CURRENT AND FUTURE CHALLENGES OF THE CERAMIC TILE FIRMS

Autor: Pablo Albalat Martínez

Tutor: Francesc Xavier Molina Morales

GRADO EN ADMINISTRACIÓN Y DIRECCIÓN DE EMPRESAS

AE1049 – TRABAJO FINAL DE GRADO

CURSO 2017-2018

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Regarding the introduction of the subject AE 1049, I deal with the topic "Current and future challenges of the ceramic tile firms". All the topics related to the practice of the tile industry are very interesting to me since my life has always been linked to this sector. I am currently working in a ceramic tile company and, therefore, my main goal is to learn as much as I can about this industry.

As the title of the paper says, I try to study the main challenges which ceramic tile companies are facing today and which may face in the future. Some of these challenges are related to environmental criteria and measures. Those were not considered entirely important in the past, but they are receiving much importance today due to the effects that gas emissions have on the environment. Another challenge that ceramic tile companies encounter nowadays is the new market trends that force companies to innovate and to expand their product portfolio with new measures and formats to compete in a market where rivalry is very high.

On the one hand, in order to select the topic of this paper, I just had to wait for the election period and then choose the option that was already proposed in the Virtual Classroom. It was an easy choice because, as I have already explained in the first paragraph, my life has been linked to this sector and I would like to learn everything related to it.

On the other hand, in order to conduct this work, I have tried to combine theory with the main concepts of the work. An example is the one of the Cluster of the Province of Castellón with which I have related Michael Porter's theoretical concepts, both the 5 forces and Porter's diamond. In this section I have also analysed the external part of the sector, in which I try to identify the main threats and opportunities.

The work consists of 6 sections, and some of them are divided into subsections. First of all, in the introduction, the topic of the work has been explained. Moreover, I will explain the history of the ceramic tile sector from its beginnings to the present day. I will also deal with the main characteristics of the sector, including the total sales, the exports, the quantity of products in millions of square meters, among others. In the following section, I will explain the production process in detail, from the moment the clay is received until the final product is classified and packed to serve the customers. The fifth point, being one of the most important ones together with point 6, deals with the ceramic Cluster in the province of Castellón. This section explains what the ceramic Cluster consists of and relates this Cluster with Michael Porter's models. It also

provides an external diagnosis of the sector and it explains the new trends demanded by the market, including the appearance of new formats and Inkjet technology. Finally, in point 6, environmental issues that companies face are explained, focusing on the concern for the environment, on the Kyoto and Paris treaties as well as on the regulations that ceramic companies have in water treatment, air quality, and emissions trading. These directives can be found in the Annexes section and they are published by ASCER on its official website.

1. GENERAL DESCRIPTION OF THE CERAMIC SECTOR

1.1 HISTORY OF THE CERAMIC SECTOR

The Spanish Association of Manufacturers of Ceramic Tiles and Flooring (ASCER), attributes the birth of the ceramic sector to the time of the ancient Egyptians, more than 4600 years ago. This sector has had a constant growth trend and a high influence worldwide since it appeared.

In Spain, this sector developed between the 13th and 14th centuries. This period of time is known as the 'Islamization of the Iberian Peninsula', i.e. when the Iberian Peninsula was invaded by Muslims. The expansion of the ceramic sector began in Andalusia, mainly with the construction of the Alhambra in Granada, which is now one of the country's emblems.

During the fourteenth and fifteenth centuries, the ceramic sector was expanded in the Valencian Community, especially the province of Castellón, being in the future the main manufacturer of this sector. As ASCER publishes, the Christians were the ones who moved the ceramic sector towards the Valencian Community and began to export the materials by the sea. The countries to which the tiles were exported were Turkey, Syria, Egypt and Italy, the latter being the main recipient of the material.

At the end of the 19th century, the industrial area of Valencia was consolidated. Nevertheless, at the beginning of the 20th century, the manufacture of tiles was focused on Manises and Onda.

At the beginning of the 1980s with the appearance of new materials such as gas, important technological changes took place in the ceramic industry. It was due to these changes that the manufacturing processes of the materials were improved, tile firing times were reduced and production was increased. In addition, these technological

changes allowed to create tiles with new formats. As a result, the Ceramic Cluster became the first European manufacturer of ceramic tiles and the second worldwide.

1.2 GENERAL CHARACTERISTICS OF THE SECTOR

Currently, the Spanish ceramic sector has been positioned as the world leader in the ceramic sector regarding the design of the products, the quality of the raw materials used, and the subsequent products and technological development. The main competitor of the Spanish ceramic sector is Italy.

According to data provided by ASCER (2016) total sales were 3,316 million euros, where an increase of approximately 7% could be observed compared to 2015. In turn, sales in the national market were 746 million euros, while in the export or international market were 2,570 million euros. Domestic sales increased by approximately 14% while exports increased by 5%.

Figure 1. General Characteristics of the sector

Cuadro de indicadores

Sector español de baldosas cerámicas

ASCER
Asociación Española de Fabricantes de Azulejos y Pavimentos Cerámicos

Magnitudes principales. Datos anuales

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017(a)
Producción (mill. m^2)	495	324	366	392	404	420	425	440	492	-
Variación anual (%)	*-15,3%*	*-34,5%*	*12,8%*	*7,1%*	*3,1%*	*4,0%*	*1,1%*	*3,6%*	*11,8%*	*8,3%*
Empleo directo	22.300	17.700	16.200	15.500	14.400	14.300	14.400	14.500	15.000	-
Variación anual (%)	*-17,4%*	*-20,6%*	*-8,5%*	*-4,3%*	*-7,1%*	*-0,7%*	*0,7%*	*0,7%*	*3,4%*	*5,1%*
Ventas totales (mill. €)	3.671	2.591	2.548	2.597	2.656	2.797	2.902	3.095	3.316	-
Variación anual (%)	*-11,9%*	*-29,4%*	*-1,7%*	*1,9%*	*2,3%*	*5,3%*	*3,8%*	*6,6%*	*7,1%*	-
Exportación (mill. €)	2.211	1.673	1.747	1.892	2.082	2.240	2.328	2.452	2.570	-
Variación anual (%)	*-3,7%*	*-24,3%*	*4,4%*	*8,3%*	*10,0%*	*7,6%*	*4,0%*	*5,3%*	*4,8%*	*5,1%*
Ventas nacional (mill. €)	1.460	918	801	705	575	557	574	643	746	-
Variación anual (%)	*-22,0%*	*-37,1%*	*-12,7%*	*-12,0%*	*-18,5%*	*-3,0%*	*3,0%*	*12,0%*	*16,0%*	-
Importación (mill. €)	120,5	72,8	91,8	80,0	59,7	62,0	75,4	68,0	77,1	-
Variación anual (%)	*-23,2%*	*-39,6%*	*26,1%*	*-12,8%*	*-25,4%*	*3,9%*	*21,5%*	*-9,8%*	*13,3%*	*17,2%*
Superávil com. (mill. €)	2.090	1.600	1.655	1.812	2.022	2.178	2.253	2.384	2.493	-
Variación anual (%)	*-2,2%*	*-23,4%*	*3,4%*	*9,5%*	*11,6%*	*7,7%*	*3,5%*	*5,8%*	*4,6%*	*4,7%*
Fabricantes de baldosas	193	182	170	165	160	153	151	146	145	-
Variación anual (%)	*-6,8%*	*-5,7%*	*-6,6%*	*-2,9%*	*-3,0%*	*-4,4%*	*-1,3%*	*-3,3%*	*-0,7%*	-

Fuente. ASCER

As it can be observed in Table 1, exports have progressively increased between 2012-2016. During the economic crisis that our country suffered, the problems in the construction sector affected mainly the ceramic sector. The international market was

still functioning, at very low levels of work, but companies were able to sustain themselves, while the national market had a very significant decline since the beginning of the crisis. In recent years, the fall in sales in the domestic market has been approximately 40%.

