TEST case study

Footwear

Developed under the framework of Med TEST II

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

switchmed

The SwitchMed Programme is funded by the European Union

Footwear

SECTOR	Leather
SUBSECTOR	Footwear
SIZE	500 employees
PRODUCTS	Children's footwear
MARKET	International
CERTIFIED MANAGEMENT SYSTEMS	ISO 9001

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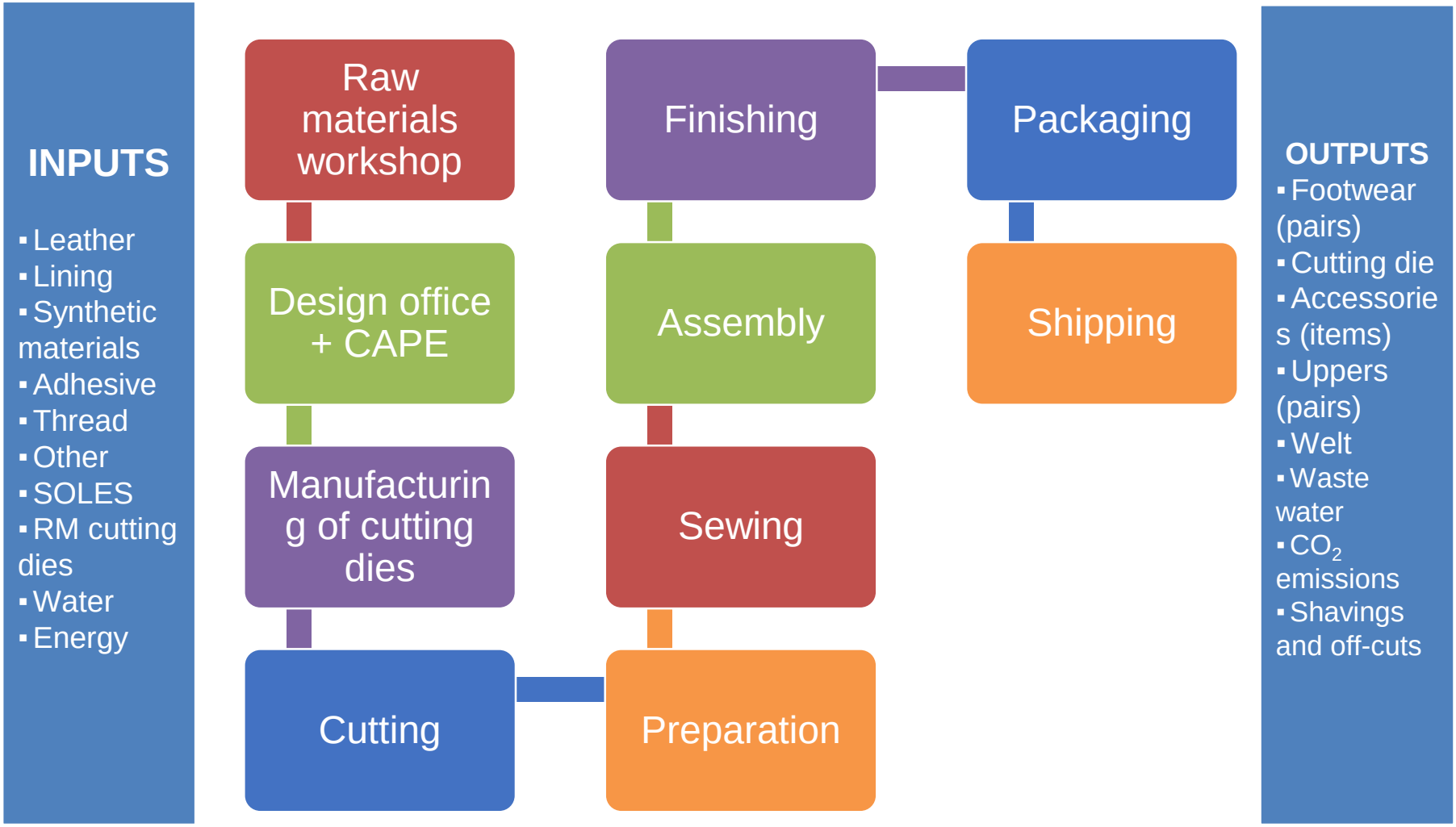
Company key data

