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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

RECP Experiences in the Project Lake Victoria Environmental Management Programme (LVEMP II), Ken Knit 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 Ken-Knit (K) Ltd, Eldoret- Uasin Gishu County, Kenya.

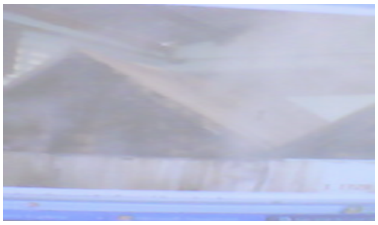
Achievements at a Glance

Ken-Knit (K) Ltd is a textile manufacturing industry established in 1966 in Eldoret in Kenya. The company deals with the manufacture of school sweaters & uniforms, suits. Blazers, trousers. Ladies skirts, wool/polyester/viscose suiting materials, blankets, wool tops, bed sheeting, Maasai shukas, baby shawls, kikois, pillows, bed covers, hospital blankets, hand knitting & hosiery yarn. With a capacity of 70 000 pieces of sweaters, 100000 pieces of blankets and 60000 kgs of hand knitting and hosiery yarn per month. The company employs over 1200 skilled workers.

Ken-knit productivity improvement has led to further expansion of the current production in terms of quality which has attracted new and sustained old customers. The company has also expanded its product range to other more competitive and quality goods. One year ago Ken-Knit in line with RECP solution implementation, has started an expansion phase especially in knitting department whereby about 250 low waste generating and low energy consuming computerized power machines has been commissioned with over 120 new job vacancies created and has boosted production efficiency, quality as well as waste reduction. Due to the RECP programme, the company has significantly excelled in product quality, waste management, occupational health and safety and general environmental performance.

Un-lagged steam supply pipes before RECP assessment

Lagged steam pipes after RECP



Leaking steam in the bulking chamber before CP

Steam bulking chamber after CP, no steam leakages

Twin lighting fluorescent tubes before CP was implemented

After: Transparent sheeting providing natural light instead

Overview

RECP has been achieved by applying acquired knowledge on CP technology, continuous change of technology, continuous audits on RECP solutions, training and continuous creation of CP awareness for capacity building. The company after implementing the 'no and low cost investment options' such as delamping of twin lighting, disconnection of power to idle machines, process monitoring to reduce waste generation, preventive maintenance, installation of translucent iron sheeting, waste water recycling and condensate collection for reuse, and surface water harvesting and recycling as well as disposal of high power consuming machines and motors that became a ladder to the second phase of the project whereby the company has initiated a water purification , filtration treatment process .

Through CP implementation, the Company has realized the following; reduced cost of production, maximum output verses input i.e. waste reduction solid, liquid, power and manpower. Cleaner environment, clean product and reduced work illnesses due to low cost CP solutions that have been implemented like proper housekeeping and hence the Company has realized a reduced rate of absenteeism than was before.

Benefits

Principal Options Implemented	Resource Use	Environmental Impact
Option 1: Water Management Continuous water harvesting, condensate collection, water recycling and water filtration.	Water resource consumption has been increased by 30.1% hence water saved is by 18%.	Underground water harvested, has been put into use in our sanitary facilities,
Option 2: Wastewater Management reuse of same bath water to dye same colour lots as much as possible in older machines but not for the new hanks dyeing machines.	Waste water has been recycled for reuse and all condensate harnessed for further reuse.	Effluent clarity, ph & temperature have been attained but BOD and COD cannot be ascertained at the moment. Dyeing effluent has gone up with the same percentage.
Option 3: Materials Management Improve handling and training on material use.	Waste generation percentage has been reduced and at present there is minimal reworking.	Production efficiency has improved since waste generation has been reduced from 8.5 tons to 4.5 tons per month.
Option 4: Energy Management Continuous delamping of twin lighting, installation of low wattage consuming machines and motors. Disconnection of power to idle machines and Installation of translucent sheets.	Energy consumption savings has led to further purchase and installation of low power consuming machines and job creations.	Improved production efficiency and reduced resource wastage. Less co2 emissions since high powered machines has been disposed. Less firewood consumption in our boilers.
Option 5: Solid Waste Management Continuous training on material handling and fabrication of machines and equipment	Material input has been efficiently used. Installation of low waste generating machinery. Attitude change training program put in place	Improved production quality and capacity output which has resulted in change from seven day working system to six days working system. Efficient manpower.
Option 6: Air emissions Disposal of high power consuming machines	Reduced co_2 emitting machinery.	Reduced environmental pollution.

