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RECP Experiences in the Project Lake Victoria Environmental Management Programme (LVEMP II), Kitumbe Tea Factory

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 Kitumbe Tea Factory, Kericho County Kenya.

Achievements at a Glance

Kitumbe Tea Factory, one of the four James Finlays group of companies was built in 1934. It is the largest black tea Factory in East and Central Africa. It produces CTC and Orthodox black tea with a daily capacity of 196, 000 green leaves for CTC and Orthodox manufacture. The factory capacity is about 8, 000,000 Kgs of Made Tea (MT)/Year.

After the training on RECP for the tea sector in 2010, the factory adopted RECP programme in the production and embarked on identifying areas of improvement on water, energy raw materials and waste management. The company has put in place structures to ensure continuous improvement through comprehensive training and awareness raising sessions on regular basis in line with the company sustainability requirements. As a result of RECP programme; operational improvements, better process control, equipment modification and good-housekeeping options have been implemented at low or no cost. The RECP strategies employed at company level include; monitoring water consumption and wastewater generation through metering and sub-metering of all usage points; development of key performance indicators and monitoring productivity levels, implementation of preventive maintenance program to control leakages, spills and overflows.

 <p>Rain water harvesting to substitute factory fresh water intake from the dam</p>	 <p>Receding waste water due to introduction of Nile cabbage</p>	 <p>Reduced & cleaner waste water after introduction of reduced generation.</p>
 <p>Installation of Solar power panels to power the tea rope way</p>	 <p>LED lights installed in the shop floor</p>	 <p>Solar withering CTC installed to reduce on energy costs</p>

Overview

In 2011 the company recorded a 45.5% decrease in factory wash down water compared to 2010. A further 23% reduction was recorded in 2012 between the months of January-August compared to 2011. Further, the company has installed three 10, 000L water tanks for rain water harvesting and recover condensate to up 80% by installing efficient steam traps.

Energy use efficiency has been achieved by implementing sub-metering of electricity at key usage points; data analysis, monitoring trends and development of key performance indicators; matching motors with machine capacity , steam pipe lagging, and switching off machines not in use.

Waste management practices implemented include minimization of waste generation at source, waste segregation, and quantification of generation levels by employing effective monitoring procedures.

Benefits

Water: The RECP strategy to reduce water consumption included the following measures; monitoring water consumption through metering and sub-metering of all usage points; development of key performance indicators, implementation of preventive maintenance program to control leakages, spills and overflows, implementation of dry cleaning option and use of water saving pressure cleaners, rain water harvesting and steam condensate recovery. The total amount saved between the months of Jan-Oct 2012 compared to the same period in 2010 is a 36% reduction in volumes of water consumed.

Energy: Energy efficiency has been achieved by implementing sub-metering of electricity at key usage points; data analysis, monitoring trends and development of key performance indicators; matching motors with machinery capacity & steam pipe lagging, Use of energy efficient machinery (CPW, motors, bulbs, boilers etc), implementation of preventive maintenance programs to minimize stoppages and switching off machines not in use. The Electrical energy consumption has reduced by 53% over the same period in 2012 compared to 2010. The cost of electricity over the same period has reduced by Kshs. 10,503,502 while the cost of firewood over the same period has reduced by Kshs. 2,871,206.

Materials Management: With the Implementation of RECP plans, an increase in outturn percentage from 22.57 to 22.87 has been realized. The expectation is to achieve >23% outturn in the coming years. Effective process monitoring approach was implemented. Re-design of the bulking chamber to contain tea dust, dry cleaning of process lines, use of PVC mesh in the withering troughs, new sacks to curb wasteful spillages and timely recoveries have been some of the measures put in place to improve the outturn percentage.