Anticipate the risks related to pollution and prevent them by minimising releases, and by improving our environmental and energetic performance while preserving resources

Year 2015	Unit	Value
Production	pairs/year	802,411
Electricity consumption	toe/year	418
Gas consumption	m^3/year	959.5 m^3
Water consumption for processes	m^3/year	42
CO_2 emissions	tonnes/year	983.3
BOD5	kg/year	75
COD	kg/year	126
Total cost of sales	€	9,971,340
Total cost of inputs (purchase value of raw materials, auxiliary materials, energy, packaging and water)	€/year	6,766,095
	% vs cost of sale	67.85%
Estimated non-product outputs	€/year	1,217,412
	% vs cost of sale	12.20%

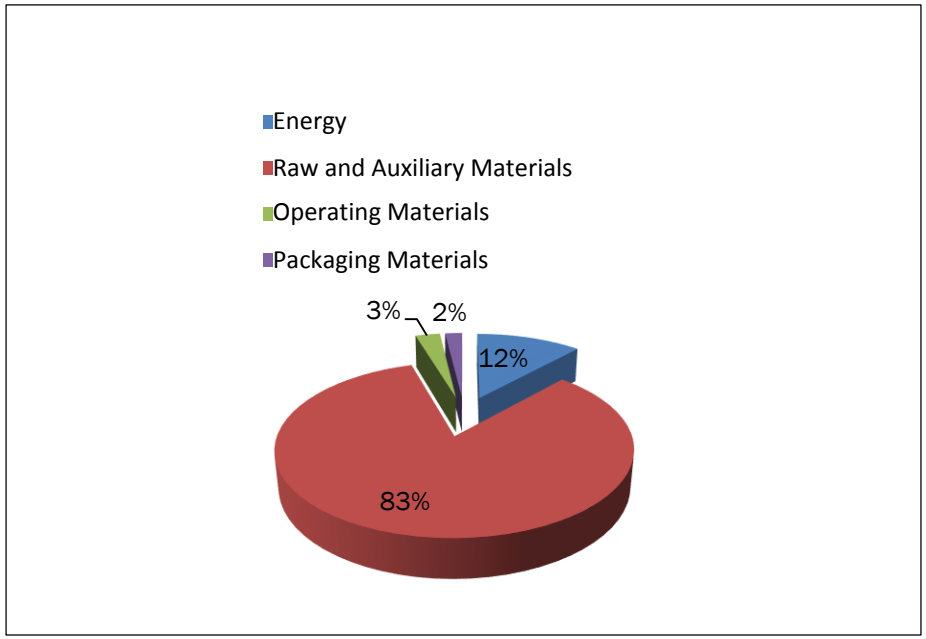
Process overview/flowchart: footwear manufacturing



