Eco-innovation in Valcucine for a circular economy

ECO-INNOVATION IN VALCUCINE FOR A CIRCULAR ECONOMY

Veronica Novelli*, Paola Geatti, Luciano Ceccon, Alberto Bettarel

Department of Economics and Statistics, University of Udine, Via Tomadini, 30/A, 33100 Udine, Italy

Abstract

Enterprises consider sustainability as an opportunity of communicating working methods and virtuous behaviors they adopt in the optics of sustainable development, and that allow both to improve their image in the market and to implement the relationships with stakeholders, thus strengthening their role on the territory. Valcucine is an enterprise of the Livenza furniture district located in the municipality of Pordenone (Italy). Valcucine focuses its care in the production of furniture, in particular of kitchen units, which are characterized by sustainable production, by eco-compatibility of materials and by the lowest possible environmental impacts. Valcucine wishes to transfer its enterprise philosophy to customers by improving product quality, by rationalizing the use of recyclable virgin raw materials, by employing also recycled materials and by reducing dangerous emissions into the environment. For this reason, Valcucine has obtained several certifications, such as ISO 14001, Forest Stewardship Council (FSC), F**** and Leadership in Energy and Environmental Design (LEED). In particular, the LEED certification, which has been obtained for the Invitrum and Meccanica production lines, allows the enterprise to differentiate from the competitors and to enter new segments of the market, such as the market of the Arab countries, where the LEED certification is renowned and appreciated. A substantial differentiation of this kind gives a competitive advantage to the enterprise working in a field which has been saturated for many years and represents a strength point, particularly in present economic framework. This virtuous behavior of the enterprise fits well into the principles inspiring circular economy and perfectly embraces the Goal 9.4 of the Sustainable Development (Agenda 2030), which foresees a sustainable industrial development, with the adoption of technological solutions in the optics of environment and people safeguard.

Key words: formaldehyde emissions, FSC, ISO 14001, LEED certification, Valcucine

* Author to whom all correspondence should be addressed: e-mail veronica.novelli@uniud.it; Phone +390432249335; Fax +390432249229

1. Introduction

Agenda 2030 is a global strategic action plan subscribed in September 2015 by the governments of 193 countries, UN members. It consists of 17 goals for Sustainable Development to be achieved within 2030. Goal 13 is represented by the fight to climate changes caused by environmental pollution due to vehicular traffic, heating systems and industrial activities (Agenda 2030, 2015).

In 2016, the "Paris Agreement" on climate changes entered into force, addressing the main priority to limit the rise of global temperatures (Sustainable Developments Goals, 2017). In fact, Earth has warmed within the last 150 years, especially during the last six decades (Jones et al., 1999). Many studies have been published on the causes and the consequences of the increase of global temperature (Crowley, 2000; Mitchell, 1989; Overpeck et al., 1997). Indeed, every time we decide to buy a good, we have the opportunity to offer our own contribution for the environmental protection and for saving raw materials and energy sources, and finally we can contribute to the climate change. Therefore, proper materials and processes used in any industrial sector allow to improve the environmental performances of the enterprises, which can obtain voluntary certifications, introducing them in the market of green and ecological products and services, also having economic benefits, (Bovea and Vidal, 2004; Ying and Li-jun, 2012).

Use of secondary raw materials and renewable energy sources, saving of water, fuel consumption and waste production enable enterprises to be virtuous in the perspective of circular economy, Goal 9.4 of Agenda 2030. The linear concept of economy is so exceeded by the new concept of circular economy, which represents a continuous and positive development cycle: it is a regenerative economy, reproducing nature, optimizing the systems connected each other (Ellen MacArthur Foundation, 2017; Federico, 2015). In few words, circular economy minimizes the consumption of resources by the adoption of cleaner technologies (Andersen, 1997; Andersen, 1999) and the application of the BAT (Best Available Technologies).

Eco-efficient companies are able to match their economic interest taking care of the environment, producing more, taking less from the environment, by recycling and saving resources and energy, obtaining new competitive advantages and a better position on the market (Shrivastava, 1995; Testa et al., 2011). Among the voluntary environmental instruments there are LCA, Eco-labelling, ISO 14001, LEED certification, F**** certification.

