), the National Development and Reform Commission (NDRC) and the Ministry of Industry and Information Technology (MIIT) in policy advice and promotion of CP in China.
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China National Cleaner Production Center Contact: Dr Pan Cenxuan Address: 8 Dayangfang, Anwai Beiyuan, Beijing 100012, China Phone number: 86 10 84915298 Email: pancenx@sina.com
English Abstract (where applicable)
N/A

RECP Experiences at Tanzania Breweries Limited Mwanza plant - Tanzania

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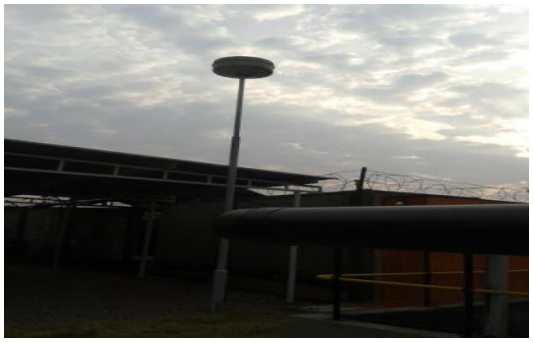
Achievements at a Glance

Execution of RECP at Tanzania Breweries has enabled the company to obtain an equivalent annual savings of USD 37,500 if it was to pay for water bills, more than USD 56,250 in energy consumptions, reduction of Carbon dioxide emissions by 50%, reduction of solid waste generation by 39% as well as reduction of waste water generation by 42%.



Before RECP-Security light (1000W)

After RECP-Solar light security system

Overview

Tanzania Breweries Limited Mwanza plant is one of the leading producers of alcoholic beverage in Tanzania. The company is located at Pasiansi, Ilemela Municipality in Mwanza City along the shore of the Lake Victoria. It was established in 1995 with a production capacity of 800,000 hl of clear beer. The company employs about 295 workers.

Tanzania Breweries Limited started RECP implementation in 2010 with the main objectives of, reducing water and energy usage, waste minimization, operational costs reduction, global sustainability compliance as well as improving business image. Since knowing that RECP is a basic tool for achieving financial savings and environmental benefits, the management of TBL commited effectively in the implementation of the RECP concept at the factory by formulating a RECP team which started implementing RECP immediately.

Benefits

RECP options in energy management has enabled the company to achieve 44% reduction in total energy consumption, this was mainly achieved through replacing higher energy consuming lights with energy saver ones, insulation of steam and condensate lines, utilization of energy efficient motors, application of energy saving compressors as well as improved condensate recovery from 60% to 85%.

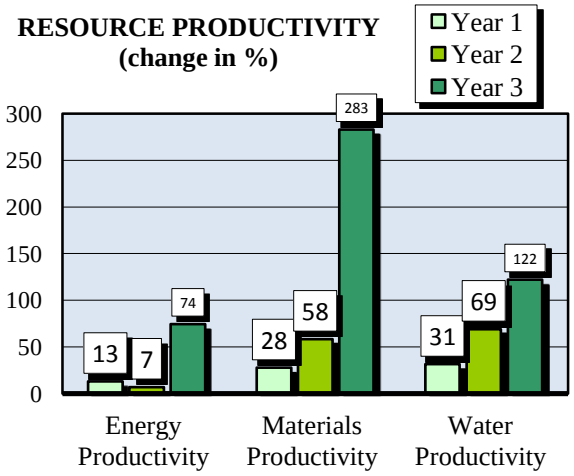
With regard to water usage, implementation of water management options like condensate recovery, installation of water sub-meters, backwash water recovery system, CO_2 Scrubber water recovery, vacuum pump water recycling, installation of water guns and weekly water leakages checklist has enabled the company to reduce its water daily consumption from an average of 5,804,639.00 Hectolitre/yr in 2011 up to an average 2,571,383.00 Hectolitre/yr in 2014 which is more than 50% reduction.

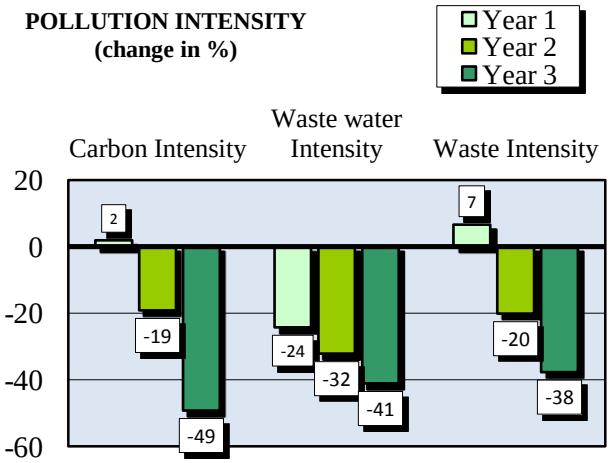
Table of Results at a Glance

Absolute Indicator	**Change (%) year 1**	**Change (%) year 2**	**Change (%) year 3**	**Relative Indicator**	**Change (%) year 1**	**Change (%) year 2**	**Change (%) year 3**
Resource Use				**Resource Productivity**			
Energy Use	-12	-11	-44	Energy Productivity	13	7	74
Materials Use	-22	-40	-74	Materials Productivity	28	58	283
Water Use	-24	-44	-56	Water Productivity	31	2	122
Pollution Generated				**Pollution Intensity**			
Air Emissions	1	-23	-50	Carbon Intensity	2	-19	-49
Waste Water	-25	-35	-42	Waste-water Intensity	-24	-32	-41
Waste	6	-24	-39	Waste Intensity	7	-20	-38
Product Output	-1	-5	-2				

Note*: The **absolute indicator** provide a measurement of how much resource use/pollution output has changed in absolute terms e.g. units of energy used or tons of waste generated. A negative percentage indicates a decrease and a positive percentage indicates an increase. The **relative indicator** gives a measurement of changes in resource use/pollution in relation to production output. **Resource productivity** provides a measurement of how much product output can be produced relation to resource used, from a sustainability point of view, productivity should increase. **Pollution intensity** provides a measurement of how much pollution is generated per unit of production output, from a sustainability perspective, intensity should decrease.*

RECP Profile





Note: *The RECP profile provides a visual overview of resource productivity and pollution intensity shown as change in % compared to the baseline values. Environmental performance is improved when resource productivity increases and when pollution intensity decreases.*

Table of Options implemented

Principal Options Implemented	Benefits				
	Economic			Resource Use	Environmental Impact
	Investment [USD]	Cost Saving [USD/yr]	Payback period	Reductions in energy use, water use and/or materials use (per annum)	Reductions in waste water, air emissions and/or waste generation (per annum)
Water Management Condensate recovery, wash room upgrade, Backwash water recovery, water meters installation, water guns, domestic water main ring upgrade, CO_2 Scrubber water recovery, Bottle washer new sprayers, Vacuum pump water recycling.	USD 112,500	USD 37,500	3 years	Reduction in water use by 3,233,256.00 Hectolitres	Reduction in waste water generation by 3,233,256.00 Hectolitres
Wastewater Management Recycling water, daily water consumption reduction, waste water metering	Included in the water management investment costs				Reduction in waste water generation by1,612,909Hectolitre (eq. to 42% reduction)
Materials Management	Normal operational			Reduction in material use by 426,461.41	Reduction in waste generation

Principal Options Implemented	Benefits				
	Economic			Resource Use	Environmental Impact
	Investment [USD]	Cost Saving [USD/yr]	Payback period	Reductions in energy use, water use and/or materials use (per annum)	Reductions in waste water, air emissions and/or waste generation (per annum)
Proper material storage, process optimization, better quality materials usage.	cost			tones	
Energy Management LED lights installation, process optimization, steam and condensate line insulation, improved condensate recovery, utilization of energy efficient Motors, application of energy saving compressors, proper control of energy equipment during day time and during off days.	USD 104,375	USD 61,250	1.7 years	Reduction in energy use by 57,170,856.40 MJ	Reduction in carbon dioxide emissions (4,458 tons-equivalent to 50% reduction)
Solid Waste Management • Machine replacement • Bottles replacement • Goal setting				Reduced bottle breakages Reduced machine downtime	Reduction in solid waste generation by 2,895.20 tons Reduced solid waste caused by bottle breakages
Air emissions Technological changes from heavy furnace oil to biomass boilers				Reduced heavy furnace oil usage	Reduction in Carbon dioxide emissions (4,458tons-eq to 50% reduction)
Process Optimization Management System installation -Montage tool **Quality Parameters Control** • SIC • PMC • PIMS&POMS	USD 54,000 USD 800		1 year		
Total	**271,675**	**98,750**			

Approach Taken

In 2010, TBL realized the importance of adopting RECP concept in order to acquire potential techniques and approach on how to handle water usage, energy and materials consumption more efficiently and reduce air emissions and waste generation.

In collaboration with the CPCT, the company started implementing RECP by first training two key staff in RECP concept, its implementation and benefits. The two trained staff formed a RECP team which comprised 10 members drawn from various sections/departments. The main task of the RECP team was to analyze the present operational status in terms of resource (water, energy and materials) consumption by conducting waste and lose analysis and mass balance using the RECP toolkit.

After realizing the benefits of RECP, the company decided to dedicate some funds for the implementation of RECP projects and established a special task force called Sustainable Development Team to strategically oversee the activities of the RECP team.

Business Case

Achievements obtained from the implementation of RECP have enabled the company to improve its operations by increasing its resource productivity, getting high quality products and reducing pollution load. The benefits realized by implementing RECP options have made the company more competitive in business, and have enabled it enhance its Corporate Social Responsibility contribution, environmental compliance and overall image in the community.

Testimony

The Cleaner Production Centre of Tanzania (CPCT) is an autonomous not -for-profit Trust which was registered under the Trustees Incorporation Ordinance, Cap 375 in April 2005. The CPCT evolved from two projects: the worldwide UNIDO/UNEP National Cleaner Production Centres (NCPCs) project which started in October 1995 and the NORAD funded five-year programme on "Cleaner Production for Ecologically Sustainable Industrial Development in Tanzania", that was implemented by the Centre, under the Vice President's Office, from December 1999. CPCT provides training, information, assessment and policy advice to a wide range of clientele in the country mainly industries, service businesses, government ministries, public and private sector institutions, academia, and NGOs/CBOs on issues related to environmental management and RECP concepts, methods, policies, practices and/or technologies.

The address of CPCT is P.O Box 105581 Dar es Salaam, 393 Mahando Street-Masaki, Email: cpct@arscp.org; Tel: 255 (022) 2602 338/40, Fax: +255 (022) 2602 339, Website: www.cpct.or.tz.

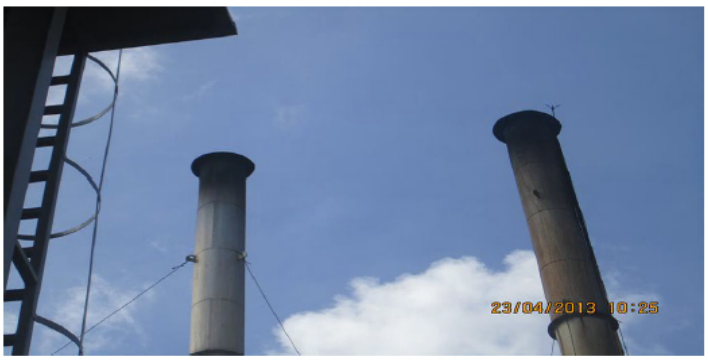
RECP Experiences at Crown Beverages Limited

The efficient and environmentally sound use of materials, energy and water - coupled with the minimization of waste and emissions - makes good business sense. Resource Efficient and Cleaner Production (RECP) is a way to achieve this in a holistic and systematic manner. RECP covers the application of preventive management strategies that increase the productive use of natural resources, minimize generation of waste and emissions, and foster safe and responsible production. Benefits are eminent in many enterprises, regardless of sector, location or size, as demonstrated by the experiences of Crown Beverage Limited-Uganda

Achievements at a Glance

Crown Beverages Ltd (CBL) embraced RECP in 2010 through UCPC, and integration of the different CP concepts such as; Waste reduction and management, Material balancing, Material flow analysis, Water and Energy conservation, Modification of processes has made a contribution to the tremendous achievements of CBL over the past two years. These tremendous achievements include; Relative reduction in Water and Energy bills, growth in volumes by 25%, Continuous improvement in food safety as evidenced by the results of the annual AIB International Food Safety audits, Renewals of permits by local authorities, Scooping of awards such as; A Bronze in the Global Chemical Leasing Award 2014, Regional RECP Award i.e Overall 2nd runners up and Winner RECP Energy Management Award 2014, National RECP Award i.e Overall 2nd Runners up and Winner Water Management Award 2013 and the Quality Excellence Bronze award in 2012 which focuses on the 3 key dimensions of Food Safety. During the initial phases of the RECP programme in 2010 and, after the implementation of all the options identified up to 2014, CBL has achieved a total saving of USD 2,396,612.50 for a total investment of USD 1,491,901.00 and BODs and CODs have reduced from 43.860tons/yr and 293.862tons/yr to 6.420tons/yr and 13.494tons/yr respectively. RECP enabled the company to simultaneously decrease waste quantities and reduce the amount of greenhouse gas emissions.

