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CASE STUDY
Resource Efficient and Cleaner Production Indonesia

PT LEETEX GARMENT INDONESIA

Textile Sector

PT LEETEX GARMENT INDONESIA
Majalengka, West Java, Indonesia

BACKGROUND

The need to decouple economic growth from environmental degradation is unquestionable as the effects of accelerating climate change and resource depletion continue to alter habitats, threatening livelihoods and ecological sustainability. UNIDO is at the forefront of efforts to build a sustainable system that allows growth while protecting the environment. It assists governments, institutions and industry to best adapt their production methods, move towards cleaner production systems and develop sustainable, efficient resource usage solutions. While it is essential that industry continues to grow and prosper, it is also worth considering changing the mindset of the way industrial sector does business and becoming more efficient and responsive to resource consumption and waste generation.

INTRODUCTION

PT. Leetex Garment Indonesia was established in 2000 and located on the main road between Bandung and Cirebon. The company voluntarily joining the RECP - Indonesia demonstration programme in the textile/garment sector category in 2017. Before implementation of the techno-economically viable RECP options, RECP assessment and baseline data was collected and compiled by national expert and company's RECP team. The objective of the assessment was to assist PT. Leetex Garment Indonesia in optimizing the resources consumption and minimizing waste or emissions generation. RECP focus on energy sources, materials, and waste management. However, management decide that first priority of initial RECP implementation is to focus on energy conservation considering its significant share in operational cost. RECP assessment and options has been carry out using RECP methodology. After the identification of feasible RECP options, the next step is convert their programme into viable solutions and prepare implementation plan based on available resources engage in implementation of techno-economically viable and environmentally refer to RECP solutions.

PROCESS DESCRIPTION

PT. Leetex Garment Indonesia produces knitted product: sweaters, both for men and women, children and infants, with a capacity of 15 million pieces per year.

The process flow chart of garment processing in PT. Leetex Garment Indonesia is depicted as **Figure 1**.

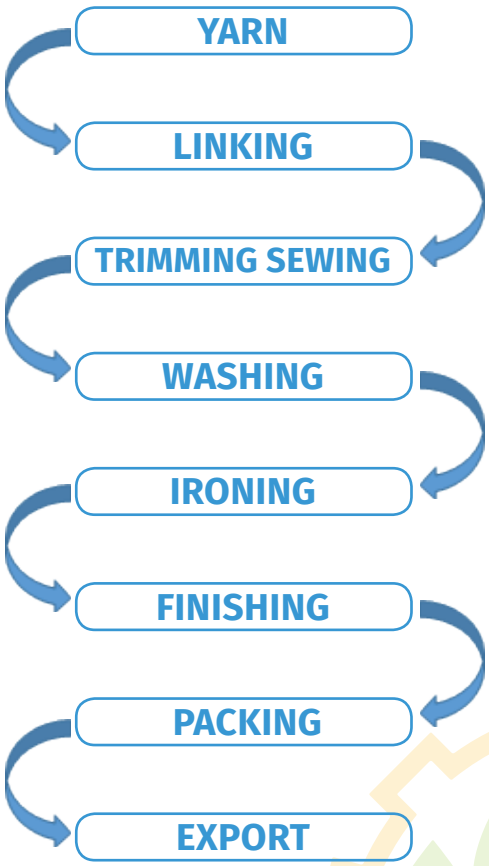


Figure 1: *Flow chart of garment production (Sweater)*

RECP POTENTIAL

PT. Leetex Garment Indonesia identify, evaluate and initiate the implementation of several resources conservation options towards environmental and financial sustainability. RECP company team and RECP project experts conduct the RECP assessment specifically on energy, water consumption and greenhouse gas emissions from energy use.

The specific resource consumption compiled by team present in **Table 1** that indicates specific energy and water consumption in the company are higher compared to industrial benchmarks on garment wash production. As reported by management and experts, higher consumption of resources can be caused by several factors, varying issues such as lighting (for example used fluorescent lamp), the old building without transparent roofing, and even about washing techniques.

Specific higher coal consumption also found as a result of low efficiency of boiler and distribution losses of steam. Specific energy consumption is being identified by RECP measured on 1.08 kWh/pieces electricity and 0.25 kg/pieces coal of garment processing, and they both having significant potential of cost saving.

