TEST case study

Home Textile company

Developed under the framework of Med TEST II

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

switchmed

The SwitchMed Programme is funded by the European Union

Home Textile company

SECTOR	Textile
SUBSECTOR:	Home Textile
SIZE	160
PRODUCTS	Furniture weaving, fabric pieces, indoor and outdoor furniture
MARKET	Local and international market
CERTIFIED MANAGEMENT SYSTEMS	ISO 9001

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Company Key data

Reason to join TEST project

the first reason for joining the test project is to consolidate a dynamic of progress in which quality and culture performance are major components.

YEAR 2016	Unit	Value
Production	Ton/year	Parts:150
	mL/year	Weaving: 563,845
Electricity consumption	kWh/year	1,299,905
Fuel consumption	Ton/year	817
Propane consumption	Ton/year	435
Water consumption (of which only 1,218 m3 of city water)	m^3/year	19,330
CO_2 emission	Ton/year	1,907
BOD5	Kg/year	n/d
COD	Kg/year	n/d
Total cost of sales	€ /year	2,488,923
Total cost of inputs (Purchase value of raw materials, auxiliary materials, packaging energy and water)	€ /year	943,960
	% vs. cost of sales	37.9%
Estimated non-product output	€ /year	391,343
	% vs. cost of sales	15.7%

