TEST case study

Pharmaceutical company

Developed under the framework of Med TEST II

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

switchmed

The SwitchMed Programme is funded by the European Union

Pharmaceutical

SECTOR	Chemical
SUBSECTOR	Pharmaceutical
SIZE	600 employees
PRODUCTS	Drugs for human use
MARKET	Local and export
CERTIFIED MANAGEMENT SYSTEMS	ISO 9001, ISO 14001
INTEGRATED GOOD PRACTICES	GMP, ISO 26000, MED TEST (MFCA ISO 14051, ENERGY MAPPING, FINANCIAL METRICS…)

Table of contents

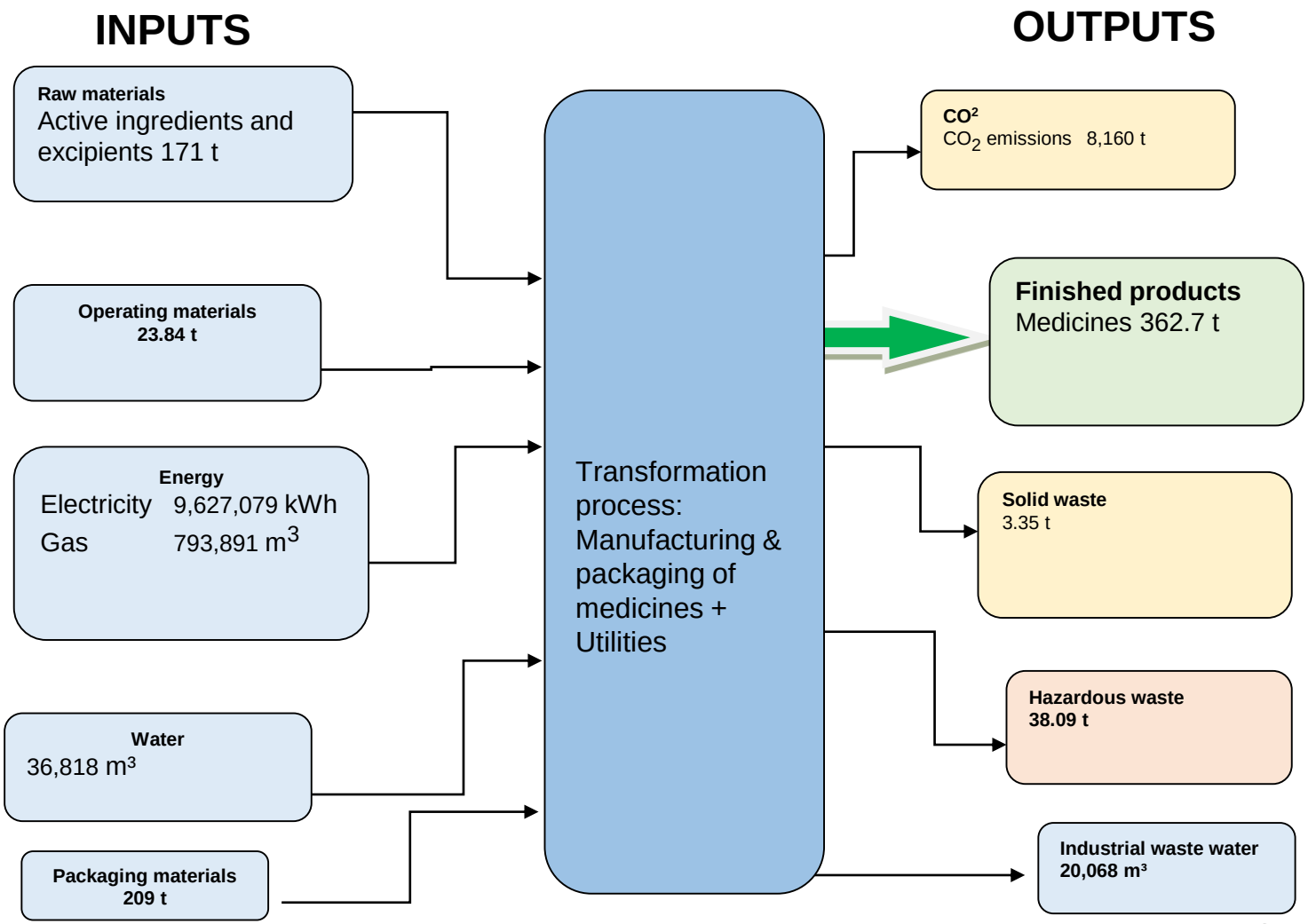
Company key data

Goals of the MEDTEST project:

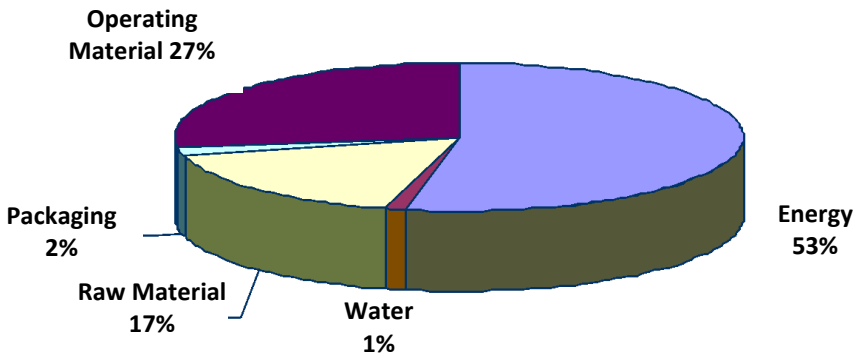
- Streamline consumption of energy and resources (water, energy and raw materials)
- Reduce fluid discharges, solid waste and atmospheric emissions
- Improve product quality while managing operating costs and optimising manufacturing processes

Year 2015	Unit	Value
Production	tonnes/year	362.7
Electricity consumption	kWh/year	9,627,079
Gas consumption	kWh/year	8,375,550
Water consumption	m^3/year	36,818
CO2 emissions	tonnes/year	8,160
BOD5	kg/year	56,592
COD	kg/year	204,693
Total cost of sales	euros	20,000,000

Input - output analysis at company level
(annual data)



Non-product Output (NPO)