Emissions from the Boiler Before RECP



Emissions after RECP Implementation

Waste water foaming has been eliminated after RECP implementation

Overview

Crown Beverages Limited (CBL) is one of the leading producers of soft drinks in Uganda with current annual production capacity of 3.12million hectoliters and currently operates under Pepsi-cola International franchise. CBL produces a variety of brands including; Pepsi-cola, Mirinda Fruity, Mirinda Orange, Mirinda Lemon, Mirinda Red Apple, Mirinda Pineapple, 7- Up, Evervess Club Soda, Evervess Tonic, Mountain Dew and Peak mineral water and employs 513 people directly and over 4,000 indirectly with a market share of 47% of Uganda market.

CBL has been in operation for 20 years in a highly competitive environment, and also working under stringent quality standard requirements by Pepsi-Cola International (PCI) the franchise providers, and by the local environmental bodies such as UNBS and NEMA. About 90% of the inputs CBL uses are imported and over the years there has been high inflation of the Uganda Shilling against the dollar, and in order to remain competitive, CBL emphasizes the concept of Cost Containment in all her operations and with this main objective, CBL decided to implement RECP.

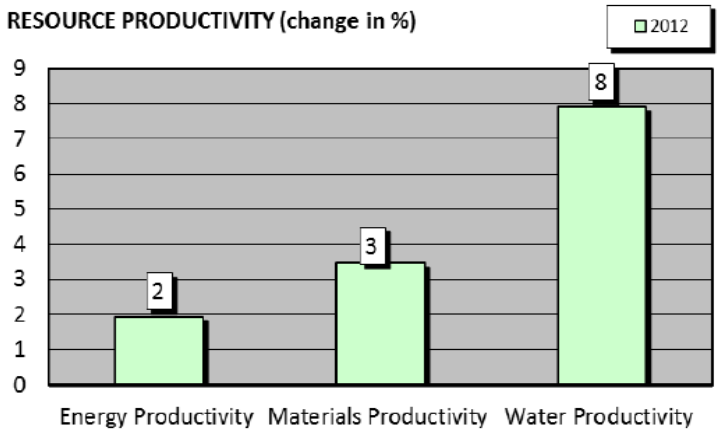
Benefits

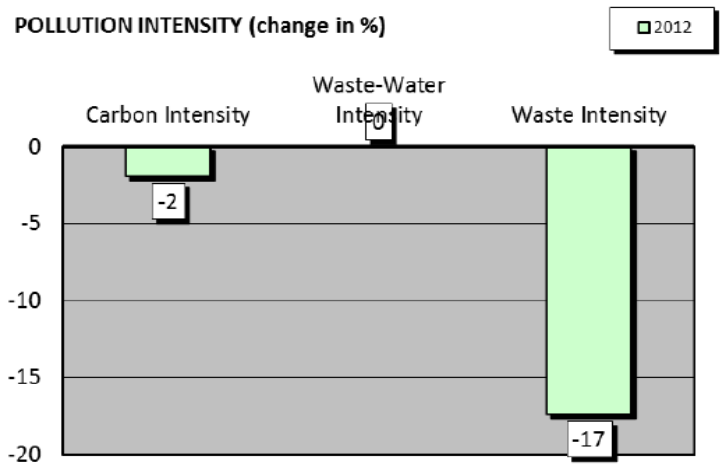
RECP implementation in Crown Beverages Ltd has been associated with tremendous savings due to number of resource efficient measures which have been implemented. These include; changing of the Wet lubrication conveyor system to a dry which resulted in savings in terms of water and lubricants resulting into prolonged life span of the expensive floor, installation of a new beverage processor on line 2 which saves 500tones of CO_2 and 60,000 litres of beverage (which was going into the drain annually), tapping of resources such as light and rain water through rainwater harvesting and use of translucent sheets, changing of Diesel Forklifts to Electrical ones plus improved fleet management brought in more savings in addition to protection of the environment and pro-longed life span of the Iron sheets and Electrical panels plus better working environment for the workers and installation of intelligent inverter drives and changing of halides lights to low energy led ones in addition to adaption of auto switching off/on of security lights resulted into high energy savings. Retrieving of glass for reuse and control of breakages, recycling and re-use of water and condensate plus continuous monitoring of leaks and segregation of wastes has simplified the handling processes and improved the working environment and safety of the workers are some of the other RECP options which have resulted into economic savings.

Absolute Indicator	Change (%)	Relative Indicator	Change (%)
Resource Use		**Resource Productivity**	
Energy Use	12	Energy Productivity	2
Materials Use	11	Materials Productivity	3
Water Use	6	Water Productivity	8
Pollution generated		**Pollution Intensity**	
Air Emissions (global warming, CO2 eq.)	12	Carbon Intensity	-2
Waste-Water	0	Waste-Water Intensity	0
Waste	-5	Waste Intensity	-17
Product Output	14		

Note: The absolute indicators provide a measurement of how much resource use/pollution output has changed in absolute terms e.g. units of energy used or tons of waste generated. A negative percentage indicates a decrease and a positive percentage indicates an increase. The relative indicators provide a measurement of changes in resource use/pollution in relation to production output. Resource productivity provides a measurement of how much product output can be produced per unit of resource use, from a sustainability perspective, productivity should increase. Pollution intensity provides a measurement of how much pollution is generated per unit of production output, from a sustainability perspective, intensity should decrease.

RECP Profile





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Success Areas;

Resource Efficient and Cleaner Production (RECP)

Resource Efficient and Cleaner Production (RECP) entails the continuous application of preventive environmental strategies to processes, products and services to increase efficiency and reduce risks to humans and the environment.

RECP addresses three sustainability dimensions individually and synergistically:
- *Production efficiency*
  - > Through improved productive use of natural resources by enterprises
- *Environmental management*
  - > Through minimization of the impact on nature by enterprises

Human development
- > Through reduction of risks to people and communities from enterprises and supporting their development

Table 2: Some of the Opportunities implemented

Principal Options Implemented	Benefits			
	Economic Investments (USD)	Annual Economic savings (USD/yr)	Annual reductions in Resource Use	Environmental Impact
Water Management				
1- Changing to Dry lubrication the PET line.(Supplier installed own equipment and supplies lubricant.)	0	33,000	15,464m3	Reduced waste water and chemicals.
2- Backwash water recovery	27,692	8,889	10,800m³	Reduced waste water.
3- Installation of bottle washer final rinse water Controls	950	2,962	3,969m³ of water	Reduced waste water.
4- Installation of a Rain water harvest tank	18,495	5,400	4,433m³	Reduced waste water. Storm volumes reduced.
5- Crate Washer Uses water from B/Washer rinse	1000	11,176	13,578m³	Reduced waste water.
6- Recirculation of Sugar dissolver pump cooling water	200	1,423	1,944m³	Reduced waste water.
7- Condensate return to the Boilers	5,000	8,473	11,575m³ of water	Reduced waste water.
8- Sub metering end user	5,632 for a new Heat exchanger			Reduced waste water and Boiler fume emissions.

Materials Management				
1- CO_2 saving by installation of a new Paramix on line2, and sub-metering of usage	323,019	215,172	500T	Reduced CO_2 emissions.
2- Reduced start-up losses of beverage by installation of the new Paramix on line 2.		12,679	60,566 Litres of beverage	Reduction in BOD and COD
3- Reduced Sugar sweeping from 5kgs per day in 2010 to 3Kg in 2012		631	672Kgs	Reduction in BOD and COD
4- Reduced syrup sample sizes from 500ml to 100ml		Sugar; 4,403 Water; 1,285	Sugar; 4689Kgs Water; 1722m^3	Reduction in BOD and COD
Energy Management				
1- Changed from Halogen bulbs to LED lights.	20,151	23,047	3,230 KW of Energy	Reduction on air emissions
2- Install Inverter drives 36 Pcs	169,231	133,269		
Air emissions				
1- Replaced 3 Diesel Forklifts with Electrical one	173,207	51,509	46,800 litres 72 Oil filters 72 Fuel filters	Reduced emissions Reduced waste generation
2- Improved fleet logistics management	0	7,826	7826 litres	Reduced emissions
3- Reduced Boiler fuel by recycling of condensate.	Replace valve(USD 1200)	7590	9677m3of water and boiler fuel	Reduced emissions

Approach taken

CBL was introduced to RECP by UCPC staff in 2010, and in October of the same year CBL signed a Memorandum of understanding with UCPC. A CP team was formed at CBL and this team was taken through a series of trainings by UCPC on RECP. In order to identify and quantify opportunities for improvement, the UCPC team and the CP team for CBL conducted an in-depth RECP assessment in the entire factory UCPC and presented the findings of the assessment to the top management and CP team for implementation. In order to facilitate smooth implementation of the identified RECP options, UCPC further organised an awareness raising seminar for the shop floor workers. UCPC team has always continued providing technical assistance to CBL in addition to involving CBL in workshops and seminars for more knowledge acquisition.

Business case

Productivity improvement has led to growth in production volumes by 25%, Continuous improvement in food safety as evidenced by the results of the AIB International Food Safety audits carried out annually, Renewals of permits by local authorities, Scooping of awards such as the Quality Excellence Bronze award in 2012 which focuses on the 3 key dimensions of Food Safety, Plant Quality and Trade Quality plus other awards from local bodies such as UMA and KACITA, better working environment for the employees, Compliance with legal requirements and enjoying good working relationships with local authorities plus good public image, and creation of job opportunities for 566 people.

Testimony Box
National Cleaner Production Centre (NCPC)
UCPC was established in October 2001 as part of the UNIDO-UNEP Cleaner Production Programme. UCPC is part of a family of over 50 National Cleaner Production Centres (NCPCs) worldwide and operates under the auspices of Trade, Industry and Cooperates. In 2010, the Centre in partnership with Lake Victoria Basin Commission embarked on promoting RECP as a tool for Sustainable Consumption and Production in enterprises within the Lake Victoria Basin and has worked with over 140 enterprises.
Contact Details
Plot 42A Mukabya Road, Nakawa Industrial Area Jinja Road P.O.Box 34644 Kampala, Uganda Tel; +256414287938/287958/0392782057 Email; silverssebagala@yahoo.com
English Abstract (where applicable)
N/A

ABOUT *RECP EXPERIENCES*

Through the joint Resource Efficient and Cleaner Production (RECP) Programme, the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Programme (UNEP) cooperate to improve the resource productivity and environmental performance of businesses and other organizations in developing and transition countries. The Programme is implemented in partnership with the Global Network for Resource Efficient and Cleaner Production (RECP*net*). This series of enterprise success stories documents the resource productivity, environmental and other benefits achieved by enterprises in developing and transition countries through the implementation of RECP methods and practices.

These successes were achieved with the assistance of the National Cleaner Production Centres, which are part of RECP*net* established with support of the UNIDO and UNEP. The success stories employ the indicator set described in *Enterprise Level Indicators for Resource Productivity and Pollution Intensity*, UNIDO/UNEP, 2010. The primer with accompanying calculator tool and further case studies are available at www.recpnet.org, as well as on www.unido.org/cp and www.unep.fr/scp/cp

RECP Experiences at Negoperú Molinera

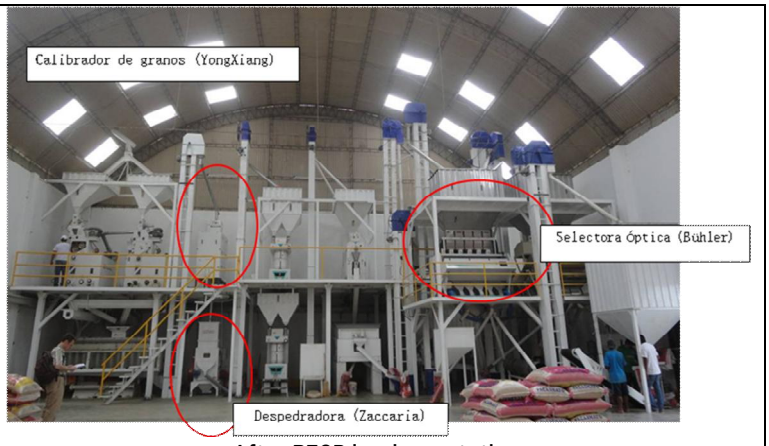
The Resource Efficient and Cleaner Production (RECP) implementation in the company Negoperú Molinera led to annual savings in the amount of USD 7,539, a credit reimbursement of USD 34,033, and improved product quality. While the initial intent of the company was improve the energy efficiency of its rice process and reducing the quantity of GHG emissions generated per unit of production, the RECP programme enabled the company to improve additionally its productivity through the efficiency of grinding (reducing by-products) and increased the milling service in the Region.

Negoperú Molinera has demonstrated that taking care of raw materials, energy, water, waste and emissions makes good business sense. RECP covers the application of preventive management strategies that increase the productive use of natural resources, minimize generation of waste and emissions, and foster safe and responsible production. Benefits are eminent in many enterprises, regardless of sector, location or size.

Achievements at a Glance

Negoperú Molinera is a Peruvian mill company which changed its obsolete technologies in its rice process through the application to the Green Credit Trust given by the Swiss Cooperation (SECO). The new clean technologies implemented were a Colour selector, a Calibrator grains and a Stoner machine which improve its productivity and reduce its environmental impacts through the efficient energy consumption per ton of rice produced.