Process overview/flowchart

INPUT

Raw Materials

Thread
Colorants
cardboard tube

Energy

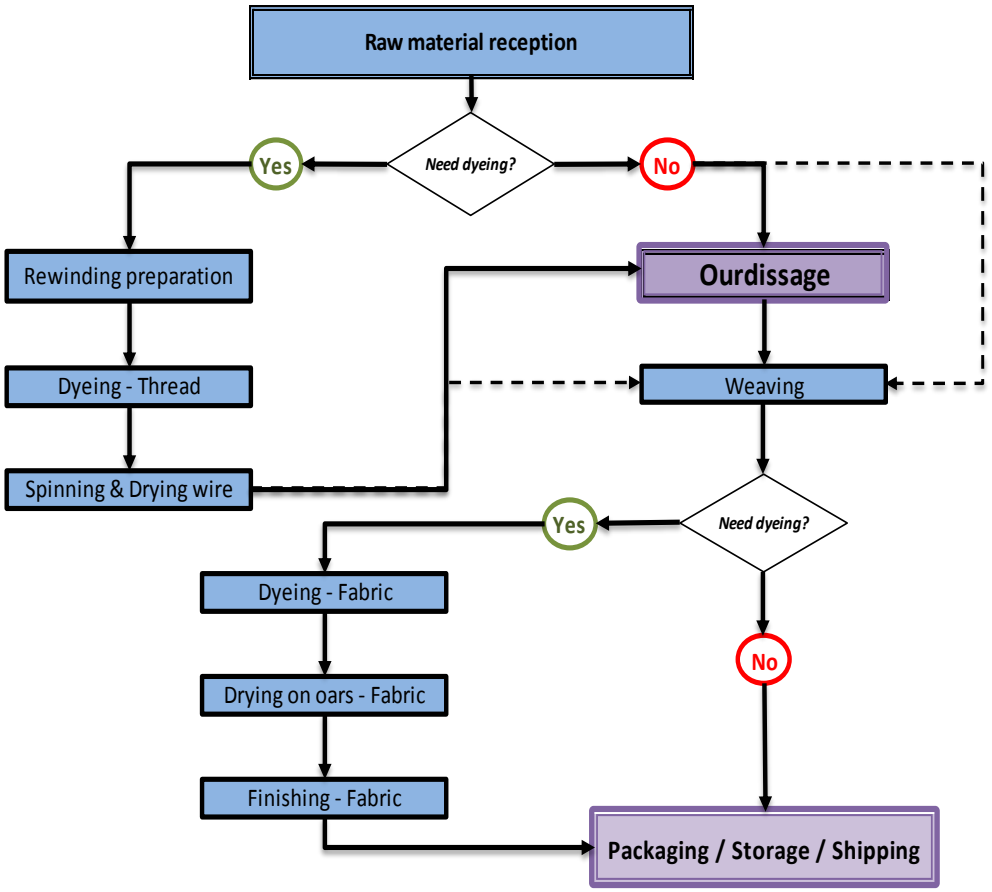
Electricity (KW)
Propane gas
Fuel

Packaging materials

plastic
Scotch

Operating materials

chemical products
auxiliary products
Spare parts
cone
palette



OUTPUT

Products

fabric pieces
Furniture weaving
cloth Nappage
gym fabric

Air emissions

CO2, SOx, NOx

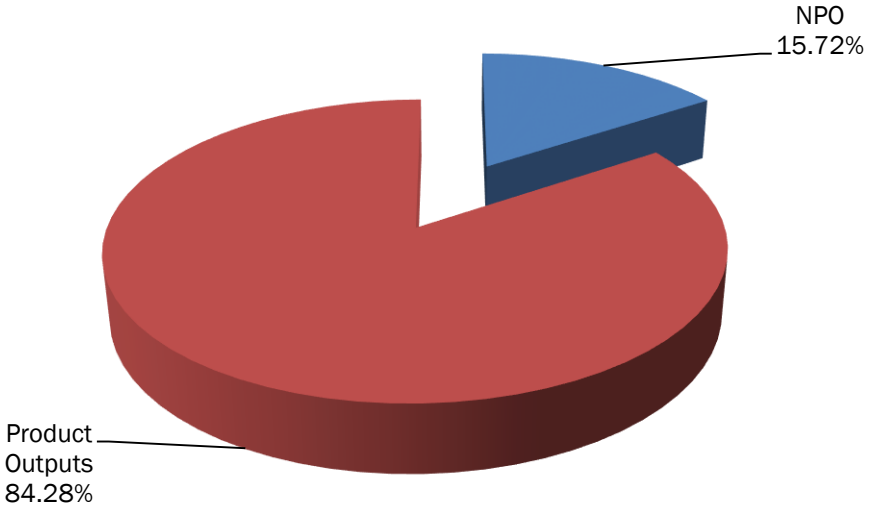
Liquid waste

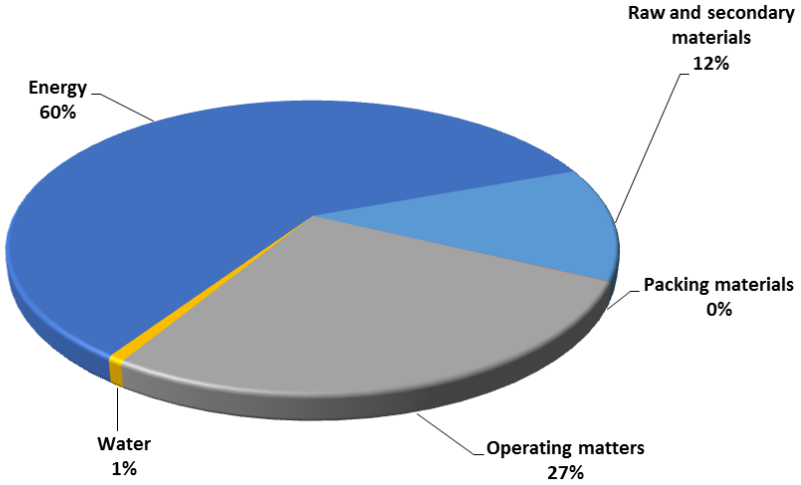
Solid waste

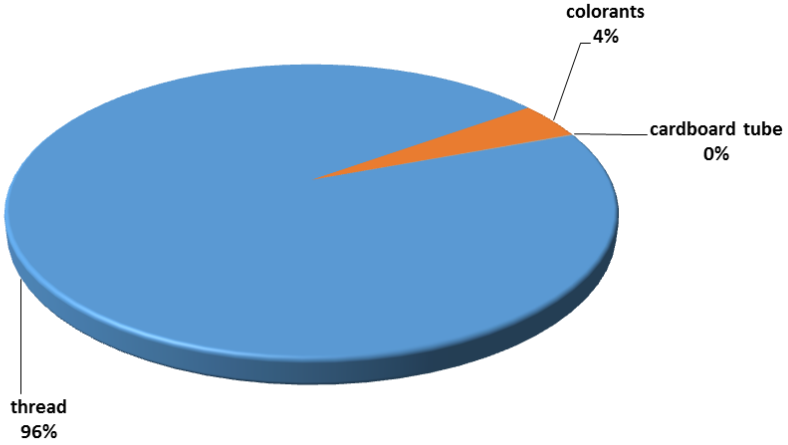
Benchmarking

Benchmark type	Unit	Company	Best practice
Electricity	kWh/T. of product	8,666	2,700-4,500
Fuel	kWh/T. of product	64,420	35,000-48,000
Propane	kWh/mL of product	9.9	5.2-7.5
Water	m3/T. of product	128.1	90-110
Waste water	m3/T. of product	122	80-110
Solid waste	Kg/T. of product	52.8	27-40

Non-Product output costs







15.7% of the purchased value in 2016 (391,343 €/yr) was lost due to product losses in manufacturing, energy, waste water and waste generation.

Priority flows

NPOs cost analysis

The following table shows that the summary of the costs of NPO is 391,343 €/ year.

Its distribution gives 62.4% for energy, around 25.3% for operating materials and 11.9% for raw and secondary materials.

In this exercise, it has to be noted that an estimate was made to determine the rate of NPO attributable to raw materials. It is 7.87%, while for the operating materials, water and energy their rate was 100%.

	Inputs (€)	NPO (average rate %)	NPO (€)	Distribution in percentage %