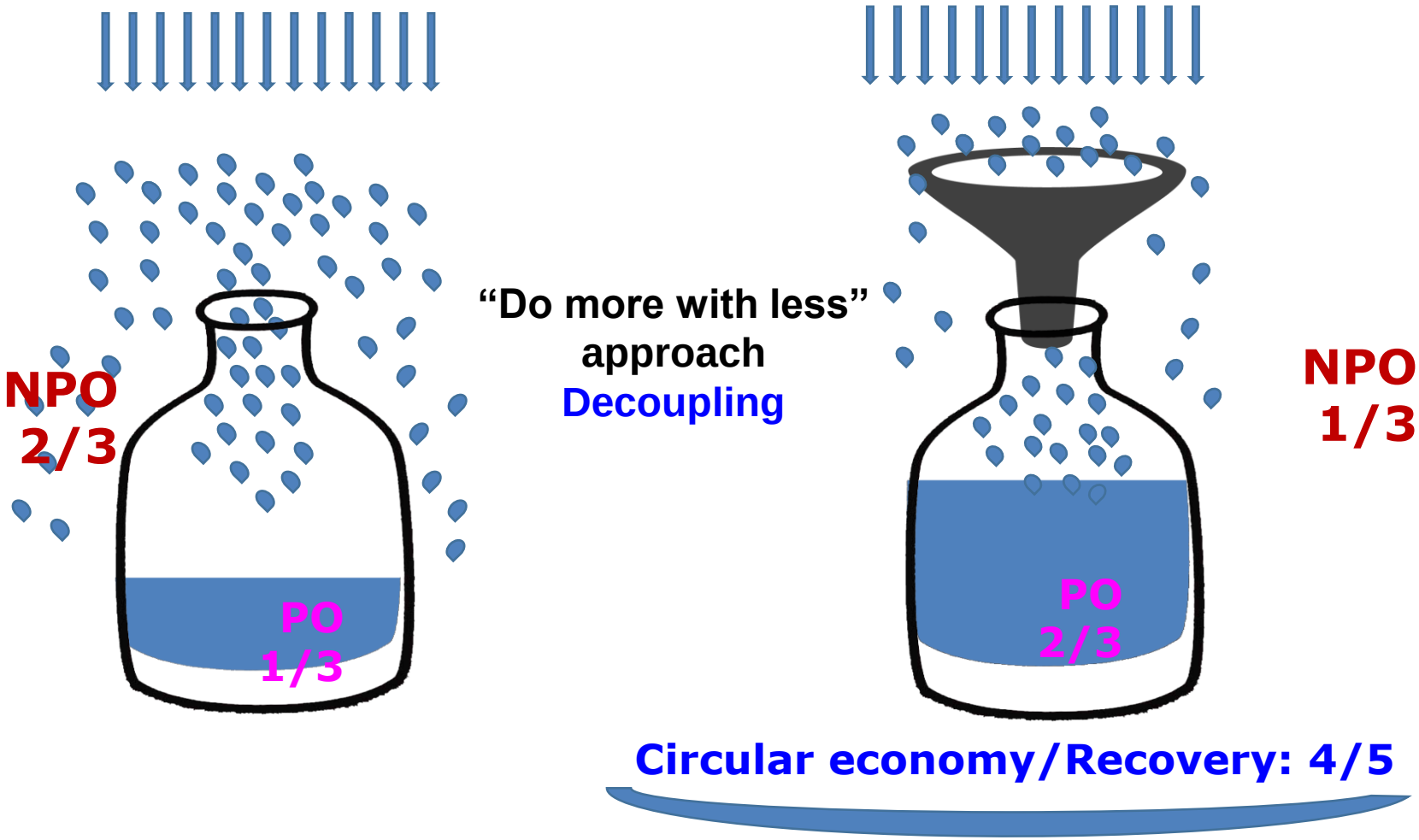
Priority flows according to the MFCA of 2015

Energy
Operating materials
Raw materials

Distribution of NPO per flow (%)

Analysis of NPO costs (MFCA 2015) reveals that approximately 6.3% of the value of input materials in 2015 (323,600 euros/year) was lost during production.

GOAL: Reduce NPO by a third



Information system – MFCA

Summary

Category	% 2016	% 2015
1. NON PRODUCT OUTPUT COSTS (NPO)	**85.5%**	**86.4%**
1.1. Raw materials and secondary materials	12.1%	14.5%
1.2. Packaging materials	1.6%	1.8%
1.4. Operating materials	32.2%	23.5%
1.5. Water	1.0%	0.9%
1.6. Energy	38.6%	45.8%
2. POLLUTION CONTROL SOLUTION	**13.9%**	**13.9%**
2.1. Depreciation of equipment	2.4%	2.5%
2.2. Operating materials	0.6%	0.5%
2.3. Water and energy	0.7%	0.9%
2.4. Internal staff	9.6%	9.5%
2.5. External units	0.7%	0.4%
3. PREVENTION INTEGRATED	**1.4%**	**0.4%**
3.1. Depreciation of equipment	0.3%	0.2%
3.2. Operating materials, water. energy		
3.3. Internal staff		
3.4. External units	0.9%	0.1%
3.5. Other prevention costs	0.2%	0.1%
TOTAL ENVIRONMENTAL COSTS (1. + 2. + 3.)	**100.8%**	**100.6%**
4. ENVIRONMENTAL GAINS		
4.1. Other gains	-0.8%	-0.6%
TOTAL ENVIRONMENTAL GAINS	**-0.8%**	**-0.6%**
TOTAL ENVIRONMENTAL COSTS AND GAINS	**100.0%**	**100.0%**