Before RECP implementation



After RECP implementation


60 rice sacks/hour (Calibrator grains)

110 rice sacks/hour (Colour selector)

Overview

NEGOPERU MOLINERA SAC is a company that is engaged in the planting, storage, and selection of white milled rice. It has a processing plant, located in the Panamericana Norte Km 690, San Jose, city of Pacasmayo, La Libertad road. The mill processed 3,000 tonnes of paddy rice annually, which amounts to approximately 61 331 bags of 50 kg.

The company has a grinding system composed of the Buhler (Switzerland) and Super Brix (Colombia) makes electrical processing capacity of 55 bags / hour of milled rice. The project consists of replacing the system of coach to a new electronic optical system (Bühler), and includes a gauge of grain (Yongxiang) and a stoner (Zaccaria) that allow multiple benefits being the most significant increase in its productivity to 110 bags / hour of milled rice.

Benefits

After the new clean technologies implemented the company had a guarantee for the 50% of the total amount of the loan which is US$ 226,887.50 U.S dollars and a reimbursement of the 15% of the total amount of the loan which is US$ 34,032.00 U.S dollars.

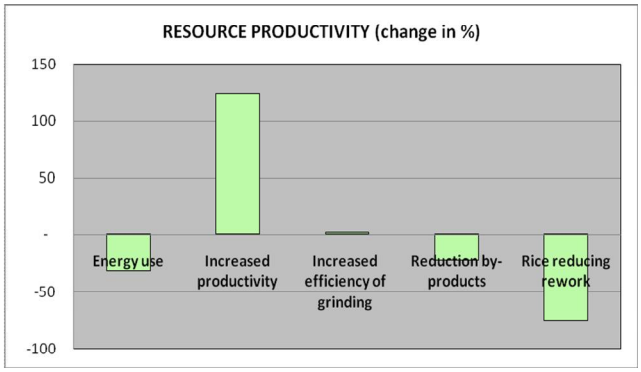
Additionally, the company had several other benefits related to its productivity and profitability. It increased the quantity of rice processed per hour, reduced the cost related the energy consumption per unit of product (equipment efficiency), reduced the rice powder generated during the process, which improved the quality and minimized of maintenance costs, but also made it possible for the company to act in a more responsible way.

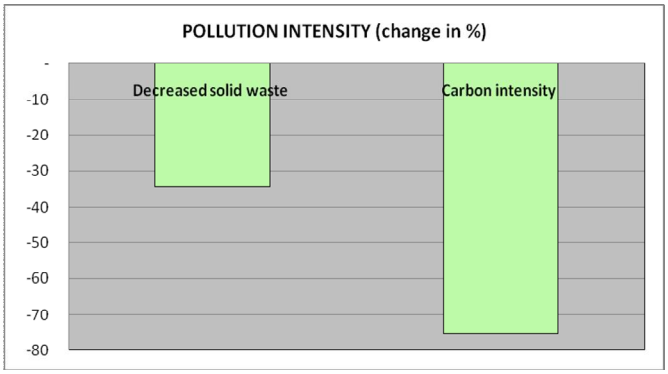
Performance	Before implementation	After implementations	Improvements	%
Resources Use				
Energy Use	43.64 kWh/t rice produced	29.7 kWh/t rice produced	- 13.94 kWh/t rice produced	-31.96%
Increased productivity	3.33 t / hour	7.46 t / hour	+ 4.13 t / hour	+ 124.02%
Increasing Efficiency of grinding	67.04%	68.13%	+ 1.09%	+ 1.63%

Reduction by-products	3.26%	2.54%	- 0.72%	- 22.09%
Rice reducing rework	22.24%	5.46%	- 16.78%	- 75.45%
Decreased solid waste	16.14%	10.60%	- 5.54%	- 34.32%

Note: The *absolute indicators* provide a measurement of how much resource use/pollution output has changed in absolute terms e.g. units of energy used or tons of rice produced. A negative percentage indicates a decrease and a positive percentage indicates an increase. The *relative indicators* provide a measurement of changes in resource use/pollution in relation to production output. *Resource productivity* provides a measurement of how much product output can be produced per unit of resource use, from a sustainability perspective, productivity should increase. *Pollution intensity* provides a measurement of how much pollution is generated per unit of production output, from a sustainability perspective, intensity should decrease.

Resource Profile





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Human development
  > Through reduction of risks to people and communities from enterprises and supporting their development

Success Areas

Additionally the new equipment allowed milling system:
- Reduce emissions of solid waste (rice powder).
- Reduce volumes ñelen, arrocillo ½ and ¾ arrocillo and increase volumes of whole white rice.
- Reduce dust emission of rice to the environment, because the new mill has eliminated cyclone dust generation.

Principal Options Implemented	Benefits			
	Economic		Resource Use	Pollution generated
	Investment [USD]	Cost Saving [USD/yr]	Reductions in energy use, water use and/or materials use (per annum)	Reductions in waste water, air emissions and/or waste generation (per annum)
Energy use	US$ 226,887.50	7,538.82 US$/year*	13.94 kWh/t whole while rice	7,538.82 US$/year*

*Referential change rate (February 2015): US$ 1 American dollar = PEN S/. 3,056.00

Approach taken

The managers of Negoperú Molinera were worried about the energy consumption and wastes of their rice process. For this purpose the managers wanted to implement clean technologies that improved their productivity, reduce the impact related to the energy consumption and waste as a result of rice process. The company got the approval of the Green Credit Trust (a credit supported by the Swiss State Secretariat for Economic Affairs, SECO) in Mayo 2014 to implement these improvements.

In order to get the credit, the company carried out a Cleaner Production programme to fulfill the requirements of the Green Credit Trust. The credit was for 226,887.00 USD and due to the great environmental performance the company got a reimbursement of USD 34,033.05.

RECP is a great cost-saving tool that has enabled the company to reduce the waste of raw materials and energy. Through the implementation of measures, the company has been able to improve the operating efficiency of the plant, improve product quality and recover a part of materials that were wasted. The work at the company illustrates the principle of Pollution Prevention Pays especially since the investments needed to achieve improvements had short payback times (a few months to 1 year).

Business case

Although the programme was mainly focused in energy efficiency, a direct positive consequence was also obtained in the milling process, which has increased the value of the final products. RECP not only allows companies to achieve savings from decreased resource use, but also decreases pollution to the environment, which benefits the surrounding employees and community.

Testimony Box
National Cleaner Production Centre (NCPC)
The CER Peru was established in 2002, and is hosted by the non-governmental organization Grupo GEA. The centre offers services in the areas of Resource Efficient and Cleaner Production (RECP), Corporate Social Responsibility (CSR) and carbon neutral markets. By mid-2010, the centre had conducted cleaner production assessments, including carbon footprint measurements, in 55 enterprises and helped 28 enterprises with CSR related strategic planning. The centre was is actively working with ministries and local governments and participates in the administration of the Green Credit Trust Fund (supported by the Swiss State Secretariat for Economic Affairs) which has financed investments in 23 enterprises - amounting to a total of USD 8.75 million.
Contact Details
Centro de Ecoeficiencia y Responsabilidad Social – CER/Grupo GEA Address: Av. Chorrillos 150. Chorrillos. Pone number: +51 467-1802 Anexo 121 -122 Web-site: http://www.cer.org.pe/ Contact: malegre@grupogea.org.pe
English Abstract (where applicable)
N/A

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RECP Experiences at Long Xuyen Rice Processing Company

The efficient and environmentally sound use of materials, energy and water - coupled with the minimization of waste and emissions - makes good business sense. Resource Efficient and Cleaner Production (RECP) is a way to achieve this in a holistic and systematic manner. RECP covers the application of preventive management strategies that increase the productive use of natural resources, minimize generation of waste and emissions, and foster safe and responsible production. Benefits are eminent in many enterprises, regardless of sector, location or size, as demonstrated by the experiences of Long Xuyen Rice Processing Company (Vietnam).

Achievements at a Glance

Based on the focus assessment that investigated the operation of main engines, heat system, the RECP assessment identified 15 RECP options to solve the identified problems. Implementing most of the feasible RECP solution, the company has achieved following results:

Saving generated by 15.729USD annually;
CO2 emission reduced by 124.9 tons annually;
Improved working environment by reduced in-house dust generation, electricity leakage and explosion risk.

Overview

Long Xuyen Food Processing Factory, which locates in An Giang province – Viet Nam is a member of An Giang Food Company. RECP assessment at the factory was conducted from Aptil to December 2013 in the frame work of the project „Industrial Waste Minimization for Low Carbon Production". The objectives of the assessment consist of the followings:

1. To improve company's management and staff awareness of RECP concept and methodology;
2. To demonstrate the RECP benefits brought to company through the full process of production analysis, RECP option identification and implementation; and
3. To reduce the emission of GHG gases and minimize wastes discharge into environment through energy consumption reduction.

The company is a small factory member of An Giang Food Company however the company manager showed strong commitment to the project. The company production accounts for about 30% of total production of mother company.

Benefits

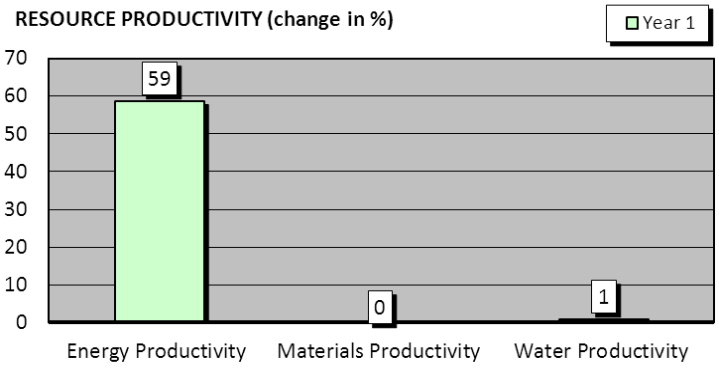
The production of a rice processing company is very simple starting with brown rice with several steps of screening, milling, polishing, drying (depending on rice humidity), sorting and packaging. The final product is white rice. Main input of the production is electricity.

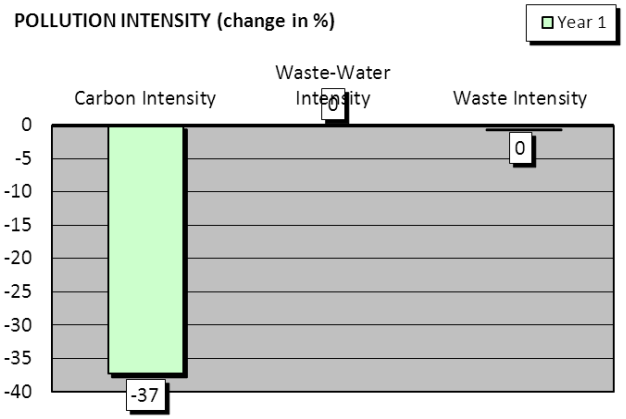
Absolute Indicator	Change (%) Year 1	Relative Indicator	Change (%) Year 1
Resource Use		Resource Productivity	
Energy Use	-36	Energy Productivity	59
Materials Use	2	Materials Productivity	0
Water Use	1	Water Productivity	1
Pollution Generated		Pollution Intensity	
Air emissions (global warming, CO_2 equivalent)	-36	Carbon Intensity	-37
Waste-water	0	Waste-water Intensity	0
Waste	2	Waste Intensity	0
Production Output	2		

Note: Absolute indicators present the total resource used by the company for the production in one year basis Relative Indicators show how efficient the production is per unit of resource consumed.

After the implementation of identified RECP solution, the company has reduced its energy used by 36% in first year, while its production has been increased by 2%. This relates to the improvement of energy productivity by 59%. As the result of this, the carbon emission per ton of product has reduced by 37%.

RECP Profile





Success Areas

Main area of improvement in the RECP assessment at Long Xuyen Rice processing company is electricity consumption. The big issues of the company are old inefficient motors, improper arrangement and maintenance of electric consumers and heating for drying rice. Therefore, RECP assessment helps company with following measures:

Increase voltage to standard (380V±2.5%).
More often check voltage to ensure it is in optimum value (370-390V).
Fix the leakage transformer oil
Replace by new transformer
Check all electric terminals in control box and fix.
Better maintenance.
Better maintenance to ensure all electric control box are free of dust.
Better load control.
Replace all small capacitors by one or two automatic capacitor 25-40kVar at control box.
Replace by high efficiency motor
Better maintenance to ensure motor belt being optimum tension.
Better maintenance to keep air filter being always clean.
Check all pressured air pipe and fix all air leakages.
Replace coal fire by rice husk
Better raw material control when buying.

Principal Options Implemented	Benefits			
	Economic		Resource Use	Pollution generated
	Investment [USD]	Cost Saving [USD/yr]	Reductions in energy use, water use and/or materials use (per annum)	Reductions in waste water, air emissions and/or waste generation (per annum)
Proactive maintenance planning for electricity equipment.	Inconsiderable			
Rearrange transformers appropriate with consumer (domestic and production purposes)	Inconsiderable	1,200	~35,000kWh	19.5 tons of CO_2
Rearrange capacitors	Inconsiderable			
Regulatory cleaning inlet air filter of compressor	Inconsiderable	140	~2,000kWh	~1,1 tons of CO_2
Replace 4 old and multi-rewound motors	12,000	2300	~33,500kWh	~19 tons of CO_2

Resource Efficient and Cleaner Production (RECP)

Resource Efficient and CLeaner Production (RECP) entails the continuous application of preventive environmental strategies to processes, products and services to increase efficiency and reduce risks to humans and the environment.