COSTS NON PRODUCT OUTPUT (NPO)	**943,961**	**41.5%**	**391,343**	**100.00%**
Raw and secondary materials	593,677	7.87%	46,722	11.93%
Packing materials	5,815	3.00%	174	0.04%
Operating materials	98,929	100.00%	98,929	25.28%
Water(Of which only 1218 m3 of town water)	1,298	100.00%	1,298	0.33%
Energy	244,242	100.00%	244,242	62.41%

The table below shows the 3 main priority flows in the factory:

Priority Flows	€	Percentage [%]
Energy	244,242	62.4%
Operating materials	98,929	25.3%
Raw materials	46,722	11.9%

Potential for improvement (e.g. vs. benchmarks):

Relative to energy part, a potential of improvement of 60% has been identified. For the water consumption, the potential is probably more that 50% achievable through a change in dyeing process technology

Environmental considerations

By the implementation of the action plan, GHG could be reduced by 60% and wastewater by 50%

Information system - MFCA

- Key findings

The MFCA methodology allows the company to know about its financial information system, the areas that represent sources of cost reduction and therefore the potential to realize additional gains.

- Experience with I/O analysis

The input-output analysis allowed the company to know the difference in costs and volume between inputs and outputs of the plant and consequently to quantify these non-product outputs (losses)

- Recommendations

It is recommended to put in place the MFCA analysis at least once a year and continue to manage all NPO, especially raw and secondary materials.

