RESEARCH ON THE IMPACT INDUCED IN THE ENVIRONMENT BY MILK PROCESSING INDUSTRY CASE STUDY: S.C. ECOLACT CO LTD. MILIŞĂUŢI, SUCEAVA COUNTY

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Abstract: *The paper presents some investigations and assessments on the impact induced in the environment by a milk processing unit which makes a variety of products. The balance sheets for raw materials were elaborated for all the activities carried on the location; based on these, the synthetic indexes of the impact on the environment were drawn, as well as the specific factors: the extent of the usage of raw material, materials and specific effluents.*

Key words: *environmental impact, milk processing, specific factors, raw materials, specific effluents.*

Introduction

The size of the dairy industry as well as the volume and nature of the waste generated have a potentially adverse effect on the environment, so that the proper environmental management of this industry is essential to ensure that the environment and the health of the community are protected. The maximization of production and the minimization of emissions are complementary objectives which are crucial to any sustained effort to maximize profitability and minimize waste on any dairy processing site – no matter how large or small [1].

This paper proposes an analysis regarding the impact induced in the environment by a milk processing unit from Romania, also considering that environmental impacts from food production and consumption are significant [2].

Presentation of S.C. ECOLACT CO LTD Milişăuţi, Suceava County

The company S.C. ECOLACT CO LTD is located in Milişăuţi, Suceava County. The firm lays on a surface of 5,362m², with 1,050 m² occupied by buildings. The analyzed company has 38 employees and processes about 2,565 tons milk per year with about 3.5% fat, most of the milk coming from private producers.

The company produces the following derivatives:

- processed milk – 13.33%
- cream with 25% fat content – 2.66%
- whipped cream – 0.88%
- cow cheese – 0.15%
- skin cheese – 10,66%
- Romanian pressed cheese – 33,34%
- fermented cheese – 31,77%
- roly cheese – 7,21%

The main production halls have recently been re-equipped and benefit of modern technologies (after fire from 1999). The production halls are supplied by a central heating unit running on light liquid fuel, a freezing agent unit, motor vehicles and maintenance workshops. The amount of energy is supplied by the company's own

source (8,252 GJ/year) but also from the national energetic network (298 GJ/year). The annual material balance sheet for the main activities is presented in Table 1.

[3].The annual balance of the materials involved in the extra activities is shown in Table 2.

Table 1 The material annul balance of the main activities

INCOMINGS		ECOLACT CO LTD	OUTGOINGS	
Milk	2,565,182		Can milk	180,280
Polyamidic membrane GM	15		25% cream in cans	10,405
Cultures	54		32%whipped cream in can	3,916
Rennet	48		cow cheese	384
Buckets	155		skin cheese	17,682
PA/PE 20/70 bags	648		Romanian pressed cheese	32,556
Thermo contractile bags - LL045	996		fermented cheese	163,692
Unoxidable can	60		roly chees	3,329
Recycled PVC boxes	306		PE waste	102
PE bags	102		Unoxidable waste	60
Card board boxes	1,305		PVC waste	306
Sacks stuffed with PE	796		Buttermilk	1,723,715
			Water vapour	536,305

Table 2 Annual material balance for extra activities

INCOMINGS		ECOLACT CO LTD Milişăuţi	OUTGOINGS		
Water	10,759,000		Waste water		10,651,410
Fuel oil	5,169		Combustion gases & coal:		1,856,927
light liquid fuel	81,460			CO_2	279,188
Air for combustion + fuel	1,770,298			CO	242
Technologic equipment	7,420			SO_2	130
Transport equipment	3,105			NO_2	316
Buildings	65,850			H_2O	148,046
Lubricants	570			O_2	57,027
Antifreeze	610			N_2	1,371,978
Tires	300		Equipment		10,345
Batteries	42		Buildings		65,150
Spare parts	810		waste building		700
Textile	30		Used lubricants		570
NaCl	12,000		Used antifreeze		600
Na_3PO_4	1,100		Used outer covers		300
Freon 134 A	35		Storage batteries		42
Ventilation air	75		Ferrous waste		810
Copper	3,000		Textile waste		30
Aluminum	2,000		Salty water		13,100
Water from rainfall	496,563		Freon		35
Other	15,680		Used air		2,000
			Copper waste		12
			Aluminum waste		135
			Water from rainfall		496,563
			Domestic waste		15680

Starting from the balance for materials the degree of utilization (*Gv*) was calculated [3].
It represents the percentage out of the raw material which is found in the finite product. The following items were calculated:
- degree of milk usage – Gv_{milk} = 16,07%
- degree of package usage – $Gv_{package}$ = 92,99%
- degree of land usage is the balance between the built area and the whole surface of the location – Gv_{land} = 19,58%
- degree of coverage of the electric supply within its own source- *Ga* = 96,51%
- productivity – 10,849 kg/year

The above mentioned indicators lead us to the following conclusions:
- the degree of milk processing within this company is low because it does not use the whey which results from this.
- the package careful management meets the present requirements and the type of packed product.
- the area of the location is best made use of, thanks to the built units.
- the amount energy which comes from the company's own source is important and the result is that the products are cheaper.