Analyzing the ceramic sector at present, regarding the global turnover, around 80% of sales correspond to exports and the rest to the domestic market. The ceramic industry is the third largest industry contributing a surplus to the Spanish trade balance.

Regarding its location, the ceramic industry was mainly concentrated in the province of Castellón. In addition, it can be said that there is a consolidated cluster within the Valencian Community, especially in the province of Castellon, bounded in the north by Alcora and Borriol, in the east by Castellón de la Plana, in the west by Onda and in the south by Nules as we observe see in the following image.

1.3 PRODUCTION PROCESS

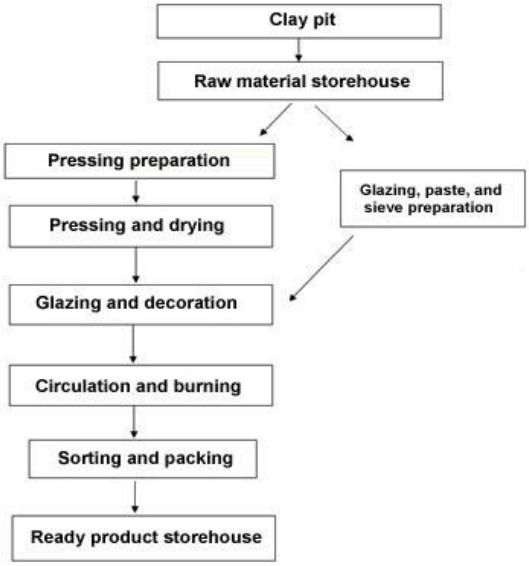
The production process of a company in the ceramics industry consists of three interrelated operations. The first of them is the preparation of raw materials, e.g. clays, frits, glazes and colourings. The second operation deals with the finished product after the production process. This finished product is the one that is ready to be used in the construction sector. Finally, the third operation involves the distribution of the products to the final consumers.

In the ceramic sector, the main material for the preparation of ceramic tiles is clay. There is a great variety of this material and the differences among these varieties are reflected in the physical-chemical properties of the final products and in the emissions generated during the production process.

In each company the production process may be different, as each company has different machinery. The main differences can be found in the production processes related to the preparation of raw materials and their treatment.

In the following image, the production process can be observed in a simplified manner:

Figure 2. Production process



Fuente: Google.

An explanation of each of the stages of the production process is included in the following subsections.

RECEPTION AND STORAGE OF RAW MATERIALS

Although there are Some business groups have their own quarry, i.e. they own one, the vast majority of ceramic tile companies, especially SMEs, depend on other companies that extract raw materials in order to carry out their production process. The clay obtained in the quarries is transported to the companies to be treated and prepared for the production process.

Once the clay arrives at the company, it is unloaded in some deposits that the companies have for it. Within the company, the clay is transported by belts to start the production process.

During the transport of the clay, particles are emitted into the air and, later, they will become waste.

CLAY TREATMENT

The following process deals with the treatment of clay. The clay is subjected to a crushing process without having been treated since it arrives from the quarry, obtaining the necessary texture of the raw material for its later use. This process can be carried out in two different ways: dry and semi-wet.

Firstly, clays that have a drier and harder composition are better treated in dry process facilities. This system ensures that a high percentage of fine particles are obtained and humidified more quickly and easily. In addition, a homogeneous mass with a high degree of plasticity is obtained. With the use of this process, a better finished product as well as a greater resistance of the cooked product are obtained.

Secondly, in the semi-wet process the water is strongly bound to the clay, resulting in an increase of plasticity and an increase of resistance to the pressures of the drying process.

THE KNEADING PROCESS

The kneading process consists of mixing the raw materials of the composition of the dough with water in order to obtain a mouldable dough.

In order to carry out a good kneading process, the clay has to be sufficiently moist, more specifically, it should have between 12% and 15% humidity while it is being worked with it.

During the clay kneading process in ceramic factories, a kneader is used, i.e. a machine which is specially designed to obtain a homogeneous clay mixture.

SHAPING OF CERAMIC PARTS

In this process, two different ways of forming the pieces can be found: dry pressing and extrusion.

As far as dry pressing is concerned, it is done through hydraulic presses. This process of forming the pieces by the mechanical compression of the paste in the mould represents one of the most economic processes in the manufacture of ceramic tiles.

The pressing system consists of presses that carry out the movements by means of oil compression and that have a series of characteristics: strong compaction, high productivity and easy regulation.

Today, the presses have been greatly improved and can be considered as very versatile and sophisticated work equipment.

On the other hand, the pieces can be also shaped through the extrusion process. This process consists of obtaining ceramic pieces through a constant section matrix.

The extrusion equipment consists of the propulsion system, the matrix and the cutter.

DRYING OF THE FORMED PARTS

Once the ceramic pieces have been shaped, they are subjected to a drying stage, with the main objective of reducing the amount of humidity in the piece, so that they develop positively during the firing and enamelling phases. In the ceramic industry, the dryers used transmit heat by convection, i.e. they expel hot gases to the surface of the piece through the walls.

To do this, the air used in the process must be dry and hot enough to remove the water from the ceramic pieces and to provide energy in the form of heat. This hot and dry air is what water needs to evaporate completely.

At present, the drying of ceramic pieces is carried out in vertical and horizontal dryers. On the one hand, the mechanism of vertical dryers consists of creating a series of 'baskets', which are the parts placed on metal planes, and these 'baskets' move vertically inside the dryer. On the other hand, in horizontal dryers, the ceramic pieces are inserted into the dryer and moved horizontally over a roller system.

There is a difference regarding the consumption of the two types of dryers: vertical dryers have a higher consumption than horizontal dryers due to the fact that pieces are placed better inside the dryer.

ENAMELLING

The enamelling process consists of applying one or more layers of glaze with a thickness of 75-500 microns by different methods in order to cover the surface area of the piece. This treatment is used to add to the cooked product different technical and aesthetic properties such as gloss, colour, texture, impermeability and a higher chemical and mechanical resistance.

There are several methods in order to enamel the ceramic pieces. The most common ones in the manufacture of ceramic products are: in curtain, by spraying, dry enamelled or in decorations.