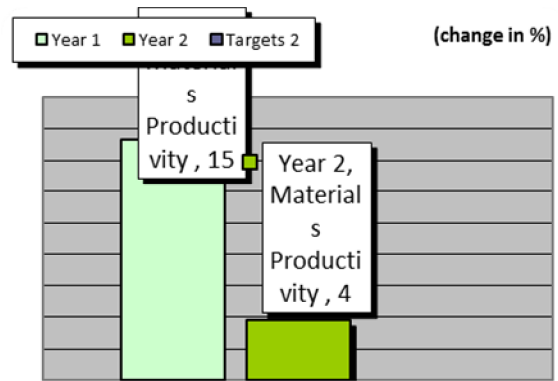
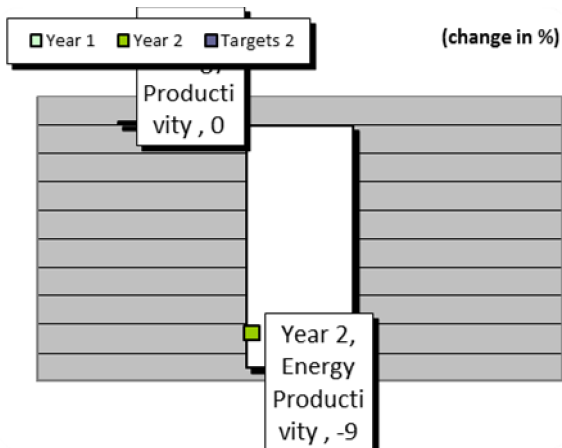
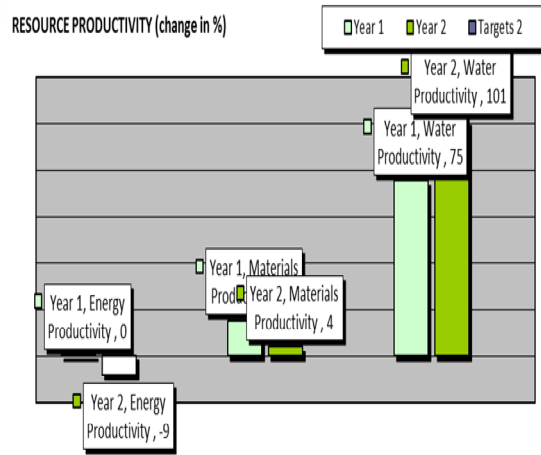
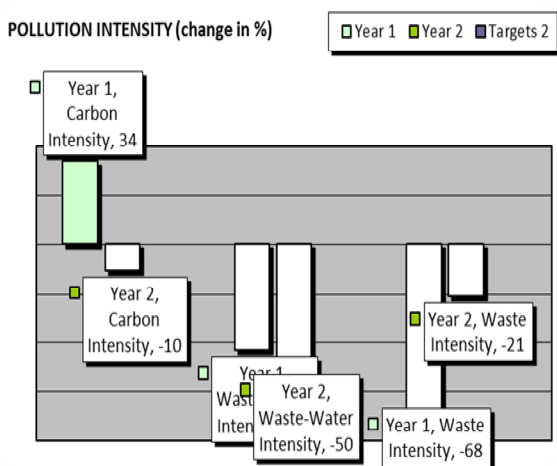
RESULTS AT A GLANCE

Principal Options Implemented	Benefits			
	Economic		Resource Use	Environmental Impact
	Investment [\$]	Cost Saving [\$/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)
Water Management. <ul style="list-style-type: none"> • Metering and sub-metering of usage points • Development of key performance indicators • implementation of preventive maintenance program to control leakages, spills and overflows • Implementation of dry cleaning option and use of water saving 	59,123.84	33,333.84	<ul style="list-style-type: none"> •Reduction in water use from 32.25L/Kg MT in 2010 to 13.95L/Kg MT in 2013. •Reduction in the cost of treatment chemicals. •Reduction in pumping cost. •Reduced transport cost 	<ul style="list-style-type: none"> •Reduction in waste water generation volumes. •Improvement of waste water quality. •Reduced abstraction of water. •Reduced carbon GHG emission •Reduced cost of waste