RECP addresses three sustainability dimensions individually and synergistically:
- *Production efficiency*
  > Through improved productive use of natural resources by enterprises

- *Environmental management*
  > Through minimization of the impact on nature by enterprises

Human development
  > Through reduction of risks to people and communities from enterprises and supporting their development

Approach taken

The RECP assessment at the company was conducted from April to December 2013 with the participation of VNCPC expert and company's RECP team. The RECP assessment in the company has been run within following stages:

No	Work	Brief description of work
1	Quick scan	- Introduction to the project and RECP programme. - Data collection. - Quick RECP assessment. - Assessment report to company.
2	Detailed assessment	- Not available due to problem of company.
3	RECP training for company staff	- 03 day RECP training: The training consisted of sections: PDCA and Resources Efficiency (1), RECP technique and options (2), RECP Methodology (3) and RECP assessment by themes (Raw materials, Energy, Water, Chemicals and Waste).

Business case

RECP assessment do not only focus on the internal improvement of the company operation, but also try to link with community such as solutions to help farmers to improve paddy quality.

Testimony Box
National Cleaner Production Centre (NCPC)
Vietnam Cleaner Production Centre (VNCPC) was established by the United Nations Industrial Development Organization (UNIDO) and the Ministry of Education and Training in 1998 under the financial support of the State Secretariat for Economic Affairs Switzerland (SECO). During the establishment period from 1998 to 2009, as a project implementer, 4 main activities of the Centre consisted of awareness raising, national capacity building, in-plant demonstration and policy advice for promoting the concept of Cleaner Production. Since 2009, VNCPC has been transformed into an organization with legal entity providing scientific and technological training and consulting services for promote RECP and SCP in industrial and service sectors.
Contact Details
Vietnam Cleaner Production Centre Address: P228B, Ta Quang Buu Library Building, Hanoi University of Science and Technology
Dai Co Viet Street, Hanoi, Vietnam Phone: +84 4 3868 4849 Email: vncpc@vncpc.org

ABOUT *RECP EXPERIENCES*

Through the joint Resource Efficient and Cleaner Production (RECP) Programme, the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Programme (UNEP) cooperate to improve the resource productivity and environmental performance of businesses and other organizations in developing and transition countries. The Programme is implemented in partnership with the Global Network for Resource Efficient and Cleaner Production (RECP*net*). This series of enterprise success stories documents the resource productivity, environmental and other benefits achieved by enterprises in developing and transition countries through the implementation of RECP methods and practices.

These successes were achieved with the assistance of the National Cleaner Production Centres, which are part of RECP*net* established with support of the UNIDO and UNEP. The success stories employ the indicator set described in *Enterprise Level Indicators for Resource Productivity and Pollution Intensity*, UNIDO/UNEP, 2010. The primer with accompanying calculator tool and further case studies are available at www.recpnet.org, as well as on www.unido.org/cp and www.unep.fr/scp/cp.

RECP Experiences at Pashkashesh Quarry

The efficient and environmentally sound use of materials, energy and water - coupled with the minimization of waste and emissions - makes good business sense. Resource Efficient and Cleaner Production (RECP) is a way to achieve this in a holistic and systematic manner. RECP covers the application of preventive management strategies that increase the productive use of natural resources, minimize generation of waste and emissions, and foster safe and responsible production.
Benefits are eminent in many enterprises, regardless of sector, location or size, as demonstrated by the experiences of Pashkashesh Quarry, Albania.

Achievements at a Glance

The Resource Efficient and Cleaner Production (RECP) project in Stone Quarrying and Crushing Industry included the Pashkashesh Quarry. RECP implementation in the Pashkashesh Quarry led to annual savings of EUR 38600, by investing EUR 15,700.
Most options were implemented in the Pashkashesh Quarry, where the improved blasting control resulted in lower drilling costs and the waste (or mullock) produced. Another implemented measure was the top-down extraction through high walls (10-12 m) per bench level. This way, the quarry was able to provide a more rational use of limestone, to clean stone selection and a more careful separation from topsoil and mullock. Furthermore, the improved haul road quality yielded savings in the order of 10% for fuel and maintenance and reduced the total cost of rejected materials by approximately 50%.

Overview

The Stone Quarrying and Crushing Industry is an important industrial sector in Albania. Actors in the sector are engaged in producing crushed stone as raw material for various construction activities such as construction of roads, bridges, buildings. The company's core business is the production of limestone, sand for plastering, concrete sand, and granulated stone 1 and 2. By applying the RECP options, Pashkashesh Quarry has clearly demonstrated that taking care of materials, energy, waste and emissions makes good business sense

Benefits

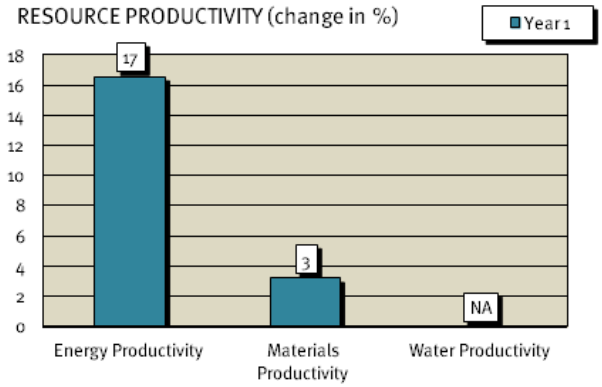
The RECP project was mainly focused on control over efficiency through monitoring. This approach has generally improved their operation through a more efficient resource use leading to significant cost reduction and improved environmental performance.

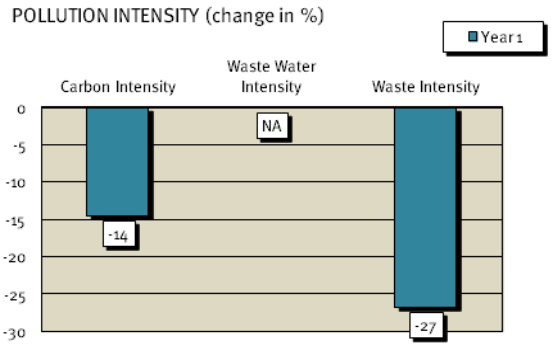
The follow-up measurements for 2011 showed that the company achieved an annual saving of EUR 38,600 as a result of implemented RECP measures.

Absolute Indicator	Change (%)	Relative Indicator	Change (%)
Resource Use		**Resource Productivity**	
Energy Use	32	Energy Productivity	17
Materials Use	49	Materials Productivity	3
Water Use	NA	Water Productivity	NA
Pollution generated		**Pollution Intensity**	
Air Emissions (global warming, CO2 eq.)	31	Carbon Intensity	-14
Waste Water	NA	Waste water Intensity	NA
Waste	12	Waste Intensity	-27
Production output	53		

In the Pashkashesh the absolute indicators are positive, which means that the use of energy, materials and waste is increased during 2011. Environmental performance is improved because the resource productivity is increased and the pollution intensity is decreased. The startup situation before implementation of RECP was recorded through monitoring of an initial baseline. Results of implemented RECP measures were monitored through follow up measurements. For energy productivity, the first follow-up measurement showed a 17% increase in productivity. For material productivity the follow-up measurement showed a 3% increase in productivity, again compared to the baseline. The pollution intensity for 2011 decreased respectively by 14% for carbon footprint and by 27% for waste.

RECP Profile





Success Areas

The results were achieved through the implementation of the following measures:

Improved site layout and quarry shaping
Quarry extraction with rationally planned benches and, haul tracks etc
Blast management (mats etc.) to prevent damage to capital equipment Better drilling patterns and blasting techniques
Optimization of running (bottle necks in transfer of material from pit/benches) etc
Road maintenance in collaboration with General Directory of Roads

Principal Options Implemented	Benefits			
	Economic		Resource Use	Pollution generated
	Investment [EUR]	Cost Saving [EUR/yr]	Reductions in energy use, water use and/or materials use (per annum)	Reductions in waste water, air emissions and/or waste generation (per annum)
Improved site layout and quarry shaping Quarry extraction with rationally planned benches and, haul tracks etc Blast management (mats etc.) to prevent damage to capital equipment Better drilling patterns and blasting techniques	0	2,600	Reductions in materials use: lower explosives consumption	Reductions in waste generation: Reduction of the rejected material "mullock", by 50%
Optimization of running (bottle necks in transfer of material from pit/benches) etc	0	4,000	Reduction in energy use 58 241 kWh	Reduction of 16 tons of CO2/year
Road maintenance in collaboration with General Directory of Roads	15,700	32,000	Reductions in materials used: 10% for fuel	Reduction of 272.00 tons CO2-eq/yr Reduction by 14%

Approach Taken

Pashkashesh Quarry commenced the Programme in 2010 and its implementation is still continuing. However, the data herewith represents monitoring results up to 2011. RECP has been achieved by performing quarry extraction with rationally planned benches and haul tracks etc. The company began by implementing no and low cost investment options such as better drilling patterns and blasting techniques and revising blast management to prevent damage to capital equipment. The company has so far achieved great economic benefits from cost-cutting measures in addition to ensuring compliance with the national legislative framework governing environmental management. Through this experience, they have learned that the top management commitment is critical to the successful implementation of RECP. Another important insight arising as a result of the Programme implemented at Pashkashesh is that since RECP is a continuous process, the savings gained from the implemented no cost options can be utilized for implementing additional RECP investment. The most important one, which is still ongoing at Pashkashesh, is related to transport as it contributes by 50% to the production cost. Further collaboration with other road users to build a new road will reduce truck wear and fuel use fundamentally. This investment will precede the use of larger trucks versus old and smaller ones and will reduce the quantity of fuel and truck wear as well.

Business Case

CP efforts resulted in a range of work including: changes to quarry morphology and benching techniques to improve logistics and improve quarrying efficiency, revision of drilling and blasting layouts to improve fragmentation and reduce product contamination, testing of new explosives for reduced waste, improved safety and improved fragmentation, consideration of road maintenance regimes to save fuel and maintenance costs, and ongoing assessment and planning to recover crusher dust as product.

Due to the RECP Programme, "Pashkashesh" Quarry has significantly improved its competitiveness by reducing production costs and improving product quality, occupational health and safety and general environmental performance. Furthermore, the management is committed to continue in the implementation and monitoring of RECP measures.

Testimony Box

National Cleaner Production Programme in Albania

Officially launched in 2010, the National Cleaner Production Programme in Albania, is established under the guidance of NCPP Steering Committee with membership of national government counterparts, UNRC, UNIDO, and UNEP. The NCCP is hosted by ECAT Tirana (Environmental Centre for Administration and Technology) established in 1995 by EU/DG Environment, German and Albanian Government to serve as an advisory body for the Ministry of Environment. ECAT has a sound experience of country-specific and capacity building projects related to energy, technical assistance, pollution, waste and healthcare waste, institutional assessment and policies.

The NCCP in Albania has a double fold purpose: to upscale RECP through plant demonstrations and industry outreach activities, and to mainstream RECP policy instruments into country's relevant legislation.

A total of 36 companies of food, beverage, quarry and tourism benefited from practical solutions identified for cost effective reduction of energy, water consumption, waste, effluents and emissions.

A pool of 35 trainee experts coming mainly from academia and industry, have been trained and about 20 trainings have been held. In addition, UNIDO and UNEP supported the NCPP to develop into a national RECP focal point, through contribution to national workshops and conferences, industry and policy consultations (about 17 in total), as well as in development of policy instrument package to promote RECP in Albania as RECP Mainstreaming Strategy; Primer for Albanian SMEs; Sector Specific Guidelines and Success Stories

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About RECP Experiences

Through the joint Resource Efficient and Cleaner Production (RECP) Programme, the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Programme (UNEP) cooperate to improve the resource productivity and environmental performance of businesses and other organizations in developing and transition countries. The Programme is implemented in partnership with the Global Network for Resource Efficient and Cleaner Production (RECP*net*). This series of enterprise success stories documents the resource productivity, environmental and other benefits achieved by enterprises in developing and transition countries through the implementation of RECP methods and practices.

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RECP Experiences at ACEROS INDUSTRIALES

The efficient and environmentally sound use of materials, energy and water - coupled with the minimization of waste and emissions - makes good business sense. Resource Efficient and Cleaner Production (RECP) is a way to achieve this in a holistic and systematic manner. RECP covers the application of preventive management strategies that increase the productive use of natural resources, minimize generation of waste and emissions, and foster safe and responsible production. Benefits are eminent in many enterprises, regardless of sector, location or size, as demonstrated by the experiences of ACEROS INDUSTRIALES in Colombia.

Achievements at a Glance

The company receives steel bars and then they are transformed into coils of different sizes and shapes. Originally the company had a chemical preparation of metals. This process was changed to a mechanical one. Aceros Industriales changed completely the production line, the layout and the basis of the production process with this investment. The impact was reflected in positive changes in environment, economic and social. New production process also reduced the processing times and got better the quality of the product. The competitiveness of the company was clearly potentialized, giving an example of sustainable

BEFORE

NOW

Overview

Aceros Industriales S.A. is a company founded in 1977 and works on transforming in cold ferrous and non-ferrous materials (tefilation). They used, from the beginning of the company, the chemical stripping process, due to the fact that in that time it was the only technology available. As a part of a continuous improvement program Aceros Industriales S.A. makes the decision of getting a world level concerning its technology, by changing its productive system and acquiring equipments for shot blasting and decalamination of brushes, thus eliminating the chemical stripping.