The impact on the environment

The impact upstream the company

The impact upstream the company can be illustrated and quantified by considering the usage of raw materials and energy, mainly through the size of influents. In order to compare the performances of two companies, it is preferable to express the usages through specific quantities reported to the whole production amount (see Camylact Sv LTD [4] and Rarăul LTD [5]). Basic engineering as well as economy imposed the term of *specific usage*. In order to show that the focus is mainly on the size of the influents, it is more common to use the term specific influent, as specific usage. The usage of a material can be made no matter where the material inputs, while the term influent means getting it directly from nature.

As far as this company is concerned, the following influents were calculated (Table 1). The analyses of the data from Table 1 show that:
1. The milk usage is very high reported to production. It is justified if we take into account the type of products but it is important that the whey should also be used.
2.The company makes use of a rather big amount of energy and this is because of the facilities and technologies from the heating unit.
3.Water usage is rather high because the percentage of treated water is low. In fact the used water is not redistributed after being filtered.

Table 1 Specific influents calculated by reporting to the quantity of products

No.	Influent	Specific influent
1.	Milk	6.22 kg/kg
2.	Packages	0.0106 kg/kg
3.	Air	4,30 kg/kg
4.	Land	0.013 mp/kg
5.	Buildings	3.64 kg/kg
6.	Technical equipment	0.015 kg/kg
7.	Energy	20.74 MJ/kg
8.	Water	26.10 kg/kg
9.	Fuel	0.21 kg/kg

The impact downstream the company
This is due to the effluents resulted from the activities carried out in the location. In order to quantify the impact induced by effluents due to the reasons mentioned above, it is preferable to use the size called specific effluents.This is the ration between the quantity of effluent and the quantity of final product.The values of the specific effluents are shown in table 2

Table 2 Specific effluents calculated by reporting to the finite quantity of products.

No.	Effluent	Specific effluent
1.	Buttermilk	4.18 kg/kg
2.	Total waste	0.047 kg/kg
3.	Used air	4.29 kg/kg
4.	Combustion gases	4.50 kg/kg
5.	Waste water	27.04 kg/kg

The data mentioned above signify that this company has a great impact on the environment, especially on water and air. It is very important to point out the high level of the specific effluents of the used air, combustion gases and used waters. It is necessary that the whey as a second product or waste should be processed according to the present technology [6].

Emissions
The amount of emissions for each source is mentioned in Table 3. During the analyzed period the level of pollutants in the burning gases of the thermal plant did not exceed normal limits. The chimneys ensure the proper dispersion of the emissions.

Even under these circumstances, large amounts of polluting gases are released in the atmosphere.
These pollutants could affect the quality of air and cause acid rains.

Table 3 Flow rates of polluting substances emitted in atmosphere (kg/year)

No.	Pollutant	Source			Total
		Thermal plant	Car park	Ventilation	
1	CO_2	244,220	34,968		279,188
2	CO	212	30		242
3	SO_2	114	16		130
4	NO_2	277	39		316
5	Water	129,504	18,542		148,046
6	O_2	57,027	-		57,027
7	N_2	1,200,138	171,840		1,371,978
8	Ventilation air	-	-	2,000	2,000
9	**Total**	**1,631,492**	**225,435**	**2,000**	**1,858,927**

The impact induced by wastewater

The specific waste water effluent value is very high. Almost 27 kg of water are discharged for each kg of product. The high value of this indicator is due to the fact that waste waters are not treated. A large amount of water is also used for diluting some pollutants from the waste water mainly those coming from whey, meaning CBO_5, suspension matters and.

Table 4 Producing and releasing waste

No.	Type of waste	Waste code	Quantity	Turning to good account
1.	PE	19.12.04	102	Third party
2.	Stainless metal	19.12.03	60	Third party
3.	Used lubricants	13.02.02	570	Third party
4.	Used antifreeze	14.06.01	600	Third party
5.	Used outer covers	16.01.03	300	Third party
6.	Used storage batteries	16.06.06	42	Third party
7.	Ferrous waste	19.12.02	810	Third party
8.	Textile waste	04.02.22	30	Third party
9.	PVC waste	15.01.02	306	Third party
10.	Copper	17.04.01	12	Third party
11.	Aluminium	17.04.02	135	Third party
12.	Domestic waste	20.03.01	15,680	
13.	Building waste	17.01.07	700	
	Total		**19,387**	

Waste

There are two categories of waste: industrial and domestic. The specific influent of the domestic waste is according to the yearly product of waste registered in Romania for 1000 citizens.

The company produces and releases an average quantity of industrial waste: 0,047 kg/kg, a fact that implies a proper usage of package, of tools and materials.

Conclusions

The following conclusions can be drawn considering the activities of SC ECOLACT CO LTD Milișăuți related to their possible impact on the environment:

1. The company is an important economic agent in the area which ensures a relatively high number of jobs and which takes from the private producer's milk and turns it to better account high quality products.
2. The impact upstream the company is important both because of the high consumption of water but also because of the big amount of milk which is processed. The milk itself is an ecological natural product, but its processing has a significant impact on the environment because of the nature of animal food and the waste resulted from farming activities.
3. The emissions of the company are relatively high, mainly due to energy production needed by the proper thermal plant and the transport.
4. The specific effluent of the waste waters is highly related to the nature of production because the company does not treat and recycle the wastewaters.
5. It is necessary that the milk processing technology should be improved by upgrading this with equipment which is supposed to turn to good account the useful components of the whey.

The above mentioned conclusions refer only to quality. Our aim is to quantify the impact on the environment due to the activities on the location in a future project.

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