FIRING OF THE PIECES

The firing process is entirely important in the manufacturing process of ceramic tiles since most of the characteristics of the ceramic product depend on it. Those aforementioned features involve resistance, stability, fire resistance, ease to clean the pieces, among others.

The firing process consists of subjecting the ceramic pieces to a thermal cycle. During this process, there are different reactions in the ceramic pieces that cause a series of changes in their microstructure and give them the properties finally desired.

Different types of firing can be highlighted:

- Single Firing of unenamelled tiles: a firing process for unenamelled tiles.
- Single firing of enamelled tiles: a firing process for enamelled tiles, i.e. after applying the glaze to the raw tiles.
- Double firing: a firing process carried out on those pieces that have been subjected to a first firing process and then have been enamelled to be fired again by a second firing.
- Quick firing: this is the predominant firing process and it is carried out in roller kilns. These furnaces have been used to reduce the duration of the firing cycles to less than 40 minutes. The pieces move over the rollers and the heat needed to bake the pieces is emitted by burners, which are located on the walls of the oven.

ADDITIONAL TREATMENTS

In certain cases additional treatments are needed. For instance, porcelain stoneware tiles are subjected to a polishing treatment of the surface of the piece in order to obtain glossy and unenamelled tiles.

SORTING AND PACKAGING

With this stage, the production process of ceramic tiles is completed. The sorting of the ceramic tiles is carried out through automatic systems. The result of this process is a product which is controlled in terms of dimensions, surface appearance, as well as mechanical and chemical characteristics.

2. THE CERAMIC CLUSTER IN THE PROVINCE OF CASTELLÓN

As Michael Porter quotes in his book Be Competitive (1998), "Clusters are geographic concentrations of interconnected companies, specialized suppliers, service providers and related institutions (universities, regulatory agencies, or industry associations), in particular fields, that compete but also cooperate".

In our province, the production and trade of ceramic tiles is the main sector of work, which has reached levels of over 90% of the ceramic business in our country. For this reason, the majority of ceramic companies are located in the province of Castellón creating the well-known Ceramic Cluster.

The Cluster or industrial district located in our province has a large number of industries and organizations that are in the same geographical area. This relationship is a positive plus in terms of the level of global competitiveness.

According to the book by Guerras and Navas (2007) entitled “La Dirección Estratégica de la Empresa” (The Strategic Management of the Company), a Cluster or industrial district is defined as "a large group of companies and related institutions, related to the same economic activity, located in a specific geographical environment. The district includes companies belonging to the industrial sector that identifies it, institutions that support the activities of these companies, as well as others belonging to other areas of activity, but that have some kind of relationship with the companies in the industry.”

Depending on the types of agents found in clusters or industrial districts a distinction can be established:

1. Companies that carry out the same activity offering final products or services.
2. Public and private bodies, i.e. institutions that provide information and a specialized support service such as universities, institutes, training centres, among others.
3. All those companies whose activities are both in the pre- and post-operational phase, such as suppliers of goods and services.

All those organizations placed within the same industrial district are positively favoured, due to the advantage of being part of a concentration of companies related to each other. One of the main advantages is the access to commercial networks between companies in order to be able to truly compete in this highly competitive sector. In addition, increasing productivity is an objective that all companies fight for. However, this objective can be achieved through the business relationships established by companies.

Another of the positive factors of being part of the same industrial district is the proximity to the suppliers with whom long-lasting business relationships are created. A good relationship with suppliers is very important because of the favours that both entities can do to each other.

One of the most important factors in terms of increasing the productivity is the support of the public administrations as it is the case of the ceramic technology institute, the Chamber of Commerce with employee training. Those public administrations can provide companies with general or specialized infrastructures.

2.1 DIAGNOSIS OF THE SECTOR

Following the theoretical framework, a diagnosis of the ceramic sector focusing on an external analysis will be carried out. As it is known, an external analysis is focused on the opportunities and threats that come from the sector's environment.

Opportunities. They refer to all the opportunities that the market launches and that are available to everyone, but if they are not identified in time, the company can lose a competitive advantage over its competitors.

- Industry 4.0: it is the term that defines the current technological revolution in the industrial world thanks to ICT. This transformation is linked to the "Intelligent Factory", which is characterized by the interconnection of machines and systems in the same production space.

- Diversification: it is the process by which a company offers new products, in addition to those it already has in its product portfolio, and invests in new businesses in order to create synergies between companies or to reduce the company's overall risk.

- New formats: the high competitiveness in the market has meant that companies have to offer other types of formats to obtain new clients and enter new markets. Today, large formats are the most prominent.

Threats. These are all those negative factors that can put the company in danger. As with opportunities, if threats are identified in time, they can be avoided or turned into opportunities.

- Cheap labour markets: these are those markets that produce the same products and where the labour costs incurred by companies are lower than the costs incurred in another country. This leads to a reduction in the final price of the product, lower salaries, and increased recruitment, among others.

- Market instability: the environment in which the ceramic industry is located is very dynamic. There is a high degree of uncertainty and dynamism and this is why companies are in a process of continuous transformation. Moreover, it is a sector that depends on others for its proper functioning.

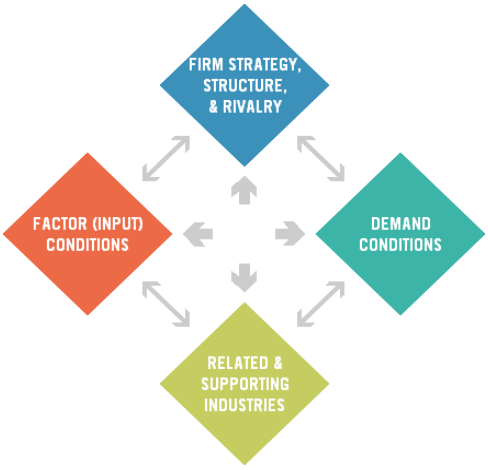
- High competitiviness: the ceramic industry is characterised by a high degree of competition. There are many companies that sell ceramic tiles, what makes participation in it more difficult. Many companies have to develop strategies to avoid other competitors in terms of price, product, and formats, among others.

- Competitors with greater purchasing power: within the sector, there are a number of companies and business groups that are considered to be the strongest in the sector. The rest of companies have to compete with each other, because they cannot compete with these strong groups. One of the reasons is the amount of production they carry out, so they do not have to give material availability deadlines.

2.2 PORTER'S DIAMOND

Michael Porter's Diamond is a theoretical model in which all its elements are interrelated with each other, and the performance of one of them always benefits or affects the others. With this model, Porter explains that there are different reasons to justify that there are countries which are more competitive than others and that there are companies that are more competitive than others.

Figure 3. Porter's Diamond



Fuente: Google

Factor conditions:

They refer to the environment in which the productive factors of enterprises are involved. Factors can be divided into different categories:

o Human Resources: they refer to the entire staff of the company and to different characteristics such as the number of employees, their quality and the skills that each one of them possess.

o Physical resources: they refer to each and every one of the company's tangible resources. This section includes the quantity of resources, the quality of each of them and their accessibility.

o Knowledge resources: they refer to the amount of scientific, technical and market knowledge that a nation has to support the production of goods and services.

o Capital resources: they refer to the amount and cost of the capital available to finance companies in the sector.

o Infrastructure: this refers to the tangible fixed assets that companies possess.