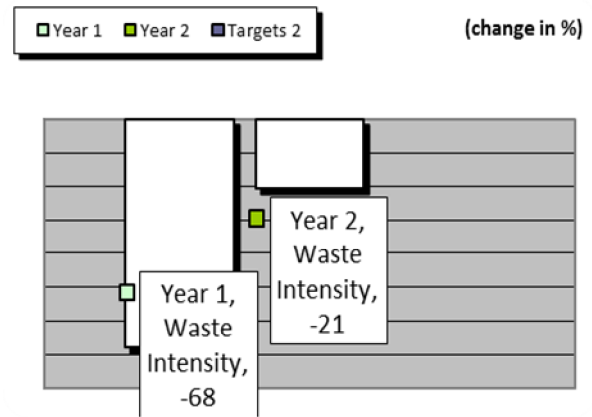
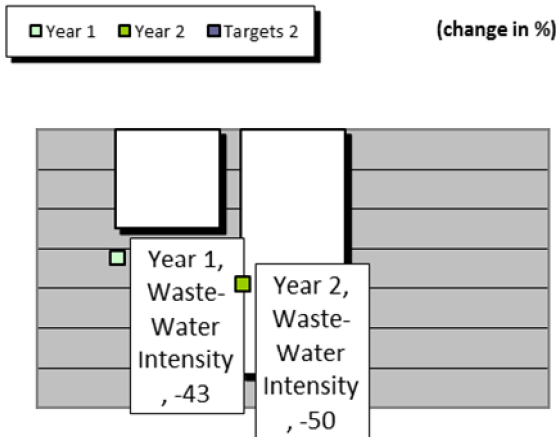
<p>pressure cleaners</p> <ul style="list-style-type: none"> • Rain water harvesting and steam condensate recovery. • Training of employees on water conservation programs. 			<p>for treatment chemicals.</p>	<p>water treatment</p>
<p>Materials Management</p> <ul style="list-style-type: none"> • Modifying process lines to minimize spillages. • Improved process control- frequent cleaning of fermenter modules & cyclone ducts. • Modification of the bulking chamber. • Redesign of the withering troughs. • Training of employees. 	<p>95,414.93</p>	<p>90, 225.88</p>	<p>Improved Outturn percentage outlook from 21.93% to 22.80%</p>	<p>Reduction in waste Generation by 77,000 Kgs MT</p>
<p>Energy Management</p> <ul style="list-style-type: none"> • Metering of electricity at usage points. • Installation of ropeway system for tea transportation. • Development of key performance indicators. • Data analysis and improved system of monitoring & recording. • Sensitization of staff to switch off machines when not in use. • Introduction of energy saving LED lights. • Introduction of transparent sheeting. • Servicing of steam traps & installation of new more efficient steam GEM traps in 2014 • Fixing steam leaks. • Installation of MCBs in staff houses • Installation of stack withering • Installations of solar panels for withering & drying in CPW • Installation of solar panels to drive the rope way system • Development of key performance indicators. • Data analysis and improved system of monitoring & recording. • Sensitization of relevant staff on use of cheaper options and impact on factory operations, profitability & environment. • Servicing of steam traps. • Fixing steam leaks. • Installation of stack withering • Use of waste biomass i.e. tea roots 	<p>1,696,938.88</p>	<p>479,429.03</p>	<ul style="list-style-type: none"> • Improved electrical consumption per kg of made tea i.e from 0.48 kg of made tea per Kwh to 0.38 • Improved firewood consumption from 1.62kg firewood per kg made tea to 1.89 	<ul style="list-style-type: none"> • Reduction in carbon dioxide emissions. • Reduced felling of trees.