Distribution per quality centre in	
Total	100%
MPAC warehouses	0.8%
Lines A1A3	22.7%
Line A2	5.4%
Line A4A6	12.8%
Line A5	4.1%
PF warehouses	0.8%
Maintenance	2.4%
Steam/heat	11.5%
Chilled water (HVAC+)	8.2%
Water production	4.2%
Waste water treatment	2.6%
Logistics	0.4%
HVAC and compressed air	6.0%
Quality	2.8%
Administration & HSEQ	15.2%

Priority flows

Priority flows (depending on nature)	Cause analysis
Electric power	The company consumes a huge amount of energy, more than 3,000 toe/year. The proportion considered an NPO of energy is majority, thus, savings are possible, and it is also an area where pollutant emissions can be reduced.
Operating materials	Operating materials represent approximately 25% of NPOs. Although it represents a significant amount, the number of items and the diversity of causes reduce the potential for improvement.
Raw materials which are mostly active ingredients	Active ingredients represent a large proportion of NPOs (15%). However, the potential for improvement is reduced by the GMP and the difficulty to take action in this very regulated field.

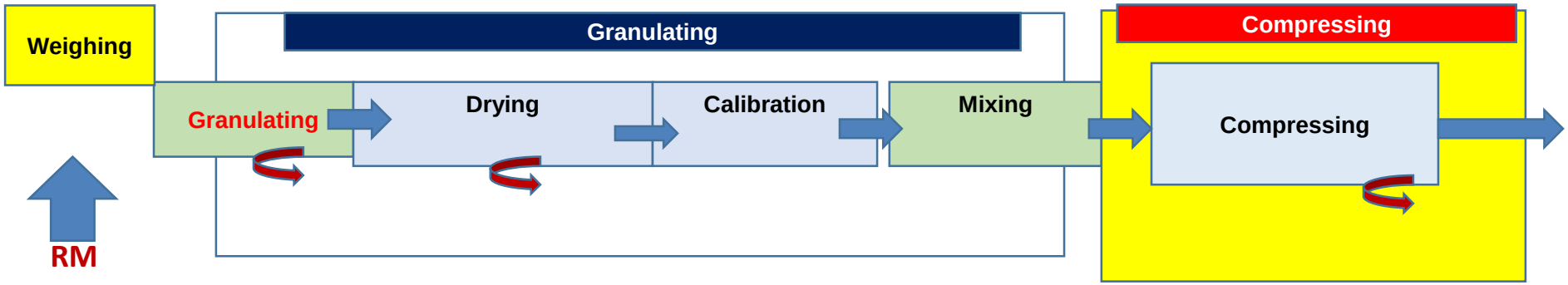
Focus areas and cause analysis

Focus area (according to cost centre)	Cause analysis
Mixing, granulating and drying on line A1	The problem is encountered during drying. The product sticks together in the Glatt dryer and in the mixer. A loss of 2 kg after the calibration phase per batch of 100 kg was recorded.
Compression phase on line A1	Manufacturing time problems with batches due to a lack of optimisation of pre-compression settings
Utilities (compressed-air production)	The low load increased the idle run of the compressors which represents 24% of compressed-air consumption.

