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ECO-INNOVATION IN VALCUCINE FOR A CIRCULAR ECONOMY

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Abstract

Recently, more and more companies are implementing good environmental practices. Environmental certifications, besides being valuable management tools for companies, given the opportunity to strengthen their role on the market. An example of such virtuous behavior is the case of Valcucine, an enterprise of the Livenza furniture district in Northern Italy. Valcucine focuses its care in the production of furniture, in particular of kitchen units, characterized by sustainable production, eco-compatibility of materials and the lowest possible environmental impacts. Valcucine wishes to transfer its philosophy to customers by improving product quality, rationalizing the use of recyclable virgin raw materials, employing also recycled materials and reducing dangerous emissions into the environment. For this reason, Valcucine obtained several certifications, such as ISO 14001, Forest Stewardship Council (FSC), F**** (4 stars) Japanese Standard and Leadership in Energy and Environmental Design (LEED). In particular, the LEED certification, obtained for the Invitrum and Meccanica production lines, allows the enterprise both to differentiate from the competitors and to enter new segments of the market, such as the Arab Countries, where the LEED certification is renowned and appreciated. This gives a strong competitive advantage to Valcucine, working in a production field which has been saturated for many years. This virtuous behavior of the enterprise fits well in the principles inspiring circular economy and perfectly embraces the Goals 6 (Clean and Water Sanitation), 7 (Affordable and Clean Energy), 8 (Decent Work and Economic Growth), 12 (Responsible Consumption and Production) and 15 (Life on Land).

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

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1. Introduction

The 2030 Agenda 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 (United Nations, 2015).

According to EC Communication (2014), some transformations in the perspective of Circular Economy (CE) are durability of a product, efficiency, eco-design, industrial symbiosis. For a firm, waste reduction is essential for developing a sustainable economy, causing less CO_2 emissions, utilizing the resources in an efficient manner and remaining competitive (EC Communication, 2015; Novelli et al., 2017). The CE realization fits well in the Goals 6 (Clean and Water Sanitation), 7 (Affordable and Clean Energy), 8 (Decent Work and Economic Growth), 12 (Responsible Consumption and Production) and 15 (Life on Land) (Shroeder et al., 2018). CE 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, CE minimizes the consumption of resources by the adoption of cleaner technologies (Andersen, 1997, 1999) and the application of the Best Available Technologies (BAT).

Eco-innovation can be defined as "innovation that consists of new modified processes, practices, systems and products which benefit the environment and contribute to environmental sustainability" (Rennings, 2000), or "a change in economic activities that improve both the economic performances and the

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environmental performances" (Kemp, 2010), or "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).

The environmental policy, the competitive pressure, the wish to reach a better position on the market by employing a cleaner production are the main drivers pushing a firm to be eco-innovative (Kemp, 2010), with the aim of satisfying the interests of the consumers towards less harmful products, built with a greater respect for environment (Davenport, 1993). According to Sala and Castellani (2011), eco-innovation may concern the following dimensions: process, product, packaging, organization, logistics and distribution, purchasing, communication, network building.

The eco-innovation application to the planning step is called eco-design and it 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). To assess the sustainability of their activities the wood-based products companies can adopt several voluntary environmental instruments, as: ISO 14001 (Ruddell and Stevens, 1998), EMAS Registration (CML, 2006; Merli et al., 2016; Novelli et al., 2018), LEED certification (Ugur and Leblebici, 2018), F**** certification (Salem and Bohm, 2013), certification of forest products (Chen et al., 2011; Wingate and McFarlane, 2005), eco-labelling (Donatello et al., 2017), LCA (Krystofik et al., 2018; Rinawati et al., 2018). In particular, the LEED (Leadership in Energy and Environmental Design) certification refers to a system of evaluation of the energy and environmental characteristics of a building, for establishing 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 characterizing 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.

Particulate matter from fireplaces, 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. The Volatile Organic Compounds (VOC) are easily released into the air for a definite period of time, 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; 1987; 1995), while the most recent studies defined formaldehyde as "carcinogenic for humans" (Cogliano et al., 2004, 2005; IARC, 2006). Formaldehyde is a colorless gas with an acrid odor; 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). Even if formaldehyde is not the only substance that can be emitted by wood-based materials, it is an important parameter to evaluate the environmental health status due to the presence of a particular type of furniture. The F**** certification, required by the Japanese legislation, foresees a limit of 0.3 mg/L, the lowest limit for formaldehyde emissions, with respect to other standard methods (Risholm-Sundman et al., 2007).