By the mechanical stripping process, a decrease of environmental damage was achieved (diminishing in DQO and mud generation, among others), a better performance of the industrial process, the incorporation of industrial incomes diminished, maintenance

and operation of the shot blasting and decalamination units got easier and an estimated saving rate of 500.000 USD per year was achieved.

After lamination steel (hot deformation) the surface is covered by a crust formed by iron oxides. This calamine impairs the cold deformation process, affecting the surface quality of the material. This is where the material surface cleaning is necessary to remove the calamine.

The cleaning processes are available for this are chemical and physical means. In corrosion chemically process it made by using acids (hydrochloric and sulfuric generally), which attack the material forming iron chlorides or sulphides as appropriate, achieving highly results in removing the calamine. Although the quality is pretty good the chemical process has a serious environmental impact caused by these practices, the process requires heating, which leads to emissions of greenhouse gases. In addition large quantities of sludge and hazardous discharges are generated, thus affecting water resources, air and soil. The physical media are the latest in the global industry. With them we reduce the negative environmental impacts without compromising the quality in the process of surface cleaning. Among the physical processes we can mention the blasting and pickling using brushes. The blasting process is a surface treatment technique by impact, is a bombardment of abrasive particles at high speed (65 -110 m / s) to impact the treated part produces the removal of surface contaminants. The brushes used for pickling steel, which, by means of a rotational movement, calamine tears of the material surface, thus achieving a clean surface suitable for cold deformation.

Benefits

The environmental benefits of the change were:

The afluents were completely eliminated and they stopped in descharding anually over 60 tons of sludge from the company (the company dumped its small unit of wastewater treatment and made a parking lot out of this space).
The company stopped producing 400 ton/year of CO2 emissions (the boiler was sold and is no longer used diesel and gas fuel while the new equipment requires more electricity, the net energy and the CO2 effect remains highly positive).
The company reduced around 8000 m3 per year in water consumption
It stopped using hazardous chemical products

Indicator	Before	After	Reduction	% Reduction
Lodos generados (Kg/ Ton producida)	0,026	0	0,026	100%
Consumo de agua (m^3 / Ton producida)	0,972	0,45	0,522	54%
Caudal de Agua Residual Industrial (m^3 / Ton Producida)	0,073	0	0,073	100%
Carga de DQO (Kg DQO / Ton Producida)	0,043	0	0,043	100%
Costo preparación superficial / Kg producido	60	50	10	17%
Consumo de ACPM (Gal / Año)	50.400	0	50.400	100%
Emisión de CO_2 por combustión de ACPM (Kg CO_2 / mes) [2]	20.355	0	20.355	100%
Emisión de CO2 por consumo de energía (Kg CO_2 / mes)	46.235	50.403	-	-
Emisiones Totales de CO_2 (Kg / mes)	66.590	50.403	16.187	24%
Emisiones de CO_2 / (Ton Producida)	83,2	63	20	24%

Resource Efficient and Cleaner Production (RECP)

Resource Efficient and Cleaner Production (RECP) entails the continuous application of preventive environmental strategies to processes, products and services to increase efficiency and reduce risks to humans and the environment.

RECP addresses three sustainability dimensions individually and synergistically:

- *Production efficiency*
  > Through improved productive use of natural resources by enterprises

- *Environmental management*
  > Through minimization of the impact on nature by enterprises

Human development
> Through reduction of risks to people and communities from enterprises and supporting their development

Success Areas

New production process also reduced the processing times and got better the quality of the product.

The competitiveness of the company was clearly potentialized, giving an example of sustainable industrial production modes.

Main economic impacts were:

Improved in product quality.
An increased productivity due to re-duce in production time
Reduction in chemical products and fuel consumption.
Less maintenance of other equipment of the company that were corroded by the acid used in the chemical treatment.
Improving the quality just is estimated by the company to be worth an additional fee of 5% resulting in additional revenue per year by U$300.000.
The productivity was increased significantly, so working capital could be reduced by around 1,5 million dollars.
In total economic benefits are estimated at approximately 500.000 USD per year, which led to a payback in less than two years.

Testimony Box
National Cleaner Production Centre (NCPC)
This project was financed by the Green Credit Line. For more information go to http://www.lineadecreditoambiental.org/lca/en The investment made by the company on the new equipment was 640,000 USD and the company got reimburse of 200,000 USD thanks to the Green Credit Line. The Green Credit Credits has granted since 2003 until middle of 2015 over US$ 12,433,431 and the total of reimbursement have been around US$ 3,403,841.
Contact Details
Centro Nacional de Produccion Mas Limpia y Tecnologías Ambientales Cra. 46 Nº 56-11 Piso 8 Edificio Tecnoparque. Tel:(57 4) 460 17 77 - Fax:(57 4) 513 09 30 Medellín - Colombia
English Abstract (where applicable)
N/A

RECP Experiences at M/s. Somany Ceramics Ltd. Gujarat, India

Achievements at a Glance

Gujarat Cleaner Production Centre (GCPC), Gujarat, India is working with M/s. Somany Ceramics Limited for RECP implementation in Gujarat. RECP refers to the continuous application of preventive environmental strategies and total productivity methods to processes, products and services to increase efficiency and reduce risks to humans and environment. RECP achieves the three sustainability dimensions individually and synergistically: Production Efficiency, Environmental Management and Human Development.

After the RECP implementation, the total investment is USD 15135 **(One time)** and saving was USD 264976 **(Yearly)** with payback period of 21 Days.

The RECP involves the improvement targeting resource efficiency, process improvement, energy efficiency and reduced environment impacts, by employing appropriate technologies, both environment and economic gain as achieved.

Overview

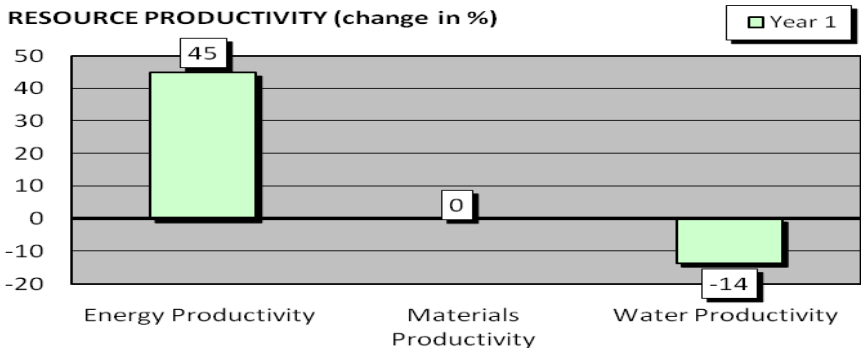
M/s. Somany Ceramics Limited is engaged in manufacturing of Ceramic Glazed wall and Floor tiles. The installed capacity of wall and floor tiles is 18000 SQM of wall and floor tiles per day. The floor tiles manufacturing facility has technological edge over the present technology with single firing facility of tile,s higher production capacity and less process loss and recovery of heat. The single firing productivity is higher and it is more energy efficient. The best performance in term of process control is achieved by output of previous process becomes input of next process, so intermediate quality parameters checked for assurance to get finished products with good quality. As an environmental friendly company, there is no wastage discharged outside the plant. All types of 100 % waste is reused in process after recycling. Even effluent treated water is also 100% recycled in process.

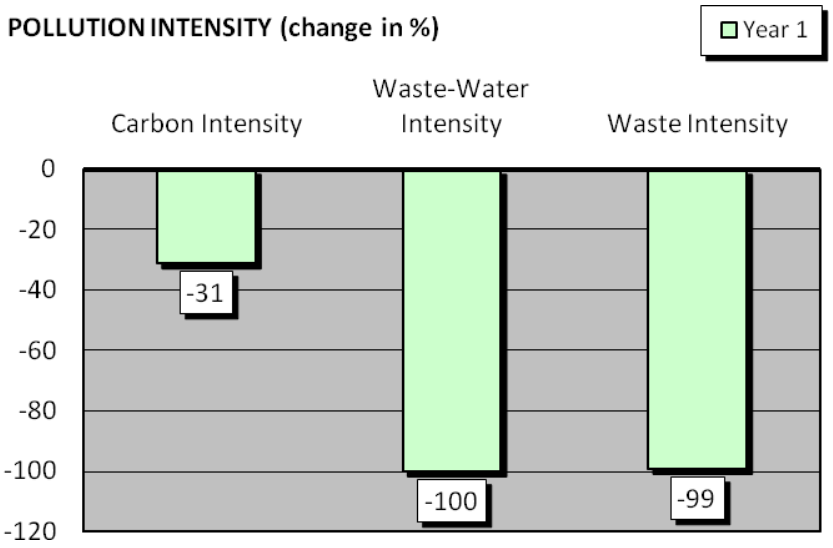
Benefits:

- Cost saving through reduced wastage of both energy and materials
- Performed cost saving on End-of-Pipe waste treatment
- Improved operating efficiency of the plant
- Increased product quality and consistency
- Recovered waste materials
- Improved the work environment (Health and Safety of the workers)
- Improved capacity of ceramic industrial floor personnel
- Developed new and improved market opportunities through waste exchange

ABSOLUTE RECP INDICATORS					
Indicator	**Unit**	**Baseline (B) (Before RECP intervention)**	**Year 1 A (After RECP implementation)**	**Change (C) C=100*(A-B)/B [%]**	**Difference Between A and B**
Resource use					
Energy Use	[kWh/yr]	130,380,720.00	95,368,114.00	-26.85	-35,012,606.00
Materials Use	[ton/yr]			0.00	0.00
Water Use	[m3/yr]	105,500,000.00	129,332,000.00	22.59	23,832,000.00
Pollution					
Carbon dioxide	[ton CO_2-eq/yr]	26,329.58	19,259.00	-26.85	-7,070.58
Waste-Water	[m3/yr]	31,185.00	1.00	-100.00	-31,184.00
Waste	[ton/yr]	120.00	1.00	-99.17	-119.00
Product Output					
Product Output: P	[ton/yr]	94,500.00	100,139.00	5.97	5,639.00

Results at a glance





Success Areas

The results were achieved through the implementation of the following measures:

- Defined and reduced all types of losses in every process
- Waste plastic containers and used oil sell to registered Re- Processors & Recyclers.
- Installation of sub energy & fuel meters with respect to quantity centre
- Precise and perfect management by right input for quantifying production and losses
- Reduced losses in: washing loss at spray dryer, dust loss, green pitchers at press and glazing section
- Used rubber tire in low in cost and used as seal at ball mill lead to avoid leakage during grinding
- Reduction in bad printed tiles by optimization in speed of machine
- Periodic maintenance report of strapping machine at packaging area to avoid strap loss.
- Plastic covers are provided while loading material to ball mill to reduce spillage.
- Press charging system is modified by limiting movement of filter to the charger to avoid spillage.
- To avoid formation of lumps and bigger size granules from dust in silos during ageing due to % of moisture, temperature and humidity, online roller grinding system is designed in house to eliminate this loss at vibro shieve at press.
- Store department has made break up in issuing raw material & spare parts Q/C wise instead of whole process wise (Department wise)
- Dust collector efficiency improved to collect flying dust recovers for reuse.
- Reusing 100 % treated water from effluent treatment plant in wet grinding of body material in Ball Milling.
- Reusing 100 % sludge generated from Effluent Treatment Plant in body preparation.
- Installation of hydro filter unit to collect flying dry glaze particles during application.
- Installation of Pulse jet dust collectors unit for collecting flying dust near press and dry sizing and chamfering area.
- Installation of Cyclone and wet scrubber unit to control fine dust escape from chimney of spray dryers.