The most significant RECP potential and management concern in PT. Leetex Garment Indonesia is energy consumption in general, and water consumption in particular. Saving in energy consumption has an effect not only saving in production cost but also reduction of GHG emissions.

Table 1: *Baseline Data and Potential of RECP in The Unit*

Compo-nents	Unit	Baseline Before RECP	RECP potential	Potential Saving Cost USD/year	Remarks
Production*	Piece/ year	7,987,259	15,000,000		production data based on 15,000,000 T/year
Specific electricity consumption (SEC)	kWh/ piece	1.08	0.91 (15.7%)	280,500	Electricity cost 0.11 USD/kWh
Specific water consumption (SWC)	L/piece	9.58	5.60 (41,5%)	11,940	Water cost 0,2 USD/M^3
Specific Coal Consumption (SCC)	Kg/ piece	0.25	0.19 (24%)	67,500	Coal cost 0.075 USD/ Kg
Specific Waste Water Generation (SWWG)	L/piece	7.67	4.48 (41.2%)	19,140	Waste water cost 0.4 USD/M^3
GHG emissions	Kg CO_2/ piece T CO_2/ Year	1.57 23,550	1.27 (19,1%) 19,050		GHG reduction 4,500 Ton/ year
TOTAL				**379,080**	Saving USD 0,025/piece

POTENTIAL OF RESOURCE EFFICIENT AND CLEANER PRODUCTION

Table 1 presents the existing consumption and the potential for savings that can be obtained by implementing RECP measures. For ease of comparison and in accordance with benchmarking studies, resource consumption is calculated per piece of product output.

A total of 23 RECP options were identified during the study and after pre-screening 13 were selected for detailed feasibility analysis and subsequent implementation of techno-economically viable and environmentally desirable RECP solutions.

During the initial stage of implementation, particular attention was paid to those measures which could be carried out at low and medium cost to the unit. Thus far, the unit has implemented 7 RECP options as part of RECP implementation and others options are into consideration. The RECP team and project team estimated the potential for RECP savings USD 379,080 per year, which are presented in **Table 1**.

The results achieved from implementation of 7 techno-economic viable options with an investment of USD **73,802**, are compiled in **Table 2**. The management also decided to continue RECP activities in the company even after the completion of the project activities in order to identify and implement additional techno-economically viable RECP options knitting processing and garment wash.

THE IMPLEMENTATION OF RECP OPTIONS AT PT LEETEX GARMENT INDONESIA

One of the most effective ways of creating more efficient resource usage is to ensure the optimized management of resource use through a dedicated, structured framework that improves performance and maximizes resource consumption and reduce waste generation over time. Number of RECP options were identified during the RECP assessment in PT Leetex Garment Indonesia and feasibility analysis was conducted by RECP team of PT Leetex Garment Indonesia. Some of the selected and implemented options are listed below in **Table 2**.

Table 2: *RECP Options Implemented by PT Leetex Garment Indonesia*

No	RECP options already implemented	Investments
1	Part replacement of fluorescent lamps (36 watt) with LED lamps	USD 27,650
2	Production planning was devised to match the resource requirement like steam to regulate boiler operation	No cost
3	Install inventers on all major drives/motors	USD 1,655
4	Recover and reuse condensate as process water (so far not as boiler feed water due to distance)	USD 795
5	Improved steam distribution installation using high quality rock wool material	USD 15,000
6	Installation of skylight/daylight using transparent roofing sheets to use natural daylight in several sheds/ production areas	USD 7,000
7	Optimize / improve power factor by installing capacitor bank to major motors and main distribution	USD 21,702
	Total investment	**USD 73,802**

It was reported that the company has made investments of approximately USD 73,802 to implement the above RECP options, resulting in reduction in energy consumption as well as a reduction of over 2,390 tons of GHG emissions per year. The poor coal quality (with high water content and low Kcal/kg) resulted in increased coal consumption per ton stem generation and thereby impacted on actual GHG emission reduction from the implemented options. Savings on water consumption and wastewater generation are 31.8% and 43.1% 8.5 per cent as presented in **Table 3**.