On the other hand, factor conditions also refer to the efficiency, the capacity of response of companies and the relations that the companies establish with the environment in which they operate. According to Michael Porter, all the factors that guarantee a good positioning of the company in the market are those that they themselves create. Moreover, both creation and innovation are linked to productivity.

- **Conditions of the demand**

With regards to this section, Michel Porter states that the demand has an indirect influence when it comes to generating competitive advantages. For example, there may be a group of buyers who are highly demanding, well informed and critical of what they are offered, therefore companies in the sector will have to make a major effort to meet their needs. In addition, they will be obliged to innovate and to look for new alternatives for the marketing of products. On the other hand, companies can and should also anticipate the needs of their customers and therefore meet those needs without waiting for the demands of the customers.

- **Strategy, structure and rivalry of the companies:**

Another aspect that promotes the creation and emergence of competitive advantages is the presence of competing companies in the same sector. Knowing that another company is looking for and offering a product or service very similar to ours produces a stimulating effect that leads to improving the quality of the product and creating new competitive strategies. In addition, this effect also appears internally when competitiveness is generated within the company in order to increase performance and productivity. Regarding the factors that affect increasing the performance and productivity of a company's employees, Michael Porter emphasises different economic incentives, such as remuneration systems.

- **Related and auxiliary sectors**:

They refer to an element of internal functionality. This is more evident in countries than in companies. It consists of the high competitiveness that exists between some sectors of the economy, leading to an increase in the supply of products that benefits the country in front of other countries that want to compete with it in the international market.

Regarding companies, it can be understood as the competitiveness that can exist between companies to achieve production margins.

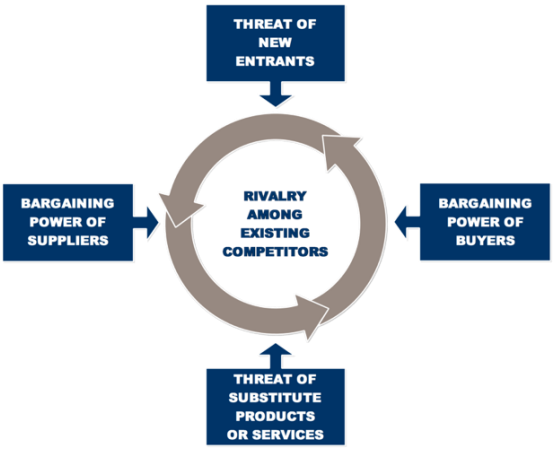
In addition, it also refers to the complementarity and linkages between companies in the same sector in order to produce a cross demand for the products that both companies can produce. It is also very important that suppliers located in the same country as companies can help them apply new technologies and the latest innovations.

2.3 MICHAEL PORTER'S FIVE FORCES

As it is well known, the ceramic tile sector is very competitive. There are many companies competing with each other to obtain their own customer base through the manufacture and sale of tiles. Each of these companies is different from the competition. This competitive framework is related to the well-known five forces of Porter. This model is a tool for the management and analysis of a sector or industry. This tool gives us the possibility to know the degree of competition that exists in a sector, and to carry out an external analysis of any company that is within it,

formulating the appropriate strategies and taking advantage of the opportunities and/or facing the threats

Figure 4. Michael Porter's five forces



Fuente: Google.

The five forces that Porter speaks of in his model and that exist in every industry are:

1. Rivalry between competitors.
2. Threat of entry of new competitors.
3. Threat from substitute products.
4. Suppliers' bargaining power.
5. Consumers' bargaining power.

The division of an industry or sector allows for a more detailed analysis of the degree of competition that exists in it. Through this division a more accurate identification of the opportunities and threats of the environment can be identified.

1. Rivalry between competitors

Among the five forces, 'rivalry between competitors' can be said to be the most powerful one in relation to the others. It refers to the rivalry between companies competing in the same sector and offering the same type of product. Logically, the greater the number of competitors, the greater the degree of rivalry.

This rivalry between competitors in the same industry can be used to carry out strategies to outperform others and to anticipate to their movements. Some of these strategies might be:

- Increasing the quality of the products.
- Reducing prices.
- Increasing the investment in marketing and advertising in order to differentiate our products from those of our competitors.
- Including services such as added value for customers.
- Reducing fixed costs.

In those sectors where rivalry is high, the number of new competitors will decrease, as profits will be lower. On the other hand, and of course, if the degree of rivalry is small, the number of new competitors will increase because the profits will be higher.

Rivalry in a sector tends to increase when there are price reductions, when there is little differentiation between products, when demand for products decreases, and when companies' fixed costs are high, among others.

2. Threat of entry of new competitors

This force refers to the entry of new companies in the same industry or sector that produce or sell the same type of product.

It is important to highlight that entering a sector is not an easy task, as there are barriers that hinder the entry of new competitors. However, firms can still enter the sector and therefore the intensity of competition will increase. Sometimes, companies can easily enter a sector because they have higher quality products than those already on the market, because they have lower prices than those already on the market, or because they have higher advertising.

Concerning the market barriers, some examples could be:

- Lack of experience.
- High tariffs.
- Saturated market of companies.
- Loyalty of the consumers towards the other brands.

Conducting an analysis of the threats of the entry of new competitors allows companies to know when they enter the sector and to formulate strategies to face their entry. Some possible strategies are:

- Reduction of prices.
- Increasing the quality of the products.
- Greater investment in advertising and marketing.
- Offering services such as the after-sales service and the added value for customers.

3. Threat from substitute products

This section refers to the arrival of companies in the same sector that produce or sell alternative products to those already existing in the industry. The alternative products are those that satisfy the same needs as the current products of the sector.

The entry of substitute products can be considered to be easier when:

- The price of existing products is higher than that of substitute products.
- There is little advertising for products already on the market.
- Consumers have little loyalty to products or brands.
- Changing from one product to another does not involve a high cost for the costumer.

The threat of entry of alternative products into a market allows companies to formulate different strategies in order to prevent companies with substitute products from entering the same industry or competing with them in the market. Some possible strategies to be followed by companies could be the following:

- Diversifying the production towards possible substitutes.
- Increasing investment in advertising and marketing.
- Improving and increasing the company's sales channels.
- Increasing the quality of the products on the market.
- Reducing in the price of existing products as opposed to substitutes.

4. Supplier bargaining power

It refers to the strength of suppliers in the market to make price changes and decisions.

In an industry with a small number of suppliers, existing suppliers will have a lot of bargaining power. Being among the few who sell raw materials, they will be able to set their prices according to their interests.

In general, there are a large number of raw material suppliers in all sectors. The bargaining power of these ones increases when:

- The number of substitute raw materials is small.
- The companies make purchases of reduced volume.
- The cost of changing from one material to another is high.