In the Friuli Venezia Giulia region (Italy) there are two important furniture districts: the Livenza district, in the province of Pordenone, and the chair district, in the province of Udine. Furthermore, Catas (an Italian institute for the certification, research and tests for the furniture sector), the most important laboratory in Europe for testing and researching on furniture quality, is

located in San Giovanni al Natisone, in the province of Udine, as well. During the meetings of Sustainability at Ecomondo 2017, a congress session has been dedicated to indoor air quality, where Catas presented a report on the characterization of emissions by domestic furniture. Fireplaces with particulate matter, cigarette smoke, dust, food cooking, can pollute indoor air in close spaces, but also building materials and furniture may cause emissions of dangerous substances for human health. Volatile organic compounds (VOCs) are easily released into air and this process has an end, while formaldehyde is continuously emitted because it is generated inside the panels (Bulian and Fragassa, 2016). Many epidemiological studies on cancer risk for humans classified formaldehyde as "probably carcinogenic to humans" (IARC, 1982, IARC, 1987; IARC, 1995), while the most recent studies defined formaldehyde as "carcinogenic for humans" (Cogliano et al., 2004; Cogliano et al., 2005; IARC, 2006).

The aim of this paper is to present the case study of Valcucine, a company operating in the Livenza district, which was able not only to improve the environmental quality of the territory in which it is located, but also to enter markets in which the care towards environmental and health protection is particularly real.

2. Materials and Methods

Data and information, relative to the case study, were collected by interviews with the persons in charge of the communication and of the quality control of the company.

3. Case Study Presentation

Valcucine is an enterprise of the Livenza furniture district located in the municipality of Pordenone (Italy). Valcucine makes modular kitchen units and other wood furniture destined to customers of a medium-high target. Exports represented 40% of sales in 2014, thanks to the company policy of growth of its catchment area. Valcucine carries on the only activity of planning and assembly of the components, with some additional workings on the semi-finished boards such as drilling, sectioning, beading and customization of worktops. The enterprise has concentrated on the topics of sustainability and of protection of customers' health, by devoting attention in particular to:

- shortage of raw materials,
- management of waste and of products at the end of their life cycle,
- energy consumption,
- environmental pollution.

The goals of Valcucine are:

- the decrease of consumption of both energy and virgin raw materials employed in the production process,
- the decrease of the use of dangerous materials,
- the development of technological innovations directed to environmental safeguard.

4. Results and Discussion

The guidelines of Valcucine's management are:

1. Product dematerialization: Valcucine obtained a notable saving of wood, of rolled sections and of energy in particular by reducing the thickness of the "Riciclantica" mono-material aluminium door to only 2 mm. From the managerial point of view, this policy aiming at dematerialization led to reduce storage spaces, weight of finished products, energy consumption and waste production.
2. Material recyclability, by introducing recyclable materials, as glass and aluminium, and recycled components for structural pieces in its products. With a view to reuse at the end of the life cycle, Valcucine plans its products so that the components can be easily identified and separated at the time of discarding (Bergamaschi, 2010). Product components are assembled with mechanical joints, without employing glues or adhesives, to be easily disassembled and recycled. This fact allowed Valcucine to commit itself in the free collection of its products at the end of their life cycle. The aluminium components, which are present in the structural frames of the doors and in the supports of worktops, are completely recyclable. Their reclamation is economically advantageous, since energy needed to obtain recycled aluminium is about 5-10% in respect of energy needed to obtain primary aluminium from ores (Quinkertz et al., 2001; Smith, 2006). Plastic components are labelled to favour their identification and possible reuse at the time of discarding. Furthermore, Valcucine has committed itself in reclamation of doors and their components, as rolled stratified section boards, which are reused for the production of dashboards in the car field when they are cast-off. In 2009, Valcucine was able to make a kitchen unit which is 100% recyclable and 80% reusable thanks to the use of the Invitrum glass structural basis, together with a glass worktop with an aluminium support and the "Riciclantica" door (Galli, 2015). The characteristics of recyclability and reusability of some components made by Valcucine are shown in Table 1.

Table 1. Characteristics of recyclability and reusability of some components made by Valcucine

Component	Material	Characteristics
Draw plates	Recycled aluminium	100% recyclable, 80% reusable
Backs	Primary aluminium sheets	100% recyclable, 100% reusable
Legs	Recycled iron, plastic	100% recyclable
Bottom bases (structural area/part)	Temperated glass	100% recyclable, 90% reusable
Sides	Temperated glass	100% recyclable, 90% reusable
Spacers	Recycled aluminium	100% recyclable, 100% reusable

Source: Valcucine, 2017, personal communication

3. Reduction of dangerous emissions. Valcucine has identified in particular three aspects to be monitored:
   - varnishes containing synthetic solvents,
   - artificial radioactivity,
   - formaldehyde emissions.