Resource Efficient and Cleaner Production (RECP)

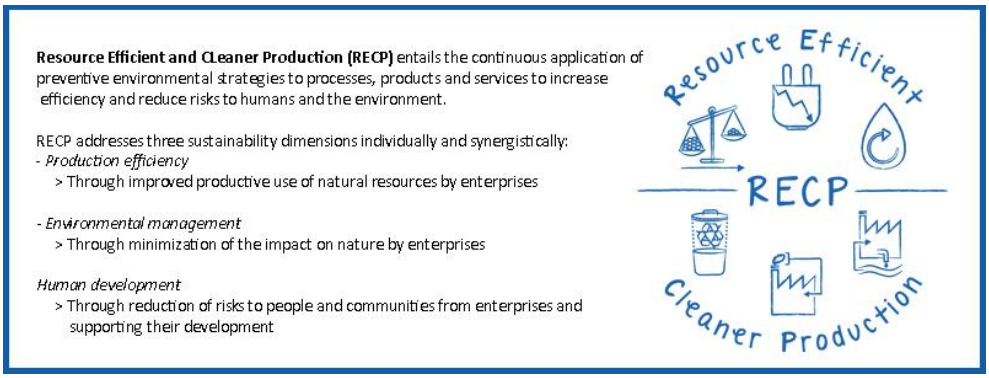


Table 2: Options implemented

Principal Options Implemented	Benefits			
	Economic		Resource Use	Pollution generated
	Investment [USD]	Cost Saving [USD/yr]	Reductions in energy use, water use and/or materials use (per annum)	Reductions in waste water, air emissions and/or waste generation (per annum)
De- flocculants consumption Cost reduced by modifying body composition from 7 Clays to 4 clays	Nil	104616.316 USD	Material consumption reduced from 11.3 Kg/MT to 9.5 Kg/MT	Reduction in raw material consumption
Glaze Scrubbed from wall tiles GGP, used as engobe for floor tiles	1513.546 USD	21401.544 USD	Material saved: DFF : 40.6 ton & FTP :24.95	Reduction in waste
On line Roller Grinding Machine Designed and installed to control Glost Pitcher Loss and Quality Loss	12108.369 USD	44649.614 USD		Reduction in waste
Minor Bad Print Green tiles earlier Scrap and sent to reprocess, but after knowing the Recycle cost, six times higher than Input raw material,	Nil	16936.582 USD	GGP reduced from 3.43% to 2.81%	

now it is sent to final firing application and get reprocess cost saved.				
Cumulative action for One line Big Granule Grinding system, controlling GGP and Spillage of Dust material	1513.546 USD	77372.4837 USD		

Approach taken

The overall objective of the programme is to facilitate promotion of Resource Efficient and Cleaner Production without entailing excessive cost in ceramic industry so as to strengthen environmental management and pollution control in the industry. Cleaner production methodology was taking as an approach for this project which includes List Process Steps, Identify Wasteful Processes, Process Flowchart, Material and Energy Balance, Identify Cause of Waste, Technical-Financial- Environmental Feasibility, Implementation of Cleaner Production Solution etc.

Business case

Resource Efficient and Cleaner Production means the most effective and advanced stage in the development of activities and their methods of operation which indicates the practical suitability of particular techniques for providing the basis for emission limit values and other permit conditions designed to prevent and where that is not practicable, to reduce emissions and the impact on the environment as a whole.

Testimony Box
Gujarat Cleaner Production Centre (GCPC), Gujarat, India
The Gujarat Cleaner Production Centre (GCPC) has been established by Industries & Mines Department, Govt. of Gujarat under Gujarat Industrial Development Corporation (GIDC) in the year 1998 with technical guidance of UNIDO and since then the centre is actively engaged in the promotion of Cleaner Production (CP)/Clean Technology (CT) through its various activities such as orientation/awareness programmes, CP and CT Assessment Projects etc. Contributions of GCPC over the years towards promotion of Cleaner Production in the state of Gujarat to improve the productivity and the environmental problems faced by SMEs have been significant. GCPC had also played active role in framing Industrial Policy 2004, 2009 and 2015, also supported in developing many financial assistance schemes pertaining to CP/CT. GCPC is also member of RECP of UNIDO and Climate Technology Centre and Network (CTCN), a working arm of UNFCCC. GCPC have so far conducted more than **200 Orientation Programmes** in different colleges, organizations and industries associations. The centre has successfully completed more than **100 CP Demonstration Projects** in various sectors like Textile, Dairy, Pulp & Paper, Chemical, Petrochemical, Pharmaceutical, Fish Processing, Ceramic etc.
Contact Details
Dr. Bharat Jain Member Secretary Gujarat Cleaner Production Centre Block No: 11-12, 3rd Floor, Udhyog Bhavan, Gandhinagar, Gujarat (India) Phone: + 91 79 232 44 147 Mail: gcpc11@yahoo.com, info@gcpcgujarat.org.in URL: www.gcpcgujarat.org.in
English Abstract (where applicable)
N/A

RECP Experiences at Dolce Vita Hotel

The efficient and environmentally sound use of materials, energy and water - coupled with the minimization of waste and emissions - makes good business sense. Resource Efficient and Cleaner Production (RECP) is a way to achieve this in a holistic and systematic manner. RECP covers the application of preventive management strategies that increase the productive use of natural resources, minimize generation of waste and emissions, and foster safe and responsible production. Benefits are eminent in many enterprises, regardless of sector, location or size, as demonstrated by the experiences of at Dolce Vita Hotel, Albania.

Achievements at a Glance

The Resource Efficient and Cleaner Production (RECP) project in at Dolce Vita Hotel. Good housekeeping options in Dolce Vita Hotel requiring organizational measures and no investments were considered as important opportunities by the hotel management have been directly implemented and led to cost reductions of EUR 3,900/year and reductions of energy, water and materials consumption.
Resource efficiency and pollution reduction was achieved by focusing on simple, organizational and low investment process change measures such as: the policy for changing towels at request, the decrease of the temperature for laundry washing, the reduction of the water flow in the bathrooms by installing flow restrictors (aerators) at the taps, the replacement of the existing bulbs with low energy consumption bulbs in the rooms and corridors, the installation of movement sensors, the replacement of the amenities from the bathrooms with soap & shampoo dozers/dispensers, etc.

Providing shadow for direct sunlight

“Changing Towels on Request”

Lowering laundry temperature

Overview

Dolce Vita Hotel is a four-star hotel situated at the seaside of the Adriatic Sea, about seven kilometers away from the town of Durrës, Albania. The hotel is located in a pine forest, next to the sandy beach and is open all year to its local and international customers. Hotel Dolce Vita was built during 2008 with a total of 48 rooms, 3 restaurants F&B (total capacity 220 seats), 2 kitchens serving Albanian and other European cuisine, a swimming pool (size 600 m2), a conference room (total capacity 100 seats), laundry, gift shop, logistic and service locations.

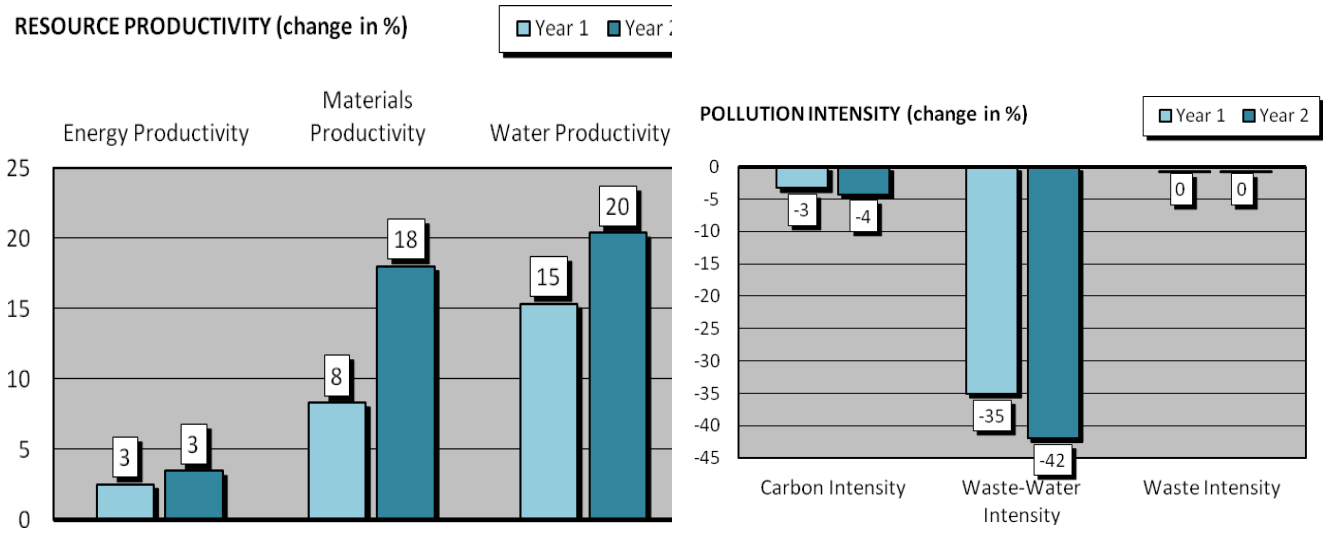
Benefits

During the audit the CP team identified a total number of 27 RECP opportunities for improvement out of which; 14 were good housekeeping options recommended for direct implementation, while 13 options requiring low to high costs investments have been evaluated for their feasibility. Good housekeeping options requiring organizational measures and no investments were

considered as important opportunities by the hotel management have been directly implemented and led to cost reductions of energy, water and materials consumption.

Absolute Indicator	Change (%) Year 1	Change (%) Year 2	Relative Indicator	Change (%) Year 1	Change (%) Year 2
Resource Use			**Resource Productivity**		
Energy Use	-12	-13	Energy Productivity	3	3
Materials Use	-17	-24	Materials Productivity	8	18
Water Use	-22	-25	Water Productivity	15	20
Pollution generated			**Pollution Intensity**		
Air Emissions (global warming, CO2 eq.)	-13	-14	Carbon Intensity	-3	-4
Waste Water	-42	-48	Waste water Intensity	-35	-42
Waste	-10	-10	Waste Intensity	0	0
Production output	-10	-10			

RECP Profile



Resource Efficient and Cleaner Production (RECP)

Resource Efficient and Cleaner Production (RECP) entails the continuous application of preventive environmental strategies to processes, products and services to increase efficiency and reduce risks to humans and the environment.

RECP addresses three sustainability dimensions individually and synergistically:

- *Production efficiency*
  > Through improved productive use of natural resources by enterprises

- *Environmental management*
  > Through minimization of the impact on nature by enterprises

Human development
> Through reduction of risks to people and communities from enterprises and supporting their development

Reduce the frequent change of linen up to once in three days
Implement policy for changing towels at request
Turn off the heated roll ironer when it is not in use
Turn off equipments when not in use
Lower the temperature for laundry washing from 90 °C to 60°C (white laundry) and from 75°C to 40°C (colored)

Principal Options Implemented	Benefits			
	Economic		Resource Use	Pollution generated
	Investment [EUR]	Cost Saving [EUR/yr]	Reductions in energy use, water use and/or materials use (per annum)	Reductions in waste water, air emissions and/or waste generation (per annum)
OPTION 1. Reduce the frequent change of linen up to once in three days	0	NA	Reduction in energy, water, detergent consumption	Reduction in waste water, CO2 emission, waste generation
OPTION 2. Implement policy for changing towels at request	0	700	5,900 kWh/year 71 m3 water/year	Reduction in waste water, CO2 emission by 0.12 tons/year, waste generation
OPTION 3. Turn off the heated roll ironer when it is not in use	0	350	Reduction in energy consumption	Reduction in CO2 emission
OPTION 4. Implement rule for housekeeping to shadow the rooms after cleaning and when not occupied	0	NA	Reduction in energy consumption	Reduction in CO2 emission, waste generation
OPTION 5. Turn off equipments when not in use	0	350	3,100 kWh/year	Reduction in CO2 emission by 0.06 tons/year, waste generation
OPTION 6. Lower the temperature for laundry washing from 90 °C to 60°C (white laundry) and from 75°C to 40°C (colored)	0	2500	21,800 kWh/year	Reduction in CO2 emission by 0.46 tons/year, waste generation

Approach Taken

The main reason for joining the Programme were concerns related to energy and water consumption; the hotel's management has been attracted by the idea of exploring new possibilities for achieving cost reductions and environmental performance, through the utilization of the Resource Efficient and Cleaner Production (RECP) methods implemented with the support of Environmental Centre for Administration and Technology (ECAT Tirana), Albania The in-plant hotel assessment has been carried out for six months starting in April 2010. This success story presents audit and monitoring results for years 2010 and 2011, compared with the baseline data of year 2009.

Business Case

The hotel management has saved at least EUR 3,900 during the initial phases of the RECP Programme after the implementation of no cost options. Due to this experience, staff and guests are actively encouraged to participate in energy, water and waste reduction measures. The vision of the hotel is to be a truly eco-friendly hotel with sustainable practices in place. The RECP Programme has contributed by significantly and continuously improving the hotel's general environmental performance. Besides the savings of energy, water and materials consumptions, the company's environmental image has been improved and the

environmental impact has decreased, delivering benefits for the surrounding community. The RECP Programme has brought improvements in working practices and beneficial changes in employees and guest behavior.

Testimony Box

National Cleaner Production Programme in Albania

Officially launched in 2010, the National Cleaner Production Programme in Albania, is established under the guidance of NCPP Steering Committee with membership of national government counterparts, UNRC, UNIDO, and UNEP. The NCCP is hosted by ECAT Tirana (Environmental Centre for Administration and Technology) established in 1995 by EU/DG Environment, German and Albanian Government to serve as an advisory body for the Ministry of Environment. ECAT has a sound experience of country-specific and capacity building projects related to energy, technical assistance, pollution, waste and healthcare waste, institutional assessment and policies.

The NCCP in Albania has a double fold purpose: to upscale RECP through plant demonstrations and industry outreach activities, and to mainstream RECP policy instruments into country's relevant legislation.

A total of 36 companies of food, beverage, quarry and tourism benefited from practical solutions identified for cost effective reduction of energy, water consumption, waste, effluents and emissions.