In order to reduce this bargaining power of suppliers in relation to buyers of raw materials, the following strategies could be pursued:

- Purchasing from suppliers in order to have the raw materials at zero cost.
- Make strategic alliances with suppliers to reduce costs on both sides of the alliance.
- Being producers of the raw materials which they need to carry out their production.

5. Consumer bargaining power

This section refers to the capacity of consumers vis-à-vis the industry to obtain good prices for the products they sell and good conditions for their sales.

In any industry or sector, buyers always have greater bargaining power than sellers, although this power can be found at different levels depending on the market in which they operate.

Generally, the fewer the number of buyers in a market, the greater their bargaining power. In other words, as there is not so much demand for products, consumers will be able to demand lower prices and better conditions from sellers.

In addition, regardless of the number of existing buyers in the industry, they will have more power when:

- Consumers make volume purchases.
- Consumers have a lot of information about the products, prices and conditions presented by each seller in the sector.
- No product differentiation.
- Consumers can easily switch brands or products.

As in the other points of the Porter 5 Forces Model, there are a number of strategies in place to reduce the bargaining power of buyers. These strategies are:

- Offer better product guarantees.
- To offer a good after-sales service.
- Increase investment in sales promotions.
- Increase communication with the client.

2.4 NEW TRENDS

In this section we are going to talk about the new trends that have emerged in the ceramic sector due to the process of globalisation that the world we live in has suffered and continues to suffer today and to which companies must adapt in order to continue to fight and grow in the sector. The information is taken from an article by ESMALGLASS-ITACA GRUPO entitled "Digital Enamels for a totally digital enamelling and decoration process" in which it talks about the history of Inkjet technology and its main advantages and disadvantages.

First of all, we will talk about Inkjet technology or digital technology, which has marked a turning point in the history of the ceramic sector. This has been a major innovation since the appearance of roller kilns and the decoration systems for ceramic pieces.

Inkjet technology is said to have marked a turning point in the industry's history because at the time of its emergence and today it is still a helpful tool for manufacturers of ceramic floor and wall tiles. By means of this technology, they have achieved a position in the market with a differentiating product, with production plants that do not increase operating costs, help to achieve better warehouse management, etc. In short, to set the company's strategies according to the business interests of each one.

Inkjet technology was born in the 70s as a printing tool in the product coding market. The first prototype of industrial machinery for the ceramic tile sector was created in 2000. During the last decade, a great evolution of this technology has been observed due to the continuous advance of the machinery components.

Two different stages can be distinguished; the first stage is defined until about 2006, when the inkjet system only worked with soluble inks. During this time a small number of this type of machinery was installed due to its great limitations related to the chromatic aspects. From this moment on, considered as the second stage, the pigmented inks are introduced which make the Inkjet technology a very important

qualitative leap. Printers are beginning to be able to print much of the colour space that the industry is used to today and at very competitive costs. This important change in the printing system is accompanied by the entry of new machinery manufacturers and new colorificios making it a very competitive scenario.

This technology also has a number of advantages and disadvantages. As for the advantages, we can highlight them for differentiating products and internally. As far as product differentiation is concerned, there are advantages such as high image definition decoration, the possibility of adapting to all types of formats and reliefs, 100% surface decoration of the pieces and great graphic versatility. As for the advantages over internal processes, we highlight the significant reduction in costs; in other words, the number of tests and the time invested in them are reduced. Another of the outstanding advantages is that it allows greater flexibility and speed when changing models and reduces the number of shades in the production batches.

On the other hand, this technology also has a number of shortcomings or disadvantages. Among them, the most outstanding are the following: reduced colour range compared to the classic decoration systems, the lack of productivity of the machines without losing definition in the products, making large investments for the duplication of the printing bars.

As a small conclusion on the Inkjet technology, we can say that it has been one of the fundamental pillars of the innovation process in the productive system of the ceramic sector and, in addition, this technology has been continuously evolving with very important advances for the sector.

Continuing in the section on new trends in the ceramic industry, we proceed to talk about the adaptation of companies to new market demands with the creation of a broader portfolio of products with new formats, environments, etc..

As we well know, the last decade has been a very complicated period of time for the ceramic sector, but on the other hand it has served to allow companies to explore other alternatives at all levels of the company. Levels such as the markets in which it operates, product design lines, distribution and promotion channels, etc. This time of negativity for the sector has coincided with a large number of changes, which were necessary in order to move forward and not to stagnate. There are two major changes to be highlighted, firstly the Inkject technology and secondly the large format manufacturing processes.

When it comes to product design, everything that is made today is done better than it was a while back. Tile production has been modernised in line with market trends, which is why the product designs are adapted to them. In addition, the companies have a wide range of products with a wide variety of materials with effects and finishes with many nuances, as well as ceramic tiles where the ceramic essence is claimed.

Some companies in the sector have detected in the design an added value for the products they manufacture. Thanks to this and to new developments, especially digital printing, ceramics is now enjoying a good time. You can see some very exaggerated changes if you look at tiles from now and some time ago. These changes are reflected in the finishes, graphics and formats in imitations of marble or wood, which gives us a picture of how the sector has been modernised and advanced.

Nowadays, although there is still the idea that it is essential to have a wide portfolio of products to find all types of consumers, many companies have opted for the creation of second brands with which they bet on more specialized editions. Many companies have managed to position themselves in a good place in the market thanks to their second brands for new ideas and new designs. The new trends of the companies in the sector are aimed at interior design and architecture. Other markets in which they are committed are the large-format façades and the worktops market.

3. ENVIRONMENT

To begin with the environment, we will start by talking about the emergence of concern about the environment. As we well know, the environment has always been an essential element of life, because we subsist on what it provides us. This international concern began in the 1950s because of the link between the environment and human life.

The main reasons for this concern were a series of environmental disasters that brought it to the surface and increased it. Several publications alerted major governments to the importance of the environment in life due to the negative events that were occurring in the world such as: deformities in newborn children due to the fact that their mothers had ingested thalidomide during the pregnancy process, which was a drug that caused congenital malformations and was used as a sedative and calming agent for nausea in the first three months of pregnancy; oil spills on the coasts; and

statements by scientists about the appearance of many dead fish in European lakes due to water pollution.

This environmental concern only existed in the West. In the eastern part of the planet, where the destruction of the environment due to the brutal growth of industrialization was unstoppable. The direct impact of industry on nature has as its main negative effect the destruction of the environment for the occupation of space, the use of natural resources and the generation of waste and gases that are expelled into the atmosphere.

At the beginning of the 1970s, environmental interest and concern focused on the biophysical environment, water pollution, desertification and problems with fauna and flora. These changes and alterations in ecosystems considered human beings as the main cause of all these problems.

It is from this moment that two different schools of thought on the causes of environmental degradation are born. On the one hand, there is a school that says that all the problems are related to the unstoppable growth of the industrialized countries. On the other hand, the second school blames population growth for all environmental problems.

Next, we will focus on what the environment as a whole consists of and we will talk about the measures that companies have had to implement to protect it regardless of the sector in which they carry out their activity.