Best practise (1):
Improvement of Galenic processes by switching to direct compression

Description of the solution: **Adoption of direct compression: Freeing-up of the granulation station, savings in energy and granulation resources, improvement of output.**

BEFORE DIRECT COMPRESSION



AFTER DIRECT COMPRESSION

Best practise (1):
Improvement of Galenic processes by switching to direct compression

Economic benefits	78,540 euros PBP: 0.6 years
Environmental benefits and savings in resources	6.4 t of raw materials 319 MWh of energy Reduction of 67 t/year of CO_2
Investment	50,000 euros Improvement of Galenic formulation processes (direct compression): 5,000 euros Purchase of a laser granulometer: 45,000 euros

Best practice (2):
Measures to improve energy efficiency

Field	Recommended measures
Optimisation of compressed-air facility	- Reduce the pressure range as much as possible (7% of savings per decrease of 1 bar); for 0.5 bar, the savings amount to 3.5%
	- Install a variable speed drive for one compressor per station (24% savings)
	- Carry out periodical checks to detect and repair any potential compressed-air leaks

Best practice (2):
Measures to improve energy efficiency

Economic benefits	10,000 euros/year PBP: 2 years
Environmental benefits and savings in resources	Savings of 169,000 kWh/year Reduction in CO_2 emissions of 110 tonnes/year
Investment	30,000 euros

Best practice (3):
Measures to improve energy efficiency

Field	Recommended measures
Optimisation of steam facility	- Recover lost condensate, estimated at 50%
	- Minimise the bleeding rate to achieve 3,000 ppm of salinity instead of 2,340

Best practice (3):
Measures to improve energy efficiency

Economic benefits	11,781 euros/year (equivalent to approximately 7% of natural gas consumption) PBP: 2.8 years
Environmental benefits and savings in resources	749 MWh Reduction in emissions of 174 TE-CO_2/year Reduction in water consumption of 1,200 m^3/year Reduction of chemicals (salts, phosphate and sulphite)
Investment	32,567 euros

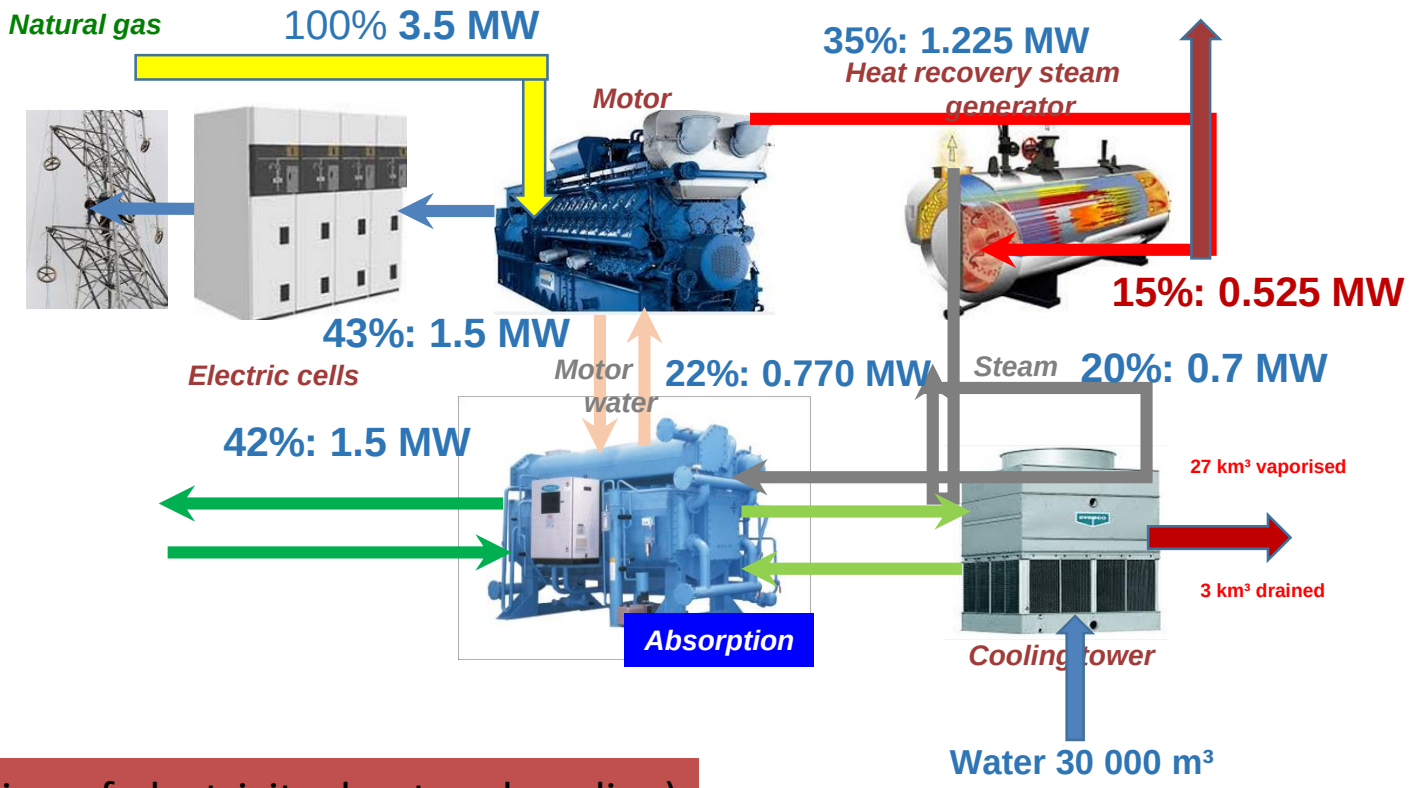
Best practice (4):
Measures to improve energy efficiency