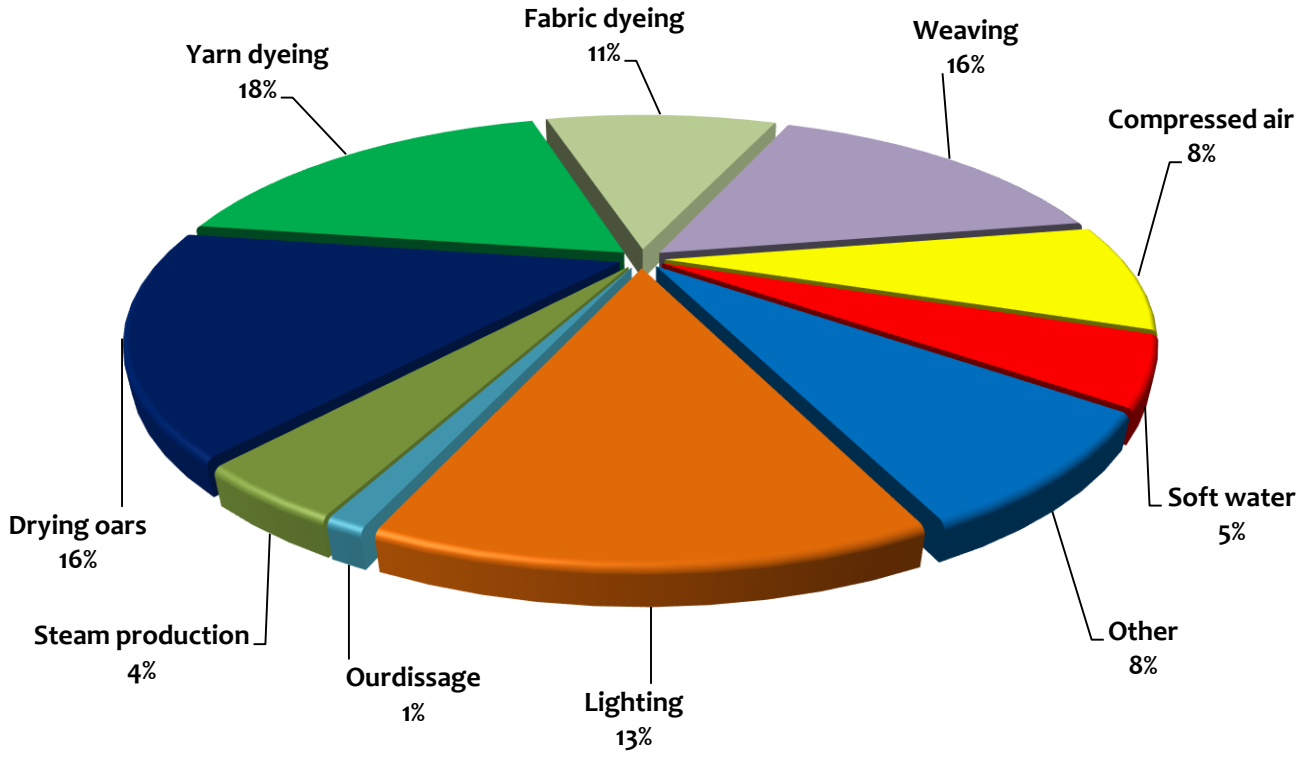
Information system - Metering

- In the case of the company, key performance indicators (KPIs) are:
  1. Total power consumption versus production (kWh / ton product)
  2. Consumption of fuel oil in relation to production (kg.fuel / Ton product)
  3. Propane consumption versus production (kg propane / ton product)
  4. Water consumption relative to production (m3.water / Ton product)
  5. Cost of production materials in relation to production ($ / Ton product)
  6. Losses of raw materials in relation to production (kg / Ton product)

  It will involve deploying the necessary tools (counters, scales, production records, etc.) and the frequency of monitoring to measure the actual gains achieved by the implementation of the action plan, the performance of the equipment and its maintenance.