To this end, we can define the term environment as the space where human beings develop and interact with each other. In addition, in such a system, there are also non-living or abiotic elements and artificial elements.

According to different authors, the environment is considered as the sum of cultural and social relations, in an environment, at a certain historical moment and in a particular place. This definition includes folklore within the concept of environment, among many other things.

All companies, regardless of the productive sector in which they are located, have been forced to incorporate a series of measures into their structure in order to protect the environment. As we are observing, there are increasingly high levels of pollution, which causes very negative causes in the environment such as: climate changes, high temperatures where they are usually quite low, air pollution, lack of water in rivers and reservoirs, etc..

For all these reasons, companies in Europe and the United States are directly or indirectly incorporating different environmental practices into their management. In our province, the province of Castellón, ceramic companies have been forced to incorporate into their structure water and gas purification systems, an increase in the percentage of waste reuse, gas expulsion control, etc.

Moreover, in Spain, environmental aspects are very socially conscious, and this is why there are instruments outside the company that have been incorporated and that allow companies that comply with them to be more competitive. The most important, which are published in the SGMA (Environmental Management Systems) of the ISO 14001 standard are:

- The existence of mandatory legislation that the company must comply with, with the continuous incorporation of new and increasingly strict and complete provisions on environmental issues.
- The existence of civil and criminal liability in environmental matters
- The introduction of economic instruments such as the existing water treatment levy or the 10% deduction of environmental investment from the corporate tax rate, and possible future taxes, such as the proposal for a tax on CO2 emissions, etc.
- The introduction of voluntary instruments that can have a major impact on the market, such as the award of an eco-label or the certification of an environmental management system according to a recognised model (EMAS or ISO 14001), etc.

All those companies that do not comply with these aspects and therefore have an incorrect environmental performance are being less competitive than all those that do.

3.1 KYOTO TREATY

For some time now, there has been considerable concern about the environmental impact of human activities that have an impact on climate change. To address this concern and set guidelines for its proper functioning, the Kyoto Protocol was implemented.

As defined in the Eco-Intelligence portal, "The Kyoto Protocol on Climate Change is the most significant result of the collective and global effort to seek a joint framework to combat climate change. In this way, quantified and mandatory greenhouse gas (GHG)

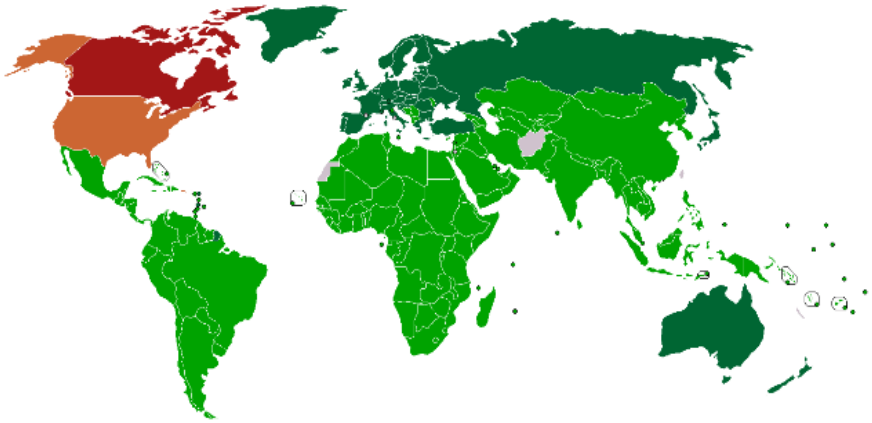
emission limits are established for the countries that ratify it, and which are legally binding for them".

On 11 December 1997, the industrialised countries committed to implementing a series of measures to reduce greenhouse gases met in the city of Kyoto. Depending on the UN figures, the average global temperature will rise by 1.4 to 5.8 oC by 2100. In addition, winters are very cold and violent, so this factor is known as global warming. The governments of these countries reached an agreement to reduce polluting emissions by 5% during the 2008 and 2012 time periods, taking as their main reference the 1990 levels of gas emissions. The main objective of the treaty was the reduction of 6 different types of gases that cause global warming, which are: carbon dioxide (CO2), methane gas (CH4) and nitrous oxide (N2O), in addition to other fluorinated industrial gases: hydrofluorocarbons (HFC), perfluorocarbons (PFC) and sulphur hexafluoride (SF6). This agreement enters into force on 16 February 2005.

In November 2009, 187 states ratified the Kyoto treaty. Among them was not the United States, which is the country with the highest levels of greenhouse gas emissions. The European Union, which was aware of the problem, set itself the target of reducing its total emissions over the period from 2008 to 2012 by 8% compared to 1990. This commitment was made jointly in accordance with Article 4 of the Kyoto Protocol, through which an internal distribution among the Member States was made. In the case of Spain, this distribution has the obligation to ensure that the average greenhouse gas emissions in the period 2008-2012 do not exceed 15% of the base year (1990-1995). between the 2013-2020 time period, the European Union aims to reduce the amount of greenhouse gas emissions by about 20% compared to the base year. Each country had a margin according to different economic and environmental variables. Argentina, for its part, was a developing country with global emissions levels close to 0.6%, so it was not required to comply with the requirements of the Kyoto Protocol. Finally, Canada abandoned the Kyoto Protocol in order not to pay the fines for failing to comply with the levels of gas reduction.

In the following chart, we see the countries that signed and ratified the Kyoto Protocol which are the ones that are in green. The countries that we found them in orange are those that signed the agreement but rejected ratification as the United States and in red the countries that abandoned the Protocol as Canada

Figure 5. Countries that sign and ratified the Kyotot Protocol



Fuente: Google

3.2 PARIS AGREEMENT

The Paris agreement falls within the framework of the United Nations Framework Convention on Climate Change. It sets out a series of measures to reduce greenhouse gas (GHG) emissions through the mitigation, adaptation and resilience of all ecosystems. Such an agreement would be implemented in 2020, once the Kyoto Protocol expires. The Paris Accord was negotiated at the 21st Climate Change Conference.

The main objective of the Paris Accord, as quoted in its Article 2, is to "strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty". In addition, within the same article there are 3 more articles, which are:

(a) To keep the global average temperature increase well below 2°C above pre-industrial levels, and to continue efforts to limit this temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;

(b) Enhance capacity to adapt to the adverse effects of climate change and promote climate resilience and low greenhouse gas development in a manner that does not compromise food production; and

(c) Placing financial flows at a level consistent with a path leading to climate-resilient development and low greenhouse gas emissions.

This Agreement shall be implemented in a manner that reflects equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.

In addition, the governments meeting in the Convention agreed on a series of measures to promote transparency and a global balance sheet. Firstly, it was agreed that governments would meet every five years to set more ambitious targets based on scientific criteria. Secondly, to provide information to other governments and to all citizens on the progress made. Finally, conduct progress assessments to see whether long-term objectives are being achieved through a transparency and accountability mechanism.