The FSC certification, promoted by Forest Stewardship Council, guarantees that the certified wood and wood products come from sustainably managed forests and harvested in accordance with the laws of the Country of origin. In particular, the FSC Chain of Custody (FSC-CoC) certification ensures the traceability of raw materials, by identifying the chain across which products are traded, starting from their origin and passing through all manufacture processes, until the sale. According to the FSC-CoC certification, final products are labelled:

- FSC 100%, if the product is made entirely by materials (wood or paper) coming from certified forests,
- FSC Recycled, if wood or paper in the products come from re-used materials,
- FSC Mix, if certified wood or paper have been supplemented with non-certified materials (Forest Stewardship Council, 2017; Masiero and Zorzi, 2006; Vidal et al., 2005).

The aim of this study is to present a case study of a Northeastern Italian eco-innovative firm that considers CE themes as fundamental drivers of the company policy. The case under examination could be a model not only for other industries of the furniture sector, but also a point of reference for consumers with attitude towards sustainable purchases. The objectives of the paper are to underline the environmentally virtuous choices of the firm and to suggest possible sustainable tools to be adopted by the enterprise, in the perspective of continuous improvement.

In this paper the case study of Valcucine is presented: a small firm operating in the Livenza furniture district, in the province of Pordenone (Italy), producing kitchen units with a particular attention to long product life, low toxic emissions of the paints used, recycling of the finished products, a sustainable use of materials (Bettiol et al., 2012).

2. Material and methods

After an in-depht analysis of CE and eco-innovation themes with particular attention to the furniture sector (Gonzales-Garcia et al., 2012; Krystofik et al., 2018) a territorial firm census has been done, to put in light the most interesting suitable ones for our study. Our scientific interests have been satisfied by Valcucine, located in the first Italian district that in 2006 obtained the EMAS registration, the Livenza Furniture district, in the province of Pordenone (Italy) (CML, 2006; Novelli et al., 2018).

This step was followed by the firm visitation, with the supervision of the Quality Control manager and the Communication manager. In the meantime, the sustainability information, acquired by literature, was compared with the firm reality and data about the production activities were collected. These data are shown in Tables 1-5. Furthermore, some calls and e-mails with the firm managers have been necessary for acquiring other material for organizing this paper.

In November 2017 an interesting congress about the quality of indoor air, within the big fair of Ecomondo in Rimini (Italy), allowed us to know not only the national legislation regulating the wood-based products emissions, but also the technologies adopted to assess them and the situation in Italy.

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 nearly 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, environmental pollution,
- the development of technological innovations directed to environmental safeguard.

Valcucine obtained the ISO 14001 certification in 2001, in 2008 the FSC-CoC certification for some of its products, in 2006 the F**** certification for the ennobled panel, in 2013 the LEED certification for the Invitrum and Artematica models: it can be considered an exemplary firm strengthening its environmental strategies for a competitive advantage in the furniture sector, able to improve the quality of the environment in which it is located and, at the same time, to enter markets in which the care towards environment and health is particularly real (De Marchi et al., 2013).

4. Results

Our analysis showed that Valcucine managing strategies use CE paradigm as business driver, improving its industrial position by eco-innovation initiatives. In fact, 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 aluminum 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. Valcucine introduced recyclable materials, as glass and aluminum, and recycled components for structural pieces in its products. With a view to reuse at the end of the life cycle, the firm 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 aluminum components, 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 aluminum is about 5-10% in respect of energy needed to obtain primary aluminum 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 aluminum support and the "Riciclantica" door (Galli, 2015). The characteristics of recyclability and reusability of some components made by Valcucine are shown in Table 1.

3. Reduction of dangerous emissions. Valcucine has identified in particular three aspects to be monitored:

- varnishes containing synthetic solvents,
- artificial radioactivity,
- formaldehyde emissions.

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

Component	***Material***	***Characteristics***
Draw plates	Recycled aluminum	100% recyclable, 80% reusable
Backs	Primary aluminum 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 aluminum	100% recyclable, 100% reusable

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. 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.

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	***Water consumed, m^3***
1999	12,488
2000	13,365
2001	12,790
2002	6,811
2003	4,836
2004	4,403
2005	4,635
2006	7,459
2007	5,620
2008	2,233
2009	6,559
2010	5,818
2011	9,320
2012	10.532
2013	5,383
2014	3,074
2015	3,603
2016	6,178

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. 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 3. Electricity consumption (kWh) in Valcucine plant

Year	*Electricity from the grid*	*Electricity produced by the photovoltaic plant*	*Self-consumed electricity*	*Total consumption*
1999	586,266			586,266
2000	596,000			596,000
2001	638,200			638,200
2002	627800			627,800
2003	640,606			640,606
2004	720,861			720,861
2005	675,878			675,878
2006	797,610			797,610
2007	877,152			877,152
2008	855,661			855,661
2009	749,447			749,447
2010	803,347	18,558		821,905
2011	615,424	207,610		823,034
2012	630,969	187,494		818,463
2013	566,505	233,489	188,665	755,170
2014	535,698	180,640	138,000	716,338
2015	554,168	193,920	149520	703,688
2016	615,200	211,404	171,840	787,040