Field	Recommended measures
Optimisation of the industrial refrigeration facility	Keep CWU out of direct sunlight
	Ensure under-cooling of condensers using adiabatic systems which ensure cooling up to 26°C during the summer months.
	Ensure proper regulation of iced water flow in relation to a temperature difference of iced water (Departure/Return) of 5°C using speed regulators.
	Increase the set temperature of iced water as much as possible (an increase in 2°C improves cold storage COP by 3%).
	Ensure and operate free cooling as much as possible.
	Carry out a study for overnight cold storage for use during the day.

Best practice (4):
Measures to improve energy efficiency

Economic benefits	97,401 euros/year PBP: 1.8 years
Environmental benefits and savings in resources	2,813 MWh/year Reduction in CO_2 emissions: 1,225 t/year
Investment	174,517 euros (adiabatic cooling, speed regulators on the pumps…)

Best practise (5):
Installation of a tri-generation system



(production of electricity, heat and cooling)

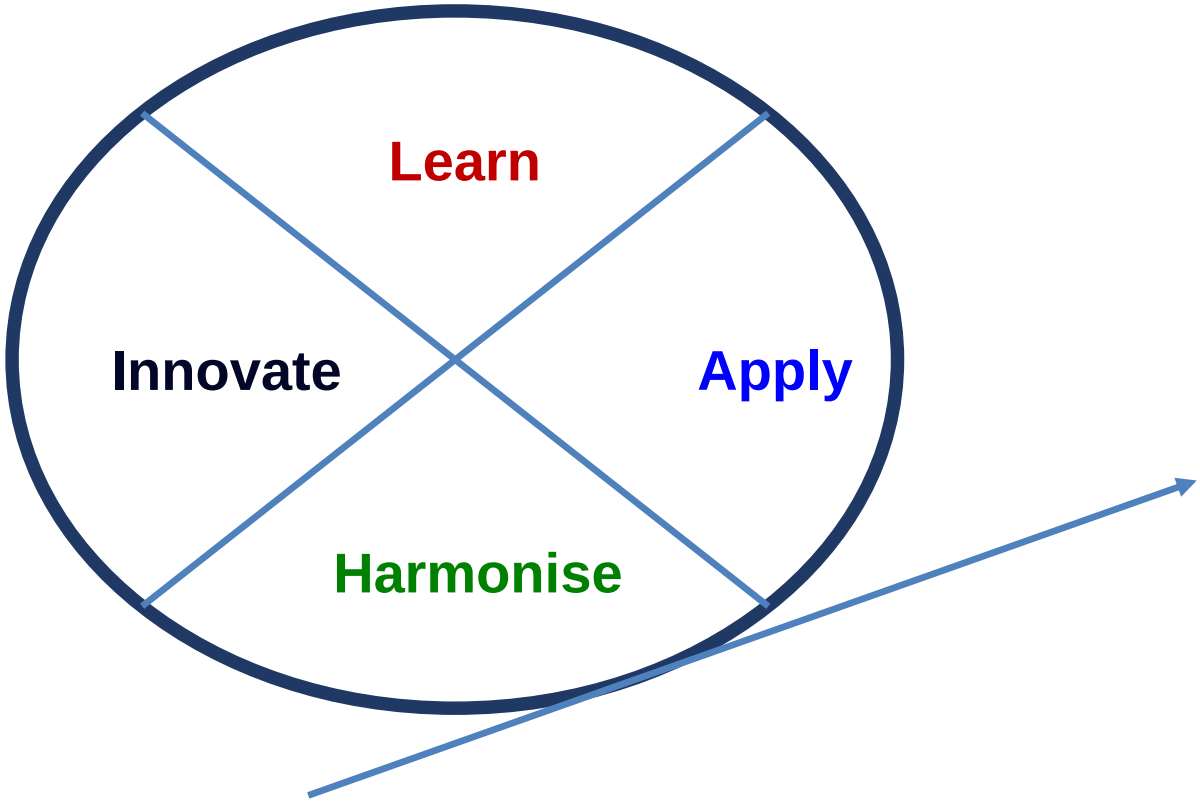
Best practise (5):
Installation of a trigeneration system

Economic benefits	320,000 euros/year PBP: 5.6 years
Environmental benefits and savings in resources	3,404 MWh 900 t CO_2/year (48%)
Investment	1,800,000 euros

Project results

Measure	Investment (euros)	Economic savings (euros/yr)	PBP (years)	Water and raw materials	Energy (MWh)	Environ-mental impact