3.3 SUMMARY TABLE OF THE KYOTO AND PARIS TREATIES

Table 1. Sumary of Paris and Kyoto treaties

SUMMARY OF PARIS AND KYOTO TREATIES	
KYOTO TREATY	**PARIS TREATY**
• The creation of the Kyoto Treaty was based on a great concern for the environmental impact. • Collective and global effort to seek a joint framework to combat climate change. • Mandatory Greenhouse Gas (GHG) emission limits are established. • On 11 December 1997, members of the industrialised countries met in Kyoto and set a target of reducing emissions of polluting gases by 5% over the period 2008-2012. • Each of the 187 countries that signed the agreement had different margins depending on different economic and environmental variables.	• Set of measures to reduce the emission of Greenhouse Gases (GHG). • The main objective of the agreement is to "strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty". • The agreement will be implemented to reflect equity and common responsibilities. • The governments that accepted the treaty promoted transparency and global balance. First, they set targets every 5 years. Secondly, they provided information to other governments and citizens about the events.

Fuente: Own elaboration

3.4 LEGISLATION

In the following section we will find the most important points regarding the applicable regulations on Water Law, Air Quality and Emissions Trading. As far as information is concerned, this section will be more summarized, since the file published by ASCER can be found in the Annexes section.

Firstly, based on the information published by ASCER on its website, we will explain Order ARM/1312/2009, which regulates the systems for the control of uses, returns and discharges into the public water domain (BOE nº 128, of 27/05/2009). As ASCER (2009) publishes, "The main objective of this order is to regulate the application systems for the effective control of the volumes of water used by public water resources in the public water domain, of returns to the public water domain and of discharges into it. In addition to regulating the conditions under which measurements are to be carried out and their records, the information to be provided by the users concerning the measurements carried out and the power of the basin organisation to verify and inspect the measurement facilities, the recording of the data obtained and, where appropriate, the transmission of such data.

In addition, the water is monitored through the pressure pipe which has a number of requirements. This supervision is carried out through the installation and maintenance that provides the volume of water extracted in m3. Another of the elements to carry out an exhaustive control is the installation of an element that limits the maximum flow of water depending on the concession. In addition, category 3 operators shall install a system to determine the accumulated volumes on a daily basis, while category 4 operators shall install it on an hourly basis. Another of the requirements to be met is that the installation and maintenance of the meter, the limiter and the other devices must be carried out in accordance with current legislation. As a last requirement, keep a document that accredits the technical characteristics of the meter, and in the cases of category 3 and 4, a certificate that accredits the meter's compliance, being the person responsible for the installation.

There are a number of pre-registrations for all effective flow control facilities. First of all, the licensee will have to be responsible for the maintenance and installation of the systems implemented. Secondly, all elements have an obligation to comply with protocols and standards that are mandatory. Another requirement is that if there are several capture points, they can be brought together into a single common measurement element, thus measuring the overall volume. In addition, the licensee will

need to have batteries to ensure the necessary power supply for the elements. Finally, all the elements installed, such as the meters and others, must have easy access for easy observation and be covered from the outside by an enclosure, hut or manhole.

In addition to pre-registration, there are also a series of obligations that the owners of the uses must comply with. These obligations are mainly focused on facilitating the work and keeping a good control of each and every one of the installations. Some of them would be the following: Facilitate access to personnel to carry out equipment inspections, personnel must have documents of the characteristics of the equipment installed where it is certified that they comply with the current standard, notify the basin organization once the number of inspections has been exceeded and carry out a series of measurement and registration procedures according to the maximum amount of water authorized. As can be seen, all these obligations are based on the proper functioning of the equipment installed and on keeping it under control so that it complies with all the requirements of the current standard.

In the event of any type of alteration in the measuring systems, the basin organisation must be notified without being able to handle the apparatus and the organisation must repair it in the time it deems appropriate. In order to monitor the installations, the basin organisation may: check the measuring systems at any time, carry out all the verification visits as often as it deems necessary and require the proper functioning of all the installed equipment.

Secondly, based on the information published by ASCER on its website, we will explain Directive 2008/50/EC on ambient air quality and cleaner air for Europe. As published by ASCER (2008) in the documents available on its website, this directive aims to incorporate the latest health and scientific advances due to the need for a revision of the regulations relating to air quality management and assessment.

The purpose of this standard is to define and establish a set of systems and assessment criteria for ambient air quality that are also available to all citizens. A number of limit values are also specified to protect human health from contaminants such as sulphur dioxide or lead.

In terms of strategies, a series of guidelines and procedures are established to carry out the implementation of air quality plans at local, regional and national levels. As for the short-term Action Plans, guidelines and procedures are also laid down in the event of exceeding the limit values.

In addition, this Directive places great emphasis on information and data communication mechanisms to ensure that the public has access to air quality information and can be informed at all times, and that there are also information and data communication mechanisms between the Member States and the European Commission.

To conclude with the directive, we will see how it is applied in the ceramics sector as published by ASCER in its report. The obligations imposed by these new regulations directly affect the Competent Authorities and Bodies of each Member State. They are responsible for air quality control and coordination of monitoring.

Therefore, this Directive does not impose additional obligations to those already existing for industrial installations, which are generally laid down in the Integrated Environmental Authorisations. Although it is true that in areas where the air quality target values or limit values are exceeded, the Air Quality Plans (such as the "Plan for the Improvement of Air Quality in the Ceramic Area of Castellón", approved in December 2008) provide for more restrictive measures to be imposed on existing industrial installations, both in terms of channelled and diffuse emissions. Among the additional measures envisaged is the temporary cessation of industrial activities.

To conclude the section on Legislation, we will comment on the summary of the main elements of the Directive amending the Community Emissions Trading System (Directive 2003/87/EC) published by ASCER on its website.

Firstly, the scope of the directive would apply to all installations where its main activity is the manufacture of ceramic products by means of the firing process, in particular tiles, bricks, refractory bricks and ceramic stoneware or porcelain tiles with a production capacity exceeding 75 tonnes per day.

In addition, the opt-out for small plants is possible. Those companies whose emissions have not exceeded 25,000 tCO2 in the last 3 years may be excluded. These installations will be subject to a series of measures which will be equivalent to the installations not excluded and which will be imposed by each Member State. They will have to implement a CO2 emissions monitoring system so that it can be verified at all times that the established limits are not exceeded and that the agreed emission reductions are being achieved.

Obviously, the directive has a number of objectives to achieve. The main objective set is to reduce emissions by 20% by 2020 compared to the number of emissions in 1990.

If an international agreement is reached, this target will be raised to 30%. The main sectors affected will aim to reduce their greenhouse gas (GHG) emissions by 21% by 2020 compared to 2005.

With regard to allocation methods, it is necessary to differentiate between emissions from electricity generation, which have been on auction since 2013, and all emissions from the heat generation process, which can be allocated free of charge. In addition, a distinction must also be made between the industrial sectors:

- Sectors at risk of relocation will receive free allocation.
- Sectors that are not at risk of relocation will gradually enter the auction of 20% in 2013 and 70% in 2020.

Those sectors which are at risk of being relocated will be identified by the Commission on the basis of criteria to be established by the Directive. A review of all sectors will be carried out every 5 years and there will be the possibility of increasing this list every year.

In addition, the Commission must present a report on carbon leakage to two very important bodies, the European Parliament and the Council. This report, and if the situation so requires, must be accompanied by legislative measures.

New entrants are considered to be new installations and those where capacity has been increased.

4. CONCLUSIONS

To conclude with the final grade work, we will make a series of conclusions depending on what has been studied in the ceramic tile sector.

To begin with the conclusion, we will talk about what has been studied at work. The main objective of the work, and as it is well said in the title, has been to investigate the main present and future objectives of the ceramic sector. As for them, we have come to the conclusion that these objectives are mainly those related to the environmental issue and to the new trends demanded by the market. In addition to the objectives, we have also talked about the history of the ceramic sector by way of introduction, the main characteristics of the sector in numerical terms, the entire production process has been explained and the Cluster of the province of Castellón has been explained.

With regard to the results of everything that has been studied, I would like to highlight all the environmental measures that are being implemented in ceramic companies in order to reduce pollution levels. Today, there is a high social awareness of environmental pollution. I think this concern has been a step forward in carrying out such measures, as people are seeing first-hand the deterioration that is taking place in the environment due to the recklessness of the world at large.

During the process of carrying out the work I have encountered a number of limitations, especially in the search for information. One of the most difficult issues when it comes to finding information has been the environmental regulations published by ASCER. It has an added degree of difficulty, since you must be a user of the association to have access to all the information published and thanks to the company in which I work I have been able to access all this information.

If I were to continue studying this subject, I would focus on finding solutions to all the problems that small and medium-sized ceramics companies have been facing since the economic crisis began. A percentage of the population really knows the efforts that have to be made to be able to move forward, since the large part of the market is owned by the ceramic business groups and fighting against them is very difficult. However, I think that these are objectives and challenges that SMEs have to set themselves and achieve over time. I have no doubt that no one is stronger than someone struggling to achieve their goals, even if they are long-term.

REFERENCES

- *Acuerdo de París*. (n.d.). In Comisión Euoropea. Retrieved, May 5, 2018, from https://ec.europa.eu/clima/policies/international/negotiations/paris_es

- *Acuerdo de París*. (n.d.). In Wikipedia. Retrieved, May 5, 2108, from https://es.wikipedia.org/wiki/Acuerdo_de_Par%C3%ADs

- Agroambient. (n.d.). Guía de mejores técnicas disponibles para el sector de fabricación de baldosas cerámicas en la Comunitat Valenciana. Retrieved ,May 7, 2018, from http://www.agroambient.gva.es/documents/20550103/91057977/Gu%C3%ADa+MTD+Cer%C3%A1mica/96454f6e-f455-4057-b310-032c642ed650?version=1.1

- Alfonso, D. (2015). Análisis sector cerámico en España. Retrieved March 10, 2018, from http://dspace.umh.es/bitstream/11000/2276/1/Alfonso%20Manzanedo%20David.pdf

- Arcilla, A. (2001). Estrategia medioambiental en las empresas. Retrieved, May 10, 2018, from https://www.gestiopolis.com/estrategia-medioambiental-empresas/

- Arturo (2015). El modelo de las cinco fuerzas de Porter. Retrieved, March 20, 2018, from https://www.crecenegocios.com/el-modelo-de-las-cinco-fuerzas-de-porter/

- Asociación Española De Fabricantes y Azulejos y Pavimentos Cerámicos (ASCER). (2018). Retrieved, April 10, 2018, from https://www.ascer.es

- CESCE (2016). Informe sectorial de la economía española. Madrid.

- COEC. (n.d.). Guía de medio ambiente. Retrieved, May 6, 2018, from http://www.coec.es/servicios/guiamedioambiente.pdf

- Concepto de Medio Ambiente. (n.d.). In Concepto.de. Retrieved , May 7, 2018, from http://concepto.de/medio-ambiente/

- El sector cerámico de Castellón crece con la innovación de la SITI-B&T. (2017). In el Periódico Mediterráneo. Retrieved, May 5, 2018, from http://www.elperiodicomediterraneo.com/noticias/ceramica/sector-ceramico-castellon-crece-innovacion-tecnologia-siti-b-t_1051871.html

- Esmalglass-Itaca. (2007). "Esmalglass-itaca, proveedora de soluciones globales para los sistemas de decoración digital"; Cerámica Información no 341, pp.65-69

- Esmalglass-Itaca. (20111). Esmaltes Digitales para un proceso de esmaltación y decoración totalmente digital: Esmalglass-Itaca Grupo. *Bol. Soc. Esp. Ceram. Vidr,*50(2), XXIII-XXVI.

- Gamir, V. (2008). *Kerajet consolida su liderazgo en decoración digital. Levante.*
- González, R. (2012). Michael Porter y sus 5 fuerzas. Retrieved, March 20, 2012, from https://www.pdcahome.com/1413/michael-porter-y-sus-5-fuerzas/

- Guerras, L.A. & Navas, J.E. (2007). *Dirección estratégica de la empresa: teoría y aplicaciones.* Pamplona: Editorial Aranzadi, S. A.

- Instituto de Tecnología Cerámica. (2018). Retrieved, April 10, 2018, from http://www.itc.uji.es/Paginas/default.aspx

- KERAjet. (2018). Retrieved, May 4, 2018, from http://kerajet.com/kerajet/index.php/es/

- La española Kerajet pionera en la digitalización de los procesos de fabricación cerámica. (2016). In Cevipyme. Retrieved, May 3, 2018, from https://cevipyme.wordpress.com/2016/07/05/la-espanola-kerajet-pionera-en-la-digitalizacion-de-los-procesos-de-fabricacion-ceramica/

- La transformación digital en la industria cerámica. (2015). In Cámara de Valencia. Retrieved, May 1, 2018, from https://ticnegocios.camaravalencia.com/servicios/tendencias/la-transformacion-digital-en-la-industria-ceramica/

- Las tendencias y el panorama del diseño en el sector cerámico español. (n.d.). In Future-A. Retrieved, May 8, 2018, from http://www.future-a.com/las-tendencias-y-el-panorama-del-diseno-en-el-sector-ceramico-espanol/

- Monfort, E., Celades, I., Velasco, P., & Velilla, D. (1999). *Estrategia medioambiental en la industria.* Castellón. Editorial: Universitat Jaume I.

- Proceso de fabricacion de baldosas cerámicas. (n.d.). In Construmatica. Retrieved, May 9, 2018, from http://www.construmatica.com/construpedia/Proceso_de_Fabricaci%C3%B3n_de_Baldosas_Cer%C3%A1micas#Amasado

- Productos cerámicos de la Comunitat Valenciana. (2017). In Generalitat Valenciana. Retrieved April 5, 2018, from http://www.ivace.es/Internacional_Informes-Publicaciones/Sectores/CER%C3%81MICO_mat.construccionWEB_2017.pdf

- Protocolo de Kioto ¿conoces en que