Furniture treated with varnishes containing synthetic solvents continues to emit harmful substances for a long time after buying, with risks for health of final users. To limit solvent emissions, Valcucine uses water varnishes, by realizing a superficial finish based on oils and natural polishes.

Artificial radioactivity is due to the radioactive substances emitted into the environment by the accidents of nuclear plants, which can be absorbed by trees and subsequently be released during time by wood. For this reason, Valcucine carries on analyses to check the presence of radioactivity in the timber utilized.

In the sector of wood processing, the wood elements for obtaining panels, like chipboard, plywood and laminated wood, are stucked by resins and adhesives based on urea-formaldehyde, melamine-formaldehyde and melamine-urea-formaldehyde. The risk of formaldehyde inhalation regards initially the workers during the steps of pressing, pasting, varnishing, handling and management. Anyhow, formaldehyde emissions continue for years, with potential risks for consumers' health, and contribute to generate the so called "indoor pollution". Valcucine does not carry out panel realization, which is the step characterized by the highest release, but only handles

the semi-finished products. Furthermore, Valcucine realizes final products without chipboard, thanks to the use of high pressure laminates; however, frames made by melamine-faced particle boards are used for some kitchen units, which respect standards and limits imposed by the Japanese F**** normative, the most severe in the world.

4. Product durability: Valcucine products are planned to last for a long time, with a consequent reduction of environmental impacts. Valcucine adopts the principles of eco-innovation, which is defined "the production, the introduction or the use of a product, a process, a service, a management system, or a company methodology which is new for the company itself or for consumers, and which guarantees, during its life cycle, a reduction of environmental risk, of pollution and of other negative impacts due to the use of resources (including energy) with respect to other possible expectations." (Sala and Castellani, 2011; Sustainable Development Goals, 2017). The process foresees the promotion of environmental efficiency with two modalities:

- by activating an efficient use of resources without exceeding the so called "carrying capacity" (Daily and Ehrlich, 1992; Fearnside, 1997; Rees, 1992); an example of carrying capacity can be the removal of wood from a woodland, guaranteeing that the same wood amount will remain unaltered during time,
- by adopting innovations allowing to increase the carrying capacity of an eco-system, by producing the necessary resources for its living species, without risks for the survival of present and future population (Milardi, 2015).

Therefore, the concept of eco-innovation includes the whole of the methodologies, instruments, technological, organizational and logistic options which allow a company to make more sustainable its products and processes.

The eco-innovation application to the planning step is called eco-design and is finalized to improve all the aspects related to a product, from the provenance of raw materials to the final packaging, through all the phases of product life cycle (Radonjič et al., 2015).

Concretely, Valcucine participates in financing of reforestation by respecting original eco-systems, by providing, in some cases, for buying the interested earths and by establishing connection with the developing countries, with whom campaigns of sensitization and information have been set up, in the perspective of an equilibrate use of resources.

Because of this procedure, it is possible to obtain many advantages:

- reduction of costs by a less material and energy consumption, less penalties due to a measured pollution, reorganization of production processes and improving of the relationships with providers;
- reduction of costs by a more successful management of human resources and an increasing of work productivity;

- increasing of the income due to innovation and development of eco-friendly products, recycling of products and scrape materials;
- creation of connection with local economies and undertaking of local people;
- construction of reputation due to increasing of efficiency and environmental responsibility;
- expansion of human capital due to a better management of resources.

As a consequence of the policy adopted by the company, Valcucine has obtained notable improvements, in particular in terms of reduction of consumption of raw materials, working scraps, waste production, emission of harmful substances and energy consumption. This has allowed the achievement of some environmental certifications.

4.1 Certifications obtained

4.1.1 ISO 14001

In 2001 Valcucine obtained the ISO 14001 certification. The parameters monitored by the environmental management system are: water consumption, electricity consumption, fuel consumption, use of raw materials, use of chemicals, emissions into the atmosphere, waste management and indirect environmental aspects.

Water consumption. Water is not used for the production process, but only for sanitary use and for irrigation of the green areas of the plant. Water consumption in the period 1999-2016 is presented in Table 2. As can be noted, consumptions showed significant yearly variations. It is not possible to control the consumption of water for irrigation, which substantially depends on atmospheric precipitations, whereas the reduction of consumption of sanitary water has been achieved with a careful maintenance of supply facilities.