Table 4. Fuel consumption in Valcucine plant

Period (July-June)	*Year*	*Diesel oil (L)*	*Natural gas (m^3)*
1998/1999		65,000	
1999/2000		74,000	
2000/2001		68,000	
2001/2002		70,000	
2002/2003		70,000	
2003/2004		71,000	
2004/2005		82,900	
2005/2006		68,732	
2006/2007		60,398	
2007/2008		81,110	
2008/2009		67,720	
2009/2010		78,640	
	2010		27,455
	2011		63,479
	2012		63,015
	2013		56,954
	2014		43,751
	2015		64,702
	2016		79,239

Use of raw materials. The main materials are chipboard and fiberboard panels, laminated wood panels, glass, aluminum 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, aluminum 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. Most packaging originates from kitchen equipment suppliers' wrappings and are composed mainly of paperboard and plastics (PE, PS and PET). Glass, granite, aluminum 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 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 for 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.

With the aim of maintaining a high product quality and protecting the environment, Valcucine started the 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 the 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: the type of transferred materials; the percentages of certified and not certified materials; 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 normally used for cabinet sides and bottom panels). 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

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) 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 during time.

Among the European Countries, national regulations for construction products are different, and this can create some problems when firms have to export their products from a Country to another (Bulian and Fragassa, 2016).

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 rules

Wooden panels are classified on the basis of formaldehyde emissions, according to the technical regulation UNI EN 13986 (2015). 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 UNI EN 717-1 (2004). 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 UNI EN 717-2 (1995), 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. 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 (Ministerial Decree, 2008).

4.1.4. The LEED certification

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 (Valcucine, 2017):

- 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

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.

5. Discussions

As can be deduced from the above findings, Valcucine business is set in the perspective of CE through:

- the efforts to lower energy and water consumption and waste production;
- the design and production of components made from recycled materials and which can be easily disassembled and recycled at the time of discarding;
- the use of renewable certified materials;
- the lowering of components thickness;
- the extension of products life.

The above listed items fit well in the guidelines proposed by EC Communication (2014; 2015).

The results obtained by Valcucine are surely important. However, the environmental strategy of the firm could be improved by a tool as Life Cycle Assessment (LCA), for example applied to a kitchen furniture production, (e.g. Artematica or Invitrum). In fact, LCA allows the assessment of the environmental impact of entire life cycle of the product considering raw materials exploitation, production, transport and distribution, use and maintenance, re-use, re-cycle and final disposal (waste management) (Baldo et al., 2008). Several are the studies on LCA in the furniture sector (Gonzales-Garcia et al., 2012; Krystofik et al., 2018; Iritani et al., 2015). The study could be “from cradle to gate”, firstly, where cradle refers to the acquisition of raw materials and gate refers to the steps inside the firm, before distribution. LCA is a mandatory methodology for the obtainment of eco-labels of Type (I) and (III), that need a third part for the verification (Cobut et al., 2013) and are defined for several products, also for furniture. In particular LCA for Environmental Product Declaration (EPD), eco-label of Type (III), needs the so-called Product Category Rules (PCR) for assuring a correct comparison among products made by different companies (Fullana et al., 2008).

The EU-Ecolabel, a Type (I) (EC Regulation 66, 2010) logo, on furniture informs the consumer on sustainable materials used, limited use of hazardous substances, low formaldehyde and VOC emissions, product eco-design (Cobut et al., 2013). More than 90% of European people think that the environmental

protection is important and 27% of the interviewed sample knows and appreciate the mark Eu-Ecolabel, considering its role important for purchasings (Eurobarometer, 2017). Considering the growing attitude of consumers towards green products, the EU-Ecolabel certification could be for the firm an important tool of marketing.

6. 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.

"Innovation for life" is the Valcucine slogan, representing the three key-words: wellbeing, long life products and innovation. The firm's focus is the realization of a product, beautiful to see, but also practical, by a planning activity that allows the ergonomic study of the kitchen units produced. The innovation can be considered a necessary tool of eco-management.

If the F**** certification can push the sales of the firm in Japan, the LEED certification in Arab countries, the EU-Ecolabel obtainment, on some products, could increase the sales in the European countries.

The adoption of clear environmental labels by the producers, permits an easy orientation of the consumers in their purchasings. In our opinion the Valcucine case can be taken into consideration by other firms that want to improve their market position.

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