A pool of 35 trainee experts coming mainly from academia and industry, have been trained and about 20 trainings have been held. In addition, UNIDO and UNEP supported the NCPP to develop into a national RECP focal point, through contribution to national workshops and conferences, industry and policy consultations (about 17 in total), as well as in development of policy instrument package to promote RECP in Albania as RECP Mainstreaming Strategy; Primer for Albanian SMEs; Sector Specific Guidelines and Success Stories

Contact Details

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Tirana, Albania
Phone / Fax: +355 4 2223930
e-mail: mima@ecat-tirana.org
www.recp.al

About RECP Experiences

Through the joint Resource Efficient and Cleaner Production (RECP) Programme, the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Programme (UNEP) cooperate to improve the resource productivity and environmental performance of businesses and other organizations in developing and transition countries. The Programme is implemented in partnership with the Global Network for Resource Efficient and Cleaner Production (RECP*net*). This series of enterprise success stories documents the resource productivity, environmental and other benefits achieved by enterprises in developing and transition countries through the implementation of RECP methods and practices.

These successes were achieved with the assistance of the National Cleaner Production Centres, which are part of RECP*net* established with support of the UNIDO and UNEP. The success stories employ the indicator set described in *Enterprise Level Indicators for Resource Productivity and Pollution Intensity*, UNIDO/UNEP, 2010. The primer with accompanying calculator tool and further case studies are available at www.recpnet.org, as well as on www.unido.org/cp and www.unep.fr/scp/cp.

RECP Experiences at Hotel 2001

The efficient and environmentally sound use of materials, energy and water - coupled with the minimization of waste and emissions - makes good business sense. Resource Efficient and Cleaner Production (RECP) is a way to achieve this in a holistic and systematic manner. RECP covers the application of preventive management strategies that increase the productive use of natural resources, minimize generation of waste and emissions, and foster safe and responsible production. Benefits are eminent in many enterprises, regardless of sector, location or size, as demonstrated by the experiences of Hotel 2001, located at Maputo in Mozambique.

Achievements of Hotel 2001

The implementation of Resources Efficiency and Cleaner Production (RECP) will contribute to continuous improvement of Hotel 2001 performance indicators, where we expect a reduction of 5,135 kWh per year on electricity consumption, reduction of approximately 15% on water consumption and recovery of about 72% of recycle material.

The Hotel 2001, has demonstrated that taking care of the environmental impact of the Hotel's activities, make it more competitive, ensuring that guests can spend more their time at Hotel 2001 in proper hygienic conditions, and showing alternatives to the hotel management that highlights options, to minimize the environmental impact that might arise from the effluents generated in the hotel area.

Overview

The hotel is three stars and has 58 rooms, restaurant, pastry, room service, tourist information, business services and two waiting rooms. The suppliers of consumables at the hotel are mostly from the region - purchases are made in the domestic market and in local grocery stores, including also meat products and vegetables are provided by local businesses.

It was defined as priority and opportunity by the company as follows:

- Improve electric boilers water heating system in the guest rooms, improve energy use in public places.
- Reduce water consumption in public bathrooms.
- Improve waste the segregation system and its management.

The RECP programme was mainly focused on improving electric water heating system in the guest rooms, improving energy use in public places, reduce water consumption in public bathrooms and improving waste the management by putting in place the the waste segregation system with coded containers. .

The benefit gained by improving the water heating electric boilers system in the guest rooms consisted in improvement of energy efficiency.

Before

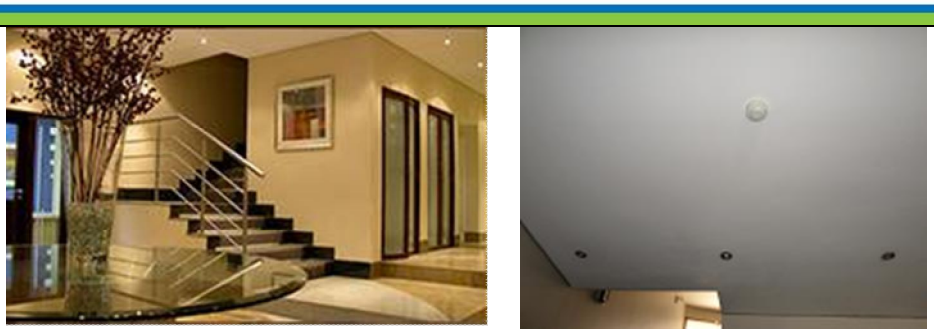
After

Figure 1 – Two news heaters water installed

The financial savings from improvement of the energy use in public places consisted in reduction of energy consumption of around 108 KWh of electricity per day, which represents annual savings of 39,420 KWh/year equivalents to USD 3,500 /year, Reduction of CO_2 emission and reduced costs of electricity bills . No investment is required. Although the economic and environmental benefits may seem small, the implementation of this opportunity is important to introduce the habit of energy savings and good housekeeping to the employees.

Before

After



Before After

Figure 2 – Lights turned in waiting room and corridors during the day

The turn of the lights whenever are not required the hotel employees were also made aware on this substantial potential of energy savings, and were trained and asked to be careful, do not to leave lights on while they can work with natural lighting.

Before After

Figure 3 – Lights turned when not required

The environmental benefit from implementing it is reflected in the reduction of CO_2 needed to produce the electricity for lighting and therefore in reduction of the electricity bills cost of the Hotel 2001. No investment is required.

The benefits gained by installation of flow sensors in the taps with of the public toilets are equivalent to saving of about 40m^3/year. With estimated investment for year 2015 of around USD 600.

The expected benefit by putting in place coded containers for different types of waste consist to increase the lifetime of the landfill and costs saving on waste collection. The company has not yet implemented this recommendation. The estimated investment is USD 750. The Hotel can save USD 1,231 /years, associated waste collection costs, and recover about 72% of recyclable materials (paper, glass, pet, plastic and aluminium) and other valuable objects.

Actually, in all corridors were left cartons boxes to collect plastic pet bottles. The workers were trained for separated collection of the plastic bottles used in rooms by guests. The collected

bottles are intended for social benefit of the employees by its sale to the recycling companies and get some revenues.

Figure 4 – Plastic bottle selected

The environmental benefit from implementation this opportunity is increase of the landfill lifetime of and cost savings on waste collection. No investment is required.

Table 1: Results at a Hotel 2001

Indicator	**Unit**	**Year 2013 Baseline (B) (Before RECP intervention)**	**Year 2014 A (After RECP implementation)**	**Change (C) C=100*(A-B)/B** [%]	**Difference Between A and B**
Resource use					
Energy Use	[MJ/yr]	1.180.191,56	1.670.148,36	41,52	489.956,80
Materials Use	[ton/yr]	0,00	0,00	0,00	0,00
Water Use	[m3/yr]	8.969,00	6.872,00	-23,38	-2.097,00
Pollution					
Carbon dioxide	[ton CO_2-eq/yr]	0,33	0,46	41,52	0,14
Waste-Water	[m3/yr]	0,00	0,00	0,00	0,00
Waste	[ton/yr]	3,00	3,00	0,00	0,00
Product Output					
Product Output: P	[ton/yr]	858,00	886,00	3,26	28,00

Note: The *absolute indicators* provide a measurement of how much resource use/pollution output has changed in absolute terms e.g. units of energy used or tons of waste generated. A negative percentage indicates a decrease and a positive percentage indicates an increase. The *relative indicators* provide a measurement of changes in resource use/pollution in relation to production output. *Resource productivity* provides a measurement of how much product output can be produced per unit of resource use, from a sustainability perspective, productivity should increase. *Pollution intensity* provides a measurement of

how much pollution is generated per unit of production output, from a sustainability perspective, intensity should decrease.

RECP Profile

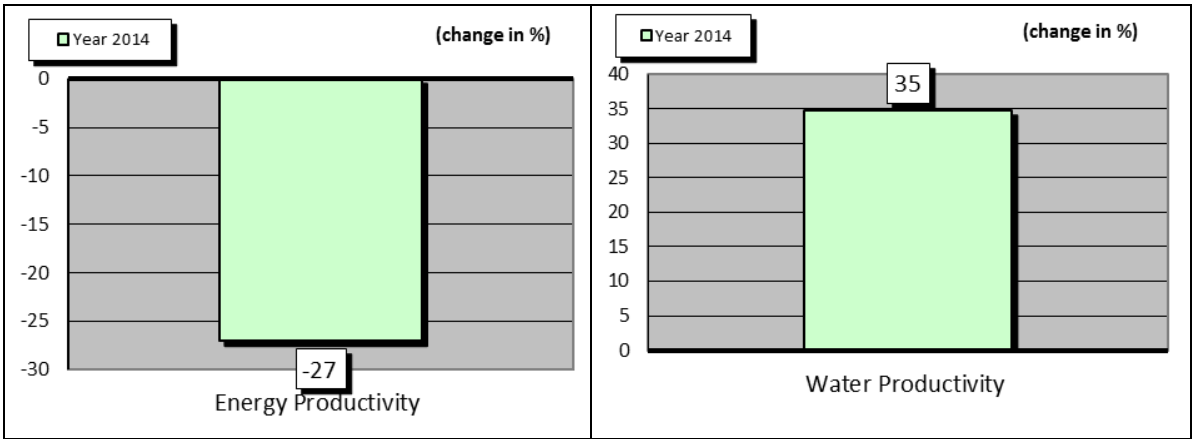


Figure 5 – Resource productivity energy and water

The graphic above shows the that the energy productivity decreased and concerning water productivity increased.
The company has focused on improving environmental performance in regard to water heating in the the guest rooms, this has required additional resource inputs for new electric boiler installation. This issue will be addressed through further implementation of RECP measures.

The equipment failure occurred during on 2013. This has unfortunately cancelled out the progress made in improving resource productivity in regard to replacement of water heating system.

However, the problem will be solved, the company has conducted feasibility study for installation of solar thermal water heating system.

Pollution Intensity CO2 emissions and Waste Generation

For energy use, there was increase of CO2 emission in 37% that means inefficiency on energy usage, concerning waste generation there was reduction in 3%.

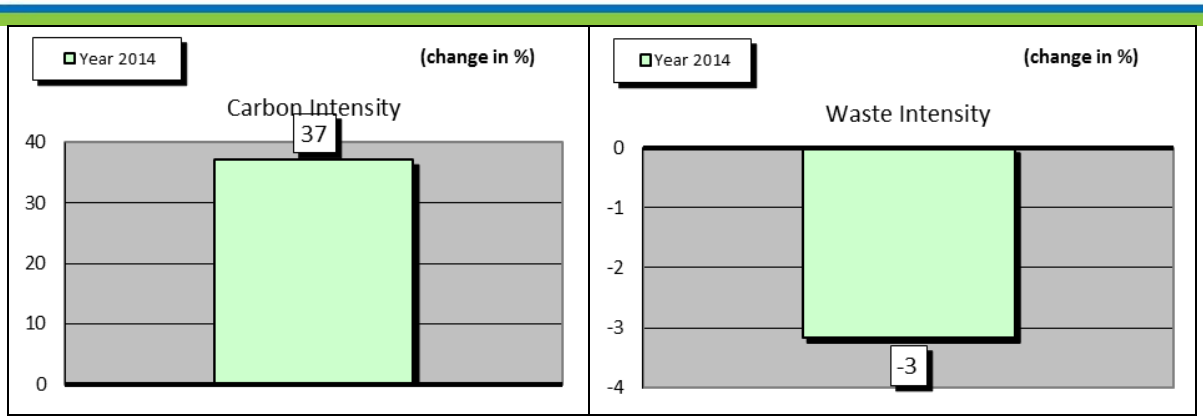


Figure 6 – Pollution intensity CO2 emission and Waste Generation

The company has made changes in its operations during this year. The implemented changes has in procedures during the transition phase, led to increased pollution intensity. However, this issue will be addressed through further implementation of RECP measures.

Resource Efficient and Cleaner Production (RECP)

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Human development
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Success Areas

The results were achieved through the implementation of the following measures:

Improve energy use in public places;

Improve the electric boilers water heating system in the guest rooms;

Improve the waste segregation system;

Implementation of good housekeeping practices;

Feasibility study for installation of solar thermal water heating system;

Installation lamps with motion and presence sensors detector in hallways;

Turn of the lights whenever not required;

Installation of led lamps in the guest rooms;

Turn of the public Ac when are not required;

Installation of water flow sensors taps;

Repair of water pipe leaks ;

Installation of coded containers for different types of waste streams.

Table 2: Option Implemented

Principal Options Implemented	**Benefits**			
	Economic		**Resource Use**	**Pollution generated**
	Investment [USD]	**Cost Saving [USD/yr]**	**Reductions in energy use, water use and/or materials use (per annum)**	**Reductions in waste water, air emissions and/or waste generation (per annum)**
Improve energy use in public places	No investment is required.	3,500	The environmental benefit consists of not consume about 108 KWh of electricity per day	Reduction of CO_2 emission and reduced costs of the electricity bills
Replace two electric water heaters for the guest rooms	4,800	1,500	Energy consumption reduced by 31,25 %	Reduction in 20% of CO_2 emission
Install taps with water flow sensors in public toilets	600	150	Overall water consumption reduced by 25 %	Reduction about 15% on water consumption in public toilets.

Approach taken

The Hotel 2001 managers of were concerned on about resource efficiency and environment conservation in their complex . For this purpose the Mozambique National Cleaner Production Center (MNCPC) was invited to conduct in plant RECP assessment jointly with the Hotel CP team set up and severally no and low cost investment option were identified during the assessment and successful implemented the high cost investment options were to put in place waste segregation system by installing coded containers to recover different types of waste streams taken to the landfill and Install solar thermal water heating system for hot water provision in the guest rooms..