Table 2. Water consumption (m^3) in Valcucine plant

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007
Consumption	12488	13365	12790	6811	4836	4403	4635	7459	5620

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016
Consumption	2233	6559	5818	9320	10532	5383	3074	3603	6178

Source: Valcucine, 2017, personal communication

Electricity consumption. In 2010 the lighting installation of production departments was rationalized. Furthermore, in 2010 the installation of photovoltaic panels (1450 m^2) was completed, as well. Electricity consumption, including the requirements of the manufacturing process, offices and other operational activities, is presented in Table 3.

Table 3. Electricity consumption (kWh) in Valcucine plant

Year	Electricity from the grid	Electricity produced by the photovoltaic plant	Self-consumed electricity	Total consumption
1999	586266			586266
2000	596000			596000
2001	638200			638200
2002	627800			627800
2003	640606			640606
2004	720861			720861
2005	675878			675878
2006	797610			797610
2007	877152			877152
2008	855661			855661
2009	749447			749447
2010	803347	18558		821905
2011	615424	207610		823034
2012	630969	187494		818463
2013	566505	233489	188665	755170
2014	535698	180640	138000	716338
2015	554168	193920	149520	703688
2016	615200	211404	171840	787040

Source: Valcucine, 2017, personal communication

Fuel consumption. Until winter 2009-2010, diesel oil was used to heat the plant; since the following year, diesel oil has been replaced by natural gas. Natural gas is also used in the laboratory for material testing. Fuel consumption relative to the period 1998-2016 is reported in Table 4.

Table 4. Fuel consumption in Valcucine plant

Season	Year	Diesel oil (L)	Natural gas (m^3)
1998/1999		65000	
1999/2000		74000	
2000/2001		68000	
2001/2002		70000	
2002/2003		70000	
2003/2004		71000	
2004/2005		82900	
2005/2006		68732	
2006/2007		60398	
2007/2008		81110	
2008/2009		67720	
2009/2010		78640	
	2010		27455
	2011		63479
	2012		63015
	2013		56954
	2014		43751
	2015		64702
	2016		79239

Source: Valcucine, 2017, personal communication

Use of raw materials. The main materials are chipboard and fibreboard panels, laminated wood panels, glass, aluminium and steel, which come to the company as semi-finished materials. The planning activity is addressed to reduction of not-renewable raw material consumption and to employment of composite materials which, despite being characterized by a high energy consumption for their production (glass, aluminium and steel), have a long life cycle and a complete recyclability.

Use of chemicals. The main products used are solvents, bonding agents and adhesives. The used amounts have not varied much over years, and are so low, that the risk associated may be classified as irrelevant for the safety of workers and the effects on the environment.

Emissions into the atmosphere. As regards the exposure of Valcucine workers to wood dust, measurements carried out in 2014 in 10 workstations showed amounts included in the range 0.10 –

0.65 mg/m^3, below the limit value of 5 mg/m^3 (EC Directive, 2004). Nevertheless, wood dust produced during the manufacturing process is captured by an air extraction and filtration equipment and then disposed, in order not to be released into the atmosphere.

Waste management. Packaging originates mainly from kitchen equipment suppliers' wrappings and are composed mainly of paperboard and plastics (PE, PS and PET). Glass, granite, aluminium and steel are also present in discarded materials, both as processing waste and as parts coming from kitchen furniture taken back from customers when disused, or when old or defective parts are substituted. Moreover, Valcucine produces electric and electronic equipment waste (EEEW) because it assembles and disposes components for lighting. Hazardous waste is produced as the result of the use of varnishes, mostly water paints, and oils and emulsions for machine tools, compressors and pantograph maintenance.

Indirect environmental aspects. Valcucine purchases semi-finished materials from external suppliers, who manage all phases from raw material acquisition up to painting. Consequently, Valcucine asked suppliers improvements in environmental matters, in particular with regard to: the reduction of industrial solvents in varnishes, with the use of water paintings, for all wood and glass panels since 2005; the use of components with extremely low formaldehyde emissions; the use of sustainable, FSC-certified, timber. Valuable information are collected for each supplier to monitor its environmental performances; gathered data are used to set an "indirect environmental impact" value, which might constitute a parameter for the qualification of suppliers.