Energy balance

The balance sheet provides an annual consumption of approximately 1,406,460 kWh while that recorded according to invoices is 1,299,905 kWh. The difference between the two values of electricity consumption is 8.2%.
The breakdown, consumption, is shown in the figure below :



Selection of focus areas:

- the focus area was selected in relation to priority flows raw materials and secondary, after an analysis of the MFCA based on the distribution of cost centers and by mutual agreement and following the request of the Management

CATEGORIES OF ENVIRONMENTAL COSTS	Cost centers (production process. key services. etc.)								
	Total €	reception and storage	warping	Dyeing	Finishing	winding	Weaving	FP Store	administration
1. COST OF Non Product Outputs (NPO)		0,8%	5,2%	62,2%	16,2%	3,3%	10,3%	0,7%	1,3%
1.1. . Raw and secondary materials		3,7%	35.1%	26,1%	0,0%	12,0%	24,1%	0,0%	0,0%
Subtotal	46,700	1,682	16,411	12,187	-	5,455	10,956	8	-
1.4. Operating material		0,0%	0,0%	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Subtotal	98,929	-	-	98,929	-	-	-	-	-
1.5. water		0,0%	0,0%	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Subtotal	1,298	-	-	1,298	-	-	-	-	-
1.6. Energy		0,5%	1,6%	53,7%	26,0%	3,1%	12,0%	1,0%	2,1%
Subtotal	244,242	1,272	3,817	131,051	63,576	7,633	29,260	2,544	5,089
Total catégorie 1	391,343	3,024	20,245	243,464	63,576	13,088	40,216	2,639	5,089

Selection of focus areas:

For the factory, and after the MFCA analysis and discussion with company Management, the focus areas are the following:

1. The dyeing production unit has been selected as the first focus area with (62.2% of NPO)
2. The finishing production unit has been selected as second focus area with 16.3% of NPO
3. The weaving unit has been selected as third focus area with an NPO of 10.3%

Saving Catalogue – identified projects

	N°	Measure
Energy	1	Optimization of the subscribed power after improvement of the power factor
	2	Improvement of interior lighting system (offices, factories)
	3	Improved outdoor lighting system (& large interior volume)
	4	Replacement of current engines with high efficiency motors
	5	Improved compressed air production through finer regulation and leak detection and repair campaign
	6	Installation of a PV electricity generation system in self-consumption mode (2,000 - 331 kWp)
	7	Thermal insulation of hot surfaces
	8	Improvement of combustion efficiency of boilers by continuous automatic regulation mode: addition of VEV and 02 probe to the burner of each boiler.
	9	Preheating of combustion air by recovery around chimney walls at 64 ° C
	10	Recovery of 90% condensates to the re-vaporization vessel (Project No. 11) and installation of an RO unit with a capacity of 1.5 m3 / day
	11	Installation of a condensate re-vaporization system with vapor expansion station
	12	Reduce the consumption of drying trains by energy recovery of fumes for preheating of combustion air (preliminary study for validation)
	13	Installation of an electrical, thermal and water energy management system to implement the ISO 50001 standard on energy management

Saving Catalogue – identified projects

Envir.	14	Study for the optimization of water consumption
	15	Improved chemical storage warehouse (dyes)
Process	16	Optimization of use of dyeing equipment
International Expert	17	Optimization of the dyeing process
	18	Technological upgrade of dyeing machines
	19	Replacement of winding machines
	20	Water management and heat recovery
	21	Training of weaving staff (trainers)

Reduce the consumption of drying reams by energy recovery of fumes for preheating combustion air

Description of the solution	The drying reams work on the principle of forced air convection. Gas burners heat the air used to dry the fabrics. This involves recovering the calories from the combustion stacks to preheat the combustion air and / or the fresh air for drying. The same goes for the different exhaust stacks for cooking gases loaded with moisture and VOC. A feasibility study is required to finalize this improvement measure.
Economic benefits	We estimate that the saving are about 20% of the current consumption of propane of only these reams drying machines. The estimated saving is equivalent to 7,900€ / year
Environmental benefits	7.3 tons of propane 22 tons of CO2
Capital investments	The investments budget is to be established during the feasibility study. It should be around 45,500 €. The ROI is about 5.7 years
Other barriers	No barriers