The environmental benefit from implementation of waste segregation system is increase of the landfill lifetime and cost savings the on waste collection.
The Solar thermal water heating system will reduce the electricity consumption for water heating, with consequent reduction of the Environmental impacts.

The financial savings from implementation waste segregation systems for different types containers are around USD 1,231 /years associated with waste collection cost, and recovering of 72% of recyclable materials taken to the landfill namely: (paper, glass, pet, plastic and aluminium) and other valuable objects. With estimated investment of around USD 750.
The economic benefit from implementation of the solar thermal water heating system is equivalent to financial savings of USD 3,860/year with estimated investment is of around USD 10,750.

Business case

RECP not only allows companies to achieve savings from decreased resource use, but also decreases pollution to the environment, which benefits the surrounding community.

Testimony Box
National Cleaner Production Centre (NCPC)
The Mozambique National Cleaner Production Centres (MNCPC) was officially established in 2001, and operates as the executive arm of FEMA - Business Forum for the Environment, Under the policy advice component is the focal point of Ministry of Land, Environment and Rural Development (MITADER) and with the support of expertise from UNIDO and UNEPs RECP net. The centre offers service in the areas of Resource efficiency and Cleaner Production, Waste Management, Energy Efficiency and Renewable Energy, and Sustainable Management. **Summary of MNCPC achievements 2010-1014** • 18 Awareness Raising Seminars and Training were carried out for the national experts, managers and company technicians, public officials and the municipalities of Maputo and Matola representatives. • 33 National experts trained on UNIDO methodology RECP toolkit; • 65 Hotel Managers, companies technicians, government officials and Municipalities of Maputo and Matola representatives have attended the Awareness Raising Workshops on Resources Efficiency Use and Cleaner Production and 146 Hotel and company technicians trained on RECP; • Wide Seminars for dissemination of RECP concepts delivered for 165 students and teachers of Instituto Industrial de Maputo (IIM) and Escola Superior de Hotelaria e Turismo de Inhambane (ESHTI) that is Eduardo Mondlane University Branch; • Awarding Ceremony Workshop and Presentation of Results of the First Round of RECP assessments conducted and Awards of 7 hotels by good performance and commitment on environmental conservation and resource efficiency use in 3 of November 11 at VIP hotel Maputo jointly organized by UNIDO, MICOA, MITUR and MNCPC; Total of 21 companies being (16 hotels and 5 supply chain industries of food products to the tourism sector) were subjected to the RECP assessments and their respective RECP reports document the results have been delivered with financial savings options , including investments, environmental and technical benefits.
Contact Details
Centro Nacional de Produção Mais limpa(CNPML) Address: Road Kibiriti Diwane (Ex. Francisco Barreto), 322 Maputo Mozambique Phone Number: +258 2148 5768. PO.Box 4595 Email: mncpc@tvcabo.co.mz
English Abstract (where applicable)
N/A

ABOUT *RECP EXPERIENCES*

Through the joint Resource Efficient and Cleaner Production (RECP) Programme, the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Programme (UNEP) cooperate to improve the resource productivity and environmental performance of businesses and other organizations in developing and transition countries. The Programme is implemented in partnership with the Global Network for Resource Efficient and Cleaner Production (RECP*net*). This series of enterprise success stories documents the resource productivity, environmental and other benefits achieved by enterprises in developing and transition countries through the implementation of RECP methods and practices.

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RECP Experiences at Howard Johnson Grand Plaza Hotel

The efficient and environmentally sound use of materials, energy and water - coupled with the minimization of waste and emissions - makes good business sense. Resource Efficient and Cleaner Production (RECP) is a way to achieve this in a holistic and systematic manner. RECP covers the application of preventive management strategies that increase the productive use of natural resources, minimize generation of waste and emissions, and foster safe and responsible production. Benefits are eminent in many enterprises, regardless of sector, location or size, as demonstrated by the experiences of Howard Johnson Hotel, in Bucharest, Romania.

Achievements at a Glance

During the CP assessment 48 CP options and 15 CSR options have been identified, analyzed and presented to the hotel management. The evaluation of CP options revealed good opportunities for cost cut, in particular with energy and water, and important environmental benefits, and this perspective convinced the management to proceed to the implementation of 35 options out of 48. The total environmental benefits achieved through implementation of CP options are: 557 MWh/year in energy savings; 3992 m3 /year in water savings; 314 m3/year of waste diverted from landfill and overall financial benefits of 42 000 USD/year.

Overview

The Cleaner Production In-Plant Assessment in **Howard Johnson Grand Plaza Hotel** was a demonstration project carried on by the Centre for Sustainable Production and Consumption in Bucharest, Romania, during the implementation of the **"Program for the sustainable development of enterprises in Romania with focus on enhancing national expertise in Cleaner Production and Corporate Social Responsibility methodologies in particular for the tourism industry";** the Program was financed by State Secretary for Economic Affairs (SECO) in cooperation with the United Nations Industrial Development Organization (UNIDO) and based on the Agreement signed with the Romanian Ministry of Tourism.

The assessment was one of the fifteen projects carried on in Romanian tourism sector, that served the purpose of demonstrating how Cleaner Production (CP) and corporate social responsibility (CSR) can be implemented in hotels, and furthermore, to provide opportunities for hands-on training in CP and CSR of the tourism industry personnel.

Howard Johnson Grand Plaza Hotel is a five stars hotel located in the very heart of Bucharest city center. The hotel features 285 rooms and suites, 7 conference rooms, fitness club, and 2 restaurants (260 places), Bar Centro (60 places), 2 Multi-functional Ballrooms (500 places). The main activities of the hotel are accommodation, in particular of business travelers, restaurant and gastronomy and organization of business and private events. The hotel was built in 1973 and modernized between 1999 and 2004, when the entire concrete structure was consolidated and the façade modified, all functional systems were replaced and interiors were re-designed and furnished.
The hotel decided to join the project due to the need for improving energy and water consumption, and being also very interested in social responsibilities aspects, in particular their relation with clients and stakeholders and how to motivate their employees and keep them satisfied with their work.

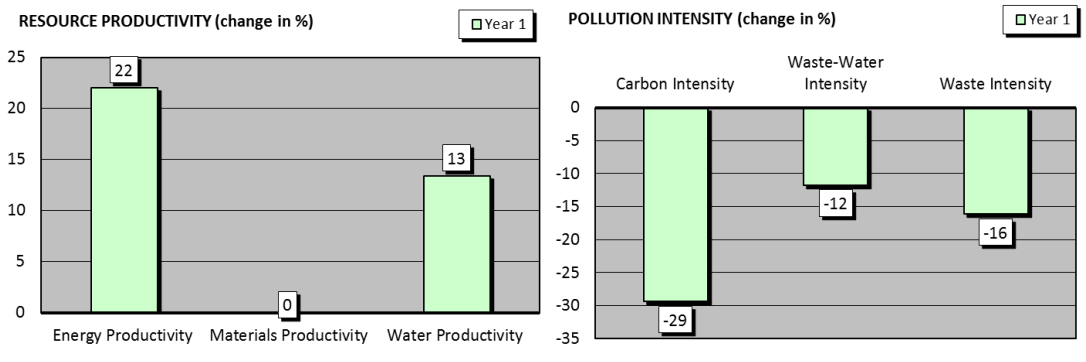
Benefits

The hotel had economic benefit out of CP and CSR options implementation, they succeed to reduce direct cost with resources, in particular energy. Indirect savings from reduced maintenance, less auxiliary materials, reduced functioning of motors, reduced waste and increased the total benefit and helped them to effectively cut costs by about 18 to 20%. For example besides the quantified benefits, the company could profit of less visible benefits such as the reduction in heat emissions from spots light bulbs, a situation that led to the decreased need for cooling of the public spaces during the summer, longer life of the LED lights. Installing variable speed drivers at the ventilation system' fan motors had as indirect benefit the reduced utilization of motors, less heat and less maintenance needs, auxiliary materials, waste, etc.

Absolute Indicator	Change (%) Year 1	Change (%) Year 2	Relative Indicator	Change (%) Year 1
Resource Use			**Resource Productivity**	
Energy Use	18 483 360.00	15 125 050.08	Energy Productivity	-18.17
Materials Use	0.00	0.00	Materials Productivity	0.00
Water Use	33 470.00	29 478.00	Water Productivity	-11.23
Pollution Generated			**Pollution Intensity**	
Air emissions (global warming, CO_2 equivalent)	10 350.68	8 470.03	Carbon Intensity	-18.17
Waste-water	33 100.00	29 170.00	Waste-water Intensity	-11.78
Waste	2 093.00	1 752.00	Waste Intensity	-16.29
Production Output	60100	60000		

The absolute indicators provide a measurement of how much resource use/pollution output has changed in absolute terms e.g. units of energy used or tons of waste generated. A negative percentage indicates a decrease and a positive percentage indicates an increase. The relative indicators provide a measurement of changes in resource use/pollution in relation to production output. Resource productivity provides a measurement of how much product output can be produced per unit of resource use, from a sustainability perspective, productivity should increase. Pollution intensity provides a measurement of how much pollution is generated per unit of production output, from a sustainability perspective, intensity should decrease.

RECP Profile



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Human development
  > Through reduction of risks to people and communities from enterprises and supporting their development

Success Areas

The hotel focused in particular on the implementation of energy efficiency opportunities as these types of options offered rapid and tangible economic benefits. Some investments were required in order to achieve these benefits, amongst them the investment required by the replacement of the spot lights with LED was the most important one.

Principal Options Implemented	Benefits			
	Economic		Resource Use	Pollution generated
	Investment [USD]	Cost Saving [USD/yr]	Reductions in energy use, water use and/or materials use (per annum)	Reductions in waste water, air emissions and/or waste generation (per annum)
Install variable speed drives on the fan of air ventilation system	2 116	1635	24 032 kWh	15,6 ton CO2
Insulate the hot water tanks and pipes for energy saving, to reduce gas consumption	1096	2057	81 910 kWh	53 ton CO2
Replace ambient spotlight bulbs with LED type bulbs in all areas of the building	36 282	10 282	151 009 kWh	98 ton CO2

Approach taken

The main problem was the high amount of electricity and gas consumed by hotel facilities and operations. The top management was very much concerned about energy consumption and was interested to make progresses towards minimizing the amount of energy used in all relevant areas, processes and activities.
The monthly monitoring of energy consumption in different areas of the hotel revealed high consumption of electricity of the ventilation system, cooling and heating, lighting of public areas and kitchen's equipment. The hotels' resource use performance was compared based on the calculated key performance indicators (energy and water per weighted number of guest) with best performances from European hotels located in temperate climates. The management was surprised to find out that the electricity and water consumption was two times higher than same consumptions in European hotels and this situation raised a big question mark and motivated them to act towards improvement of the resources use.

Business case

In this particular case, the hotel was focused mainly on energy efficiency and favored implementation of energy efficient options. An energy-efficiency program can save between 10% and 30% of those energy costs within three years. Indirect savings from reduced maintenance, materials, waste and risk increase the benefits, combining to effectively cut direct energy costs consistently. By reducing dependence on energy, the energy cost was less reflected in the total business cost and businesses was able to better plan their resources and investments.

More opportunities related to the way energy and water were used for cooling and heating were postponed at the time because of restricted investment budget, but considered on long term. What is important however is the changing in the mindset of the company staff and management and their engagement towards embedment of RECP in their day to day operations, as part of the their continuous improvement process.

Testimony
National Centre for Sustainable Production and Consumption in particular
Performing the cleaner production assessment in a big hotel like Howard Johnson was a challenging mission, in particular because of the hotel standard requirements and in the same time limitations. At the first glance the impression as that hotel is aware of social responsibility issues and resources are used in an efficient manner, however, digging deeper into their processes and operations revealed numerous improvement opportunities.
The management of Howard Johnson Hotel
"The Howard Johnson Grand Plaza management team considers that the UNIDO project has brought valuable insight on both Clean Production and Corporate Social Responsibility issues. *It has been a useful experience to analyse our operations and policies through the new CP and CSR lenses imparted by the UNIDO consultants. We have seen interesting ideas arise from these discussions regarding the improvement of business, production and staff policies and we are committed to implement the advised measures to the best degree possible.* *Overall, the workshops proved to be a valuable exercise into corporate responsibility and sustainability"* *Sonia Nastate , Hotel Manager*
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ABOUT *RECP EXPERIENCES*

Through the joint Resource Efficient and Cleaner Production (RECP) Programme, the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Programme (UNEP) cooperate to improve the resource productivity and environmental performance of businesses and other organizations in developing and transition countries. The Programme is implemented in partnership with the Global Network for Resource Efficient and Cleaner Production (RECP*net*). This series of enterprise success stories documents the resource productivity, environmental and other benefits achieved by enterprises in developing and transition countries through the implementation of RECP methods and practices.

These successes were achieved with the assistance of the National Cleaner Production Centres, which are part of RECP*net* established with support of the UNIDO and UNEP. The success stories employ the indicator set described in *Enterprise Level Indicators for Resource Productivity and Pollution Intensity*, UNIDO/UNEP, 2010. The primer with accompanying calculator tool and further case studies are available at www.recpnet.org, as well as on www.unido.org/cp.

NOTE

NOTE

Reduce Natural Resource use and Emissions

Increase Productivity

Improve the well-being of workers and communities

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