4.1.2 FSC chain of custody certification

Valcucine uses wood as the main material in the realization of its products. The company is not involved in wood processing, except marginally in short finishing operations: it mostly purchases semi-finished products as doors, panels, seat backs, structural parts and accessories from external suppliers (Valcucine, 2017, personal communication).

With the aim of maintaining a high product quality and protecting the environment, Valcucine started the FSC chain of custody (FSC-CoC) certification process. To obtain the certification, all production phases along the supply chain need to be identified, to ensure the traceability of the material; so it is necessary to identify in an appropriate matrix the following issues: type of incoming material, supplier from which material is purchased and validity of supplier certification, type of incoming material certification (e.g. FSC 100%; FSC Mix Credit, etc.), contractor chosen by the supplier for possible processing and kind of processing, type of certification which will be affixed on the product at the end of processing or after assembling. Likewise, the material supplier has to fill out a similar matrix by indicating previous phases, up to

the phase of wood cutting, in order to guarantee traceability and certification characteristics (Masiero and Zorzi, 2006).

An important topic is the allocation of certification standard of finished products - output - (FSC 100% or FSC Mix Credit) in relation to incoming products – input -. FSC regulation provides for three types of assessment systems based on: 1. the type of transferred materials, 2. the percentages of certified and not certified materials, 3. assigned credits (rare).

In case of a single type of material, the initial label is assigned to the final product. In the other cases, the FSC certification of the final product changes on the basis of the percentage of incoming material of one or more types: the allocation is done with a weighting of incoming material. Valcucine properly evaluated this issue because of small not certified parts (a very small proportion of the overall amount), slowing down the whole certification process. On the occasion of the various renewals of the certification, Valcucine has widened the range of certified products. In 2008, in compliance with the FSC STD-40-004 standard, Valcucine obtained the FSC 100% certification for solid maple pieces, corresponding to the so-called "internal drawer". In 2014 the FSC 100% certification was obtained for doors and back panels, as well as the FSC Mix for parts made of melamine faced chipboard panel (material which is normally used for cabinet sides and bottom panels) (Valcucine, 2017, personal communication). The products which obtained the certification are listed in Table 5.

Table 5. Present FSC certified Valcucine's products

Product	Certification
Internal solid maple drawer	FSC 100%
Door	FSC 100%
Cabinet back panel	FSC 100%
Cabinet side panel, cabinet bottom panel, wooden worktop	FSC Mix

Source: Valcucine, 2017, personal communication

Special investments were not needed for the certification process of Valcucine's products; costs met were mainly related to consultancy services and certification process itself. Because of FSC certification, which led to an improved product quality and facilitated access to markets in which FSC-CoC standard is a compulsory element and competition is reduced, the company improved its environmental sustainability reputation.

*4.1.3 The F**** certification*

4.1.3.1. Formaldehyde: indoor air quality and effects on human health

We spend the major part of our life inside houses, offices, schools etc., so indoor air quality (IAQ) we breathe is very important. Many chemical substances can be emitted by furniture, walls, carpets, with dangerous consequences for human health. Modern buildings, built with energy saving insulating systems, could increase the concentration of pollutants in indoor environments. In particular, formaldehyde and other substances can be released in times.

In the European countries, the national regulations for construction products are different among them, and this can create some problems when firms have to export their products from a country to another (Bulian and Fragassa, 2016).

Formaldehyde is a colourless gas with an acrid odour; it is used in many industrial productions, like adhesives for wood, floorings, paints, walls, ceilings, carpets, furniture, plastics and textiles and for producing chemical compounds (Bosetti et al., 2008; Missia et al., 2010). Formaldehyde emissions are dangerous not only during the phases of working, but also during the phase of product use (National Cancer Institute, 2017).

In the last years, IAQ has become a very important matter under discussion (Böhm et al., 2012; de Blas et al., 2012; Gilbert et al., 2006; Mølhave et al., 1995; Vassura et al., 2015). The frame study European Indoor Air Monitoring and Exposure Assessment (AIRMEX) is related to the bound between indoor air and chronic human exposure to VOCs in public buildings during the years 2003-2008 (Geiss et al., 2011; Kotzias, 2005).