Technological upgrade of dyeing machines

Description of the solution	The machines installed are relatively recent (2005) but currently consume too much energy (electricity and steam) and too much water. The engines of the traditional machines consume a lot of energy (Example: on a machine of 500 kg, the old generations of machines had an engine of HP75 (55 Kwh) whereas today they range from 15 to 20HP (11 kWh) We could think of replacing the motors but this operation would not be enough because we must also replace other parts such as frames, inverters, pumps, etc. These changes represent a cost estimated at 90% of the cost of a new machine. It is therefore preferable and more economical to change the machine.
Economic benefits	Machine replacement reduces electricity, water and steam consumption: • electricity - 90% = estimated at around € 39,000 / year • water - 40% = estimated at around € 1,000 / year • steam - 21% = estimated at around € 200 / year ... and a quality improvement estimated at around € 5,000-10,000 A total of around € 40000 to € 50,000 savings per year
Environmental benefits	The gains consist of a reduction in the consumption of electricity, water and fuels. Electricity: 409,400 kWh // Fuel oil n ° 2: 21,3 Tons // Water: 2,200 m3 CO2 reduction of 477 T/year
Capital investments	The cost of a Machine of 500 Kg is about € 244,423 (discounted price € 159,000)
Other barriers	No barrier

Water management and heat recovery

Description of the solution	There is the possibility to recover some of the water and heat from the hot water coming out of the dying machines. The heat recovery can be achieved through the installation of a heat exchanger.
Economic benefits	Reduction of steam consumption: estimated at € 35,000 / year for full time running of the factory Actually the dying unit is running only 3,000 hours/ year. Based on this, the revised saving is 18,986 € / year Thus the economic benefits for this project is 18,986 €/year
Environmental benefits	The gains consist of a lower consumption of thermal energy. It is estimated at approximately 192,000 kcal / h x 3,000 h / year / (9,600 kcal / kg x 85%) / 1,000 = 70.6 Ton fuel, The calculation of water saving is estimated at 1,067 m3/year Saving energy also means reducing CO2 emissions as agreed under the Climate Change Convention, this reduction is 217 T.eCO2 / year
Capital investments	RCR Wastewater Energy Source € 51,000
Other barriers	

Management system integration

- Impact on potentially reduced environmental compliance costs (reduction of 3,584 m^3 of liquid waste, and 3.4 tons of solid waste)
- Integration of RECP into ISO 9001 existing management systems
- Culture behavior change in the factory and management
- Systematic use of TEST tools such MFCA
- Other less tangible benefits gained by company such the reduction of thermal & electrical energy consumption, optimization of the dyeing process and the technological upgrading of the winding equipments

Results

Action	Investment Euro	Savings euro /Yr	PBP Years	Water and Raw Materials /Yr	Energy MWh/Yr	Environmental Impacts /Yr.
Electric power and compressed air	31,013	17,710	1.8		177	Total: 1,686 t.CO_2 3,584 m3 of water 3.4 t solid waste
Thermal energy and economy of the water	101,084	53,420	2.0	1,184 m3 of water	1,884	
Improvement of the organization and production optimization	50,320	10,814	4.7	3.4 t solid waste	126	
Optimization of the dyeing process and technological upgrading of winding equipment	988,593	251,880	2.9	2,400 m3 of water	1,210	
Photovoltaic system	275,460	44,176	6.2		565	
TOTAL	**1.446,470 €**	**378,000 €**	**3.8**	**3,584 m3 of water 3.4 t solid waste**	**3,963 MWh**	

Conclusion

- 85 % out of 21 RECP opportunities are under implementation
- Economic Savings 378,000 € with an average PBP of 3.8 years
- Total annual Water savings :18.5 %
- Total annual Energy savings : 23.3 %
- Total annual Raw Material savings : 2.3 %

- Non-Product output costs reduced by more than 50 %
- CO_2-emission reduction by 88.4 %