Total of ALL implemented Options	*(Almost 45% of the high cost options has been implemented)*	

Resource use indicator

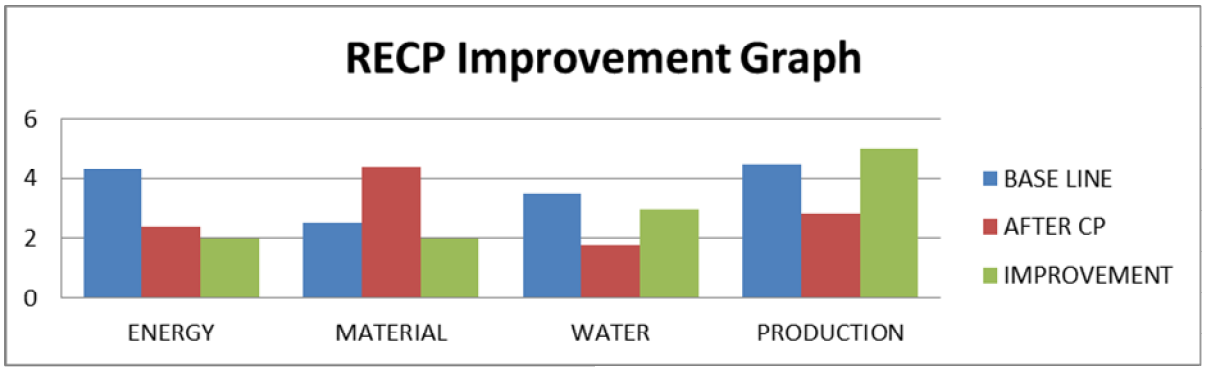
Indicator	**Unit**	**Baseline (after CP intervention) (B)**	**Follow up (After implementation of 'all' feasible CP options) (A)**	**Improvement (I) (I=100* (B-A)/B [%]**
Resource use				
Energy Use: E	[kWh/m]	199052kwh/m	164006 kwh/m	4.9 %
Materials Use: M	[t/m]	39372 tons/m	37480.65 tons/m	7.2 %
Water Use: W	[m^3/m]	3249 m^3 /m	4226.95 m^3/m	30.1 %
Environmental impact				
Air Emissions: A (global warming)	[ton CO_2-eq/m]			
Waste Water: WW	[m^3/m]	2080 m^3/m	2706.08 m^3/m	30.1 %
Waste: Wa	[t/m]	13t/m	8.5t/m	34.6%
Productive output				
Production: P *(choose one indicator for production)*	[ton/m];	30872 t/m	34792.75 t/m	12.7 %