Solid Waste Management <ul style="list-style-type: none"> Provision of well labelled waste disposal containers in all sections of the factory Training of employees on waste separation. Implementation of concepts to reduce waste at the source. 	4,117.64			<ul style="list-style-type: none"> Reduction in waste generation Reduced wastes to landfill
Option 5: Air emissions				
Total of ALL implemented Options ⁽¹⁾	1,855,595.29	602,988.75		

RECP Profile



¹ Note that the total of ALL options can be greater than the some of the three to five key options detailed in the table 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



Success Areas

Water Management

- Metering and sub-metering of usage points
- Development of key performance indicators
- implementation of preventive maintenance program to control leakages, spills and overflows

- Implementation of dry cleaning option and use of water saving pressure cleaners
- Rain water harvesting and steam condensate recovery.
- Training of employees on water conservation programs.

Materials Management

- Modifying process lines to minimize spillages.
- Improved process control- frequent cleaning of fermenter modules & cyclone ducts.
- Modification of the bulking chamber.
- Redesign of the withering troughs.
- Training of employees.

Energy Management

- Metering of electricity at usage points.
- Installation of ropeway system for tea transportation.
- Development of key performance indicators.
- Data analysis and improved system of monitoring & recording.
- Sensitization of staff to switch off machines when not in use.
- Introduction of energy saving LED lights.
- Introduction of transparent sheeting.
- Servicing of steam traps & installation of new more efficient steam GEM traps in 2014
- Fixing steam leaks.
- Installation of MCBs in staff houses
- Installation of stack withering
- **Installations of solar panels for withering & drying in CPW**
- **Installation of solar panels to drive the rope way system**
- Development of key performance indicators.
- Data analysis and improved system of monitoring & recording.
- Sensitization of relevant staff on use of cheaper options and impact on factory operations, profitability & environment.
- Servicing of steam traps.
- Fixing steam leaks.
- **Installation of stack withering**
- Use of waste biomass i.e. tea roots

Solid Waste Management

- Provision of well labeled waste disposal containers in all sections of the factory
- Training of employees on waste separation.
- Implementation of concepts to reduce waste at the source.

Approach taken

Kitumbe factory upholds sustainability as one tool with which to enter the future. RECP offers a broader opportunity with which this valued virtues are to be achieved. By mapping out RECP strategies the Company is committing itself to undertaking RECP concepts to its fruition & conclusion. Regular trainings, improving technologies, better process control and technology change, low cost investments, process monitoring and preventive maintenance programs have achieved economic benefits from cost-cutting measures in addition to ensuring compliance with the legal and statutory requirements. Kitumbe factory has so far saved over Kshs. 58 308 673.06, due to the implementation of various CP programs.

Business case

A benefit analysis of the savings made from implementation of RECP projects are as follows;

1. Water-Kshs. 1662924.86
2. Energy- Kshs. 25301809.2 (Firewood & Use of energy efficient equipment)
3. Energy- Kshs. 23 674 739 (Ropeway conveyance)
4. Made Tea- Kshs. 7669200 (Bulking chamber only.)

Testimony Box
Kenya National Cleaner Production Centre (K NCPC)
<p>The Kenya National Cleaner Production Centre (KNPC) is a Trust under the Ministry of Industrialization and Enterprise Development. It was established in July 2000 as part of the global UNEP/UNIDO National Cleaner Production Centre program under the UNDP-Government of Kenya Country Co-operation Framework of 1999-2002. Currently, it is being transformed into a semi-autonomous government agency. The Centre is a nodal Government agency in building capacity and providing advisory services in Resource Efficient and Cleaner Production (RECP) so as to increase the productivity of enterprises by reducing wastage of resources (water, energy and raw material) and their associated negative environmental impacts. The Centre offers consultancy and training on environmental impact assessment, environmental audit, energy management training and audit, Clean Development Mechanism and climate change (CDM), amongst others. These programmes are implemented in service and manufacturing enterprises including hotels, hospitals, households, municipalities, water services and sewerage companies, supermarkets among others.</p>
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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 (RECPnet). 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 RECPnet 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.recenet.org, as well as on www.unido.org/cp and www.unep.fr/scp/cp.