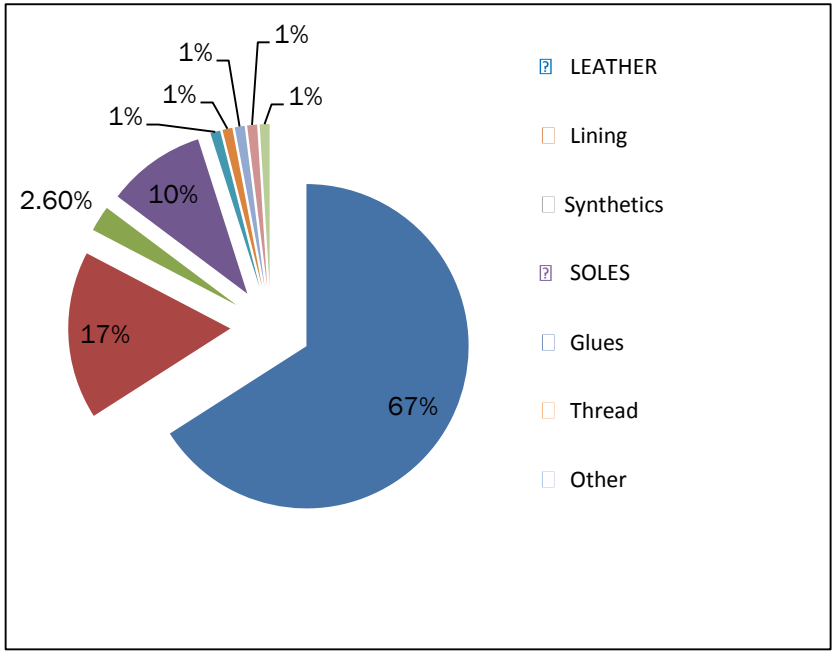
Benchmarking

Benchmark type	Unit	Company	Best practices
Energy	kWh/pair	1,844	
Water consumed	hl/pair	0.22	
Waste water	m^3/pair	Nothing to report	
BOD5, waste water	kg/m^3	Nothing to report	-
COD, waste water	kg/m^3	Nothing to report	
Solid waste	kg/pair	0.125	
Labour	Number of pairs/h	356 pairs/h or 0.7 pairs/h/worker	
Solid waste	t/tonne of finished product	0.003	Not available

Non-product output (NPO)



Distribution of NPO per flow (%)



Distribution of NPO RM per product flow

- Raw materials represent the biggest cost centre. This represents approximately 64% of the purchase value in 2015 (€6,766,095/year).
- These losses are estimated at €1,217,412/year, equivalent to 83% the cost of losses. These losses represent losses of leather, lining and soles.

Mapping of energy use

Energy use	Location	Energy consumed [kWh/year]	Percentage [%]
Air conditioning for sewing workshop	Sewing workshop	17,550	1.2%
Air conditioning for cutting workshop	Cutting workshop	18,000	1.2%
Air conditioning assembly workshop	Assembly workshop	60,000	4.0%
Air conditioning for raw materials warehouse	RM warehouse	15,450	1.0%
Assembly compressor CSDX137	Assembly compressor room	160,380	10.6%
Cutting compressor ASD47	Cutting compressor room	14,504	1.0%
Cutting compressor AS44	Cutting compressor room	14,740	1.0%
Cutting/sewing conveyor no. 1	Cutting workshop	7,030	0.5%
Cutting/sewing conveyor no. 2	Cutting workshop	9,500	0.6%
Cutting/sewing conveyor no. 3	Cutting workshop	10,640	0.7%
Cutting/sewing conveyor no. 4	Cutting workshop	10,450	0.7%
Cutting/sewing conveyor no. 5	Cutting workshop	9,500	0.6%
Cutting/sewing conveyor no. 6	Cutting workshop	12,350	0.8%
Mechanics workshop + storeroom + ***sewing***	Cutting workshop	10,450	0.7%
Black line	Assembly workshop	31,360	2.1%
Spindle 1	Assembly workshop	31,360	2.1%
Red line	Assembly workshop	67,620	4.5%
Green line	Assembly workshop	67,620	4.5%
Orange line	Assembly workshop	67,620	4.5%
Yellow line	Assembly workshop	67,620	4.5%
Blue line	Assembly workshop	31,360	2.1%
Total factory lighting	Factory	220,000	14.6%
Other production equipment	Factory	555,414	36.8%
Total electricity consumption 2015	**Factory**	**1,510,517**	**100%**

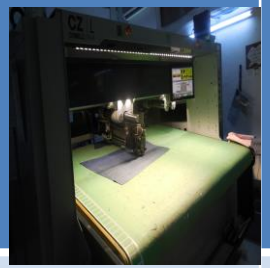
Focus areas and cause analysis

Focus areas	% in relation to NPO costs	Cause analysis
Cutting	80%	Loss of heel seats, choice of materials and defects in leather, lining and synthetic materials during cutting
Sewing	2%	Losses of cut-out parts; needles, glue, thread etc.
Assembly	13%	A loss of raw materials (soles, glue, solvents, hardening agents) has been identified during the gluing phase
Manufacturing of cutting dies	2%	Inefficient distribution of degreasing and rinsing baths, deficient quality control of the bath