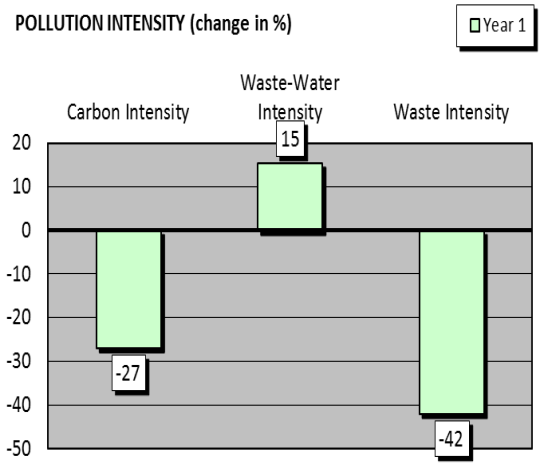
RESULTS AT A GLANCE

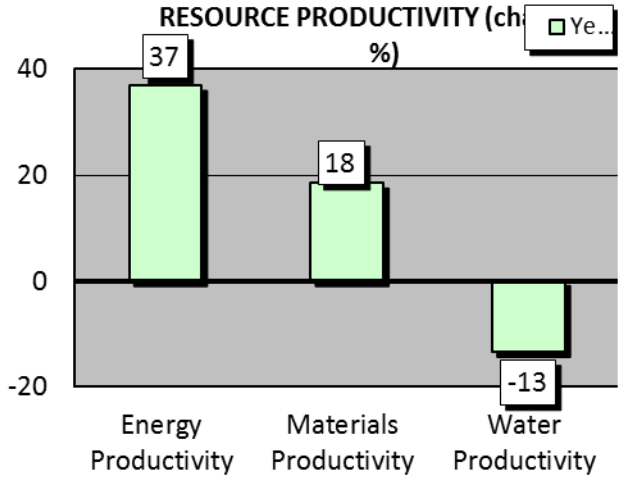
Thematic Areas	Benefits				
	Economic			Resource Use	Environmental Impact
Principal Options Implemented	Investment [$]	Cost Saving [$/Yr]	Pay Back Period (Yrs)	Reductions in energy use, water use and/or materials use (per annum)	Reductions in waste water, air emissions and/or waste generation (per annum)
Water Management • Continuous water harvesting, • Condensate recovery • Water recycling • Water filtration.	44,326.9	9,850.4	4.5 Yrs	Water resource consumption has been reduced by 30.1% hence water saved is by 18%.	Underground water harvested, has been put into use in our sanitary facilities,
Wastewater Management Reuse of same bath water to dye same colour lots as much as possible in older machines but not for the new hanks dyeing machines.				Waste water has been recycled for reuse and all condensate harnessed for further reuse.	• Effluent clarity, Ph & temperature have been attained. • Dyeing effluent has gone up with the same percentage.
Solid Waste and Materials Management • Improved material handling procedures. • Installation of low waste generating machines. • Modification of yarn carriers. • Continuous monitoring of material flow. • Repair and maintenance of machines • Intensified training on material handling procedures, storing and processing steps. • Controlled waste generation. • Attitude change trainings. • Trimmings used to make blankets	3,500,000	1,242,353		• Reduced material wastage & rework from 8.3% to 5.7%. • Increase in production since less material was wasted. • Reduced trimming waste in spinning from 13 tons/month to 3 tons/month saving about 37.5% on material consumption. Production output went up to 92.5%.	Production efficiency has improved since waste generation has been reduced from 8.5 tons to 4.5 tons per month.
Energy Management • Fabrication of bulking chamber. • Lagging of steam supply pipes.	200,000	20,864		• Improved production efficiency **by**	• Less CO_2 emissions since high

• Fabrication and installation of new drying chambers • Installation of new steam traps and continuous repair of leaking valves. • Collection and recycling of condensate for steam production. • Delamping of twin lighting. • Disposal of old high power consumption machines. • Change of high power consumption motors to low Kw motors. • Disconnection of power from idle machines. • Installation of translucent sheets and wall painting brighter. • Fabrication and modification of machinery. • Installation of new technology machines. • Installation of five new dyeing machines • Boiler heater recovery • Increased number of machines with low power consumption capacities in the entire mill.(i.e. in dyeing from six machines to nine machines and in blanket from fifty four to eighty six machines while in knitting we have commissioned an additional department of over two hundred power driven machines)				**27.5%.** • Reduced time cycle between batches from 20 minutes to 8 minutes per batch which is **60%** save on bulking time. • Increased working batches from **10** batches to **12** batches of **230**kgs from **200**kgs each in **7.5** hours which is **38%** increased production capacity. • Reduced firewood consumption from **12.4**tons to **9.5** tons per day.	powered machines has been disposed. • Less firewood consumption in our boilers meaning less cutting of trees
Air emissions Disposal of high power consuming machines				Reduced CO_2 emitting machinery.	Reduced environmental pollution.
Total of ALL implemented Options ()	**3,744,326.9**	**1,273,067.4**			

RECP Profile







RECP Experiences

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

Resource	Action taken	Gains
Water	• Repair of leaking valves and supply pipes • Fabrication of steam bulking chamber. • Servicing and repair of steam traps. • Lagging steam pipes. • Installation of new dyeing machines with high production capacities • All cooling and condensate water harnessed and recycled. • Construction of water reservoirs and water harvesting. • Installation and initiation of water filtration.	• Reduced water leakages. • Reduced Eldowas water consumption rate. • Optimum use of steam. • Improved heating and yarn bulking efficiency. • Increase production and improved quality. • Reduced reworking (redyeing). • Optimum utilization of manpower. • All these gains sums up to 48.1% save on the total production cost. • After the installation of the new machines, the above saving was affected by high rate of water consumption which led to the decline to 18% • **Reworking and water wastages has drastically reduced** and has led to reduced water consumption from **Eldowas** by about **40%** • Reduced liquor wastages**.**