4.1.3.2. Wooden panels: the European and Japanese normatives

Wooden panels are classified on the basis of formaldehyde emissions, according to the technical regulation UNI EN 13986 (appendix B). Panels can be classified in one of the two classes E1 and E2. For E1 (low emissions) the beginning test refers to the emissions that have to be less or equal to 0.124 mg/m^3 air, measured with the chamber analysis method EN 717-1. The raw panels, Medium-Density Fibreboard (MDF) or Oriented Strand Board (OSB), have to emit less or equal to 8 mg/100g of oven dried panel, measured with the method UNI EN ISO 12460-5:2016. The other panels, varnished panels, melamine-faced particle boards or plated panels have to emit less or equal to 3.5 mg/m^2 h, measured with the gas analysis method EN 717-2, substituted by the UNI EN ISO 12460-3:2015.

The E1 limit of emission (0.1 ppm) is in accordance with the limit recommended by WHO (Federlegnoarredo, 2017).

According to the changes for improving the integrity of new houses, after the Kobe earthquake in 1995, the Japanese government introduced some countermeasures for reducing indoor formaldehyde pollution. In fact, the Housing Quality Assurance Act (HQAA) required the improvement of the quality and performance of residential houses, including air quality. The Sick House Regulations regulated formaldehyde emissions in houses, schools and clinics. Among the countermeasures for formaldehyde emissions there was the F**** rating of materials for products, including wooden building materials. For the F**** rating system, formaldehyde emission levels have to be less or equal to 0.005 mg/m^2 h, an added value for the above mentioned wooden products (Eastin and Mawhinney, 2011).

*4.1.3.3. Valcucine toxic emissions control (F**** normative)*

In October 2006, Valcucine obtained the F**** certification for its chipboard panels by Catas (Valcucine, 2017). The panels observe the formaldehyde emission limits required by the Japanese normative, which is the most severe in the world: this limit is less than the half of the European standard E1 (Federlegnoarredo, 2017). In Italy, the Ministerial Decree of October 10, 2008, foresees a limit of 0.1 ppm, as recommended by WHO.

4.1.4 The LEED certification

The LEED (Leadership in Energy and Environmental Design) voluntary certification is referred to a system of evaluation of the energy and environmental characteristics of a building, to establish how much it integrates with the environment, by defining its level of eco-compatibility during the steps of planning, building and management (Steinemann et al., 2017; Wei et al., 2015). The system is based on the assignment of a score to each requisite which characterizes the building sustainability. The degree of sustainability is obtained by the sum of the scores. Therefore, not only the structural and plant-engineering components, but also the internal elements, as furniture and kitchen unit, contribute to the definition of the degree of sustainability.

Valcucine had set itself entering the market of Arab countries as a goal; in that countries the topics of eco-sustainability of buildings and the LEED certification are renowned and appreciated. This is partly due to the local market habits of proposing the sale of buildings already furnished inside. For this reason, who takes part in a LEED project in the Arab countries looks for suppliers of products compliant with the parameters required for the awarding of the various scores. Therefore, in 2013 Valcucine started the process of evaluation of some of its products with the aim of

awarding of LEED credits. The products to which LEED credits have been awarded belong to the Invitrum and Meccanica models. The credits obtained by Valcucine are shown in Table 6.

Table 6. LEED credits obtained by Valcucine for the Invitrum and Meccanica models

MR Credit 2_Construction Waste Management
MR Credit 3_Material Reuse
MR Credit 4_Recycled Content
MR Credit 7_Certified Wood
EQ Credit 4.1_Low-Emitting Materials: Adhesives and Sealants

Source: Valcucine, 2017, personal communication

For many years Valcucine had already implemented an environmental management system, with a consequent decrease of the utilization of raw materials and energy and of environmental impacts. Therefore, Valcucine had to introduce only small changes to planning and making of its products in order to obtain the LEED credits. As a consequence, the costs met have been essentially only those of professional advice and certification, corresponding to about 4000 €. However, the awarding of LEED credits to Valcucine's products has not led to significant increases of sales up to now.

5 Conclusions

Valcucine, a company operating in the Livenza furniture district, carries out its activity with particular care towards the environment. This policy allowed Valcucine to obtain some certifications, such as ISO 14001 in 2001, F**** in 2006, FSC in 2008 and LEED in 2013. Consequently, Valcucine could differentiate from the competitors and enter new segments of the market. The virtuous behavior of Valcucine fits well into the principles inspiring circular economy and perfectly embraces the Goal 9.4 of the Sustainable Development (Agenda 2030), which foresees a sustainable industrial development.

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