Improvement of Galenic processes (switching to direct compression, purchase and set-up of a humidity probe, purchase of a laser granulometer. **New granulation line (1,300,000 euros)**	1,325,000	278,540	4.8	11.2 t of RM 2,000 m^3 of water	444 MWh	110 t CO_2
Installation of a trigeneration system (production of electricity, heat and cooling)	1,800,000	320,000	5.6	-	3,404 MWh	900 t CO_2
Set up an energy accounting system	40,000	20,000	2	_	289 MWh	247 t CO_2
Optimisation of electricity costs (power factor, lighting…)	40,660	27,007	0.7	-	434	127 t CO_2
Optimisation of the steam facility	32,567	11,781	2.8	1,200 m^3 of water	749 MWh	174 t CO_2
Optimisation of the industrial refrigeration facility	174,517	97,401	1.8	-	2,813 MWh	1,225 t CO_2
Optimisation of the compressed-air facility	30,000	10,000	3	-	169 MWh	110 t CO_2
Improvement of productivity and water (Lean/Kaizen)	84,000	118,000	0.7	16 m^3 of water	47 MWh	11 t CO_2
TOTAL	**3,513,090**	**896,382**	**3.9**	**3,216 m^3 of water 11.2 t of RM**	**8,518 MWh**	**3,014 t CO_2**

INTEGRATION OF TEST TOOLS AND CONTINUOUS IMPROVEMENT



Conclusions

- Total annual economic gains identified: 578,000 euros
- Total annual water savings in relation to annual consumption: 3.3%
- Total annual energy savings in relation to annual consumption: 37%
- Total annual raw material savings in relation to annual consumption: 3.5% of quantities and 1.5% of value
- Total CO_2 reductions: 46%
- 79% of the measures identified were implemented by 31/12/2017

(This data is based on production year 2015)