Energy	• Fabrication of bulking chamber. • Lagging of steam supply pipes. • Fabrication and installation of new drying chambers • Installation of new steam traps and continuous repair of leaking valves. • Collection and recycling of condensate for steam production. • Delamping of twin lighting. • **Disposal of old high power consumption machines.** • Change of high power consumption motors to low Kw motors. • Disconnection of power from idle machines. • Installation of translucent sheets and wall painting brighter. • Fabrication and modification of machinery. • Installation of new technology machines.	• Improved production efficiency **by 27.5%.** • Reduced time cycle between batches from 20 minutes to 8 minutes per batch which is **60%** save on bulking time. • Increased working batches from **10** batches to **12** batches of **230**kgs from **200**kgs each in **7.5** hours which is **38%** increased production capacity. • Reduced firewood consumption from **12.4**tons to **9.5** tons per day. • Increased boiler efficiency. • Reduced drying time and increased production capacity in our dryers. • From 1017 de-lamped lights to 890 pcs of 4feets of 36kwh. • Reduced unnecessary lighting. • Increased number of machines with low power consumption capacities in the entire mill.(i.e. in dyeing from six machines to nine machines and in blanket from fifty four to eighty six machines while in knitting we have commissioned an additional department of over two hundred power driven machines). • As from our baseline of about 172038 Kwh/h in June 2012 to 164006 Kwh/h this is equivalent to 4.67% which is a save of Kshs 147788.8 per month as reflected by October 2013 bill even though it fluctuates.
Materials management	• Improved material handling procedures. • Installation of low waste generating machines. • Modification of yarn carriers. • Continuous monitoring of material flow. • Repair and maintenance of machines which led to increase efficiency. • Intensified training on material handling procedures, storing and processing steps. • Controlled waste generation. • Attitude change trainings.	• Reduced material wastage and reworking from 8.3% to 5.7%. • Tremendous increase in production since all the material that used to go to waste was converted to output production. • A notable percentage of solid waste as from the previous 13 tons of off cut wastes from knitting department to an average of 8.5tons per month to about 3 tons which is about 37.5% save on material consumption hence production percentage versus waste is 92.5%. • This save was reflected directly on production as from June 2012 to September, 2013 consecutively.

Approach taken

Ken-knit (k) ltd is a textile manufacturing industry which majorly deals with the production of textile assorted goods. As part of its RECP programme the company installed new technology that enabled an expansion of production capacity and an improvement in production quality and work safety. Annual RECP benefits include savings which fuelled company expansion and great migration from high power consumptions machines to modern generation machines of less power consumption.

The success was achieved with the assistance of the Kenya National Cleaner Production Centre, which is part of the global RECP networks which trained continuously and tirelessly monitor the progress of the whole project. The trained team set out a no cost and low cost baselines and of which after the implementation they are now on the second phase of the RECP implementation the high cost options.

What motivated the entire Ken-knit management to engage themselves in the RECP processes are factors like; Tireless participation of the KNCPC experts, the KNCPC's award ceremony held in December 2012 in Kisumu where the Company became the first runners up in waste reduction category.

Due to the improved relationship between KNCPC and Ken-Knit management, it has led to other bodies recognizing the efforts that the Ken- Knit management has put in place towards the attainment of the RECP goals in line with Vision 2030 which has also attracted support from other Government bodies to the KNCPC initiated projects towards Cleaner Production.

Business case

Ken-knit productivity improvement has led to further expansion of the current production in terms of quality which has attracted new and sustained old customers. The company has also expanded its product range to other more competitive and quality goods. One year ago Ken-Knit in line with RECP solution implementation, has started an expansion phase especially in knitting department whereby about 250 low waste generating and low energy consuming computerized power machines has been commissioned with over 120 new job vacancies created and has boosted production efficiency, quality as well as waste reduction. Due to the RECP programme, the company has significantly excelled in product quality, waste management, occupational health and safety and general environmental performance.

Testimony Box
Kenya National Cleaner Production Centre (K NCPC)
The Kenya National Cleaner Production Centre (KNCPC) 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.
Contact Details
KENYA NATIONAL CLEANER PRODUCTION CENTRE Kenya Industrial Research and Development Institute (KIRDI) Kapiti Road - Off Mombasa Road, Nairobi South 'C' P.O. Box 1360-00200 - City Square, Nairobi- Kenya Tel. +254-020-604870/1, 603842, 0734 412 402. E-Mail: info@cpkenya.org Fax: +254-020-604871/607023/555738 Web: www.cpkenya.org
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.