Catalogue of identified measures

ID	Initiative
Raw materials	
1	Recovery of leftover leather
2	Recovery of waste from vegetable tanned leather
3	Replace cutting presses with automatic cutting machines
Energy	
4	Set up an energy management system
5	Detect and repair compressed-air leaks
6	Optimisation of compressed-air consumption
7	Optimisation of the lighting system in the production areas
8	Technical assistance to improve energy efficiency in the different workshops
Non-compliant procedures	
9	Purchase an automatic additive doser
10	Remove a rinsing bath from the chemical degreasing phase
11	Switch baths during the chemical rinsing phase
12	Minimise the consumption of leather during cutting
13	Improve the quality of zinc coating water and reduce losses of pneumatic power

Best practice 1:
(Replace cutting presses with automatic cutting machines) Materials

Description of the solution 	The measure consists in replacing the traditional cutting presses with automatic cutting machines. The entire system features software and a table with the devices used for cutting materials.
Economic benefits	**240,000 euros** equivalent to the cost of labour and purchase of raw materials and auxiliary materials for manufacturing cutting dies, representing estimated savings of **24%.**
Environmental benefits	**12 t of metallic waste / year** Waste from zinc sludge from the zinc coating phase is approximately **80 kg/year.** Reduction in metallic waste of **75%.**
Capital investments	**20 machines = 20 x 50,000 euros = 1,000,000 euros** **PBP: 4.5 years**
Other barriers	High cost of machines

Best practice 2:
(Optimisation of the lighting system in the production areas) – Energy

Description of the solution 	Replace the T8 neon tubes with T5 neon tubes powered by electronic ballasts.
Economic benefits	**12,500 euros** which represents savings of **7.5%** in relation to the total consumption costs
Environmental benefits	**Reduction of 71.3 t CO_2** which represents savings of 7.25%
Capital investments	**Purchase cost of T5 neon tubes**: 14,000 euros **PBP:** 1.1 years
Other barriers	Nothing to report

Best practice 3:
(Switch baths during the chemical degreasing phase) – Non-compliant procedures

Description of the solution	The chemical degreasing bath is the first to be contaminated, whereas the electrochemical bath is less polluted, so the chemical degreasing bath can be renewed when contaminated, then, set up the electrochemical bath to work as a chemical degreaser, and then set up a new electrochemical degreasing bath. This doesn't affect the final quality of the cutting dies.
Economic benefits	340 euros/year
Environmental benefits	3 kg of COD/year
Capital investments	~
Other barriers	Nothing to report

Management system integration

- Set up an environmental policy
- Well-trained company TEST team, representing a driving force to ensure the efficiency of resources and sustainable production
- Planning of implementation of ISO 14001, v 2015 in 2018
- Improve the cost accounting system to better reflect real environmental costs: complete adoption of the MFCA tool
- Improvement of the absolute ratios calculated at the end of the project

Results

Measure	Investment (euros)	Savings (euros/yr)	PBP (years)	Water and raw materials	Energy (MWh)	Environmental impacts
Optimisation of manufacturing procedures	€1,024,320	€357,010	2.9	18 tonnes of materials (leather + steel)	-	76 tonnes of solid waste 327 t CO_2 24.9 kg COD 8.3 m^3 of waste water
Recovery of waste	€354,000	€918,000	0.4	58 tonnes	-	
Optimisation of energy consumption	€39,200	€43,430	0.9	-	514 MWh	
Optimisation of the zinc coating process	€1,643.50	€1,279	0.8	170 kg additives 8.3 m^3 of residual water	1.6 MWh	
TOTAL	**€1,419,137**	**€1,319,719**	**1**	**8.3 m^3** **76 tonnes**	**515.6 MWh**	

Conclusion

- Implementation of 46% of the measures, and 43% are planned (for seeking funding and/or further study)
- Economic savings amount to €1,319,719 with an average PBP of 18 months
- Total annual water savings: 8.3 m^3/year (20%)
- Total energy savings: 515.6 MWh (34.7%)
- Total annual material savings: 76 t (1%)
- Reduction in CO_2 emissions: 327 t (3%)
- Reduction in water pollution: 36% in terms of COD