Table 3: *Results of RECP Measures Implemented (on July 2019)*

Compo-nents	Unit	Baseline Before RECP	RECP potential	Potential Saving Cost USD/year	Remarks
Production	Piece/ year	9,480,662	11,950,884		
Specific electricity consumption (SEC)	kWh/ piece	1.08	0.97 (10.2%)	144,606	Electricity cost = 0.11 USD/kwh
Specific water consumption (SWC)	L/piece	0.25	0.21 (16%)	35,853	Coal cost = 0,075 USD/ Kg
Specific Coal Consumption (SCC)	Kg/ piece	9.58	6.53 (31,8%)	7,290	Water cost = USD 0.2/M^3
Specific Waste Water Generation (SWWG)	L/piece	7.87	4.48 (43.1%)	16,205	Waste Water cost = USD 0.4/M^3
GHG emissions*	Kg CO_2/ piece T/year	1.57 18,763	1.37 (12.7%) 16,373		Computed from energy use. GHG reduction 2,390 T/ year
TOTAL				**203,594**	Saving USD 0.017/kg

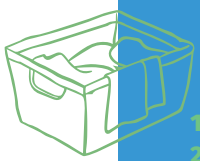
The reduction achieved so far implementing RECP options are approximately 53.7 per cent of estimated savings potential and 53.1 per cent GHG emissions reduction. RECP is sustainable when it becomes internalized, which has been the case at PT Leetex Garment Indonesia due to management support and proactive RECP team. During the current RECP assessment, several additional measures were recommended by an international RECP expert, which will be assessed and implemented in accordance with a company review in the future. In the next phase, it is important to continue to collect information on future improvements.

RECOMMENDED ADDITIONAL RECP OPTIONS BY PROJECT

1. Substitute an old inefficient motor with energy efficient motors to reduce energy consumption
2. Changing coal fuel to wood or agro residue briquettes or pallet fuel: wood or agro residue fuels are “carbon neutral” and possibility of substitution shall be explored
3. Install coal mill to reduce the size of coal to reduce energy loss in bottom ash.
4. Optimization of compressed air as per usage requirement.
5. Replacement of identified old inefficient motors with energy efficient motors.

CONCLUSION

Highlights of RECP implementation



1. **Reduced GHG emissions 12.7%**
2. **Reduced electricity consumption 10.2%**
3. **Reduced water consumption 31.8%**
4. **Reduced waste water volume & load 43.1%**

PT. Leetex Garment Indonesia management and RECP Team show a keen interest in RECP and its implementation. And in short period, host of RECP measures were either reported implemented or under implementation. The implementation of low and medium cost RECP options has contribute to the reduction of GHG emissions and specific energy consumption. The investment and tangible savings indicate a payback period of less than 5 months on investment. PT. Leetex Garment Indonesia also plan to embark on more technology-oriented options specially substitution of coal fuel and change of motors in second phase of RECP implementation.

RESOURCE EFFICIENT AND CLEANER PRODUCTION

Resource Efficient Cleaner Production (RECP) is a new and creative way of thinking towards products and the production processes. It is achieved by the continuous application of preventive strategies to minimize the generation of wastes and emissions. RECP strategy comprises the following eight practices, which are also applied in the demonstration of RECP at PT LEETEX Garment Indonesia:

1. **Good Housekeeping (GHK):** appropriate provisions to prevent leaks and spills (such as preventative maintenance schedules and frequent equipment inspections) and to enforce existing working instructions through proper supervision, training etc.
2. **Input Material Change (IMC):** replacement of non-renewable inputs by low carbon, renewable feedstock.
3. **Better Process Control (BPC):** modification of working procedures, machine instructions and process record-keeping to operate processes at higher efficiency and lower rates of waste and emission generation.
4. **Equipment Modification (EM):** modification of production equipment and utilities (for instance through the addition of measuring and controlling devices) in order to run processes at higher efficiency and lower rates of waste and emission generation.
5. **Technology Change (TC):** replacement of technology, processing sequence and/or synthesis pathway in order to minimize rates of waste and emission generation during production.
6. **On-site Recovery/Reuse (RR):** reuse and recycling of wasted materials and energy (thermal energy) in the same process or for another useful application within the company.
7. **Production of Useful By-Product (BP):** transformation of wasted material into a material that can be reused or recycled for another application outside the company.
8. **Product Modification (PM):** modification of product characteristics in order to minimize resource usage and associated environmental impacts of the product during or after its use (disposal) or to minimize the environmental impacts of its production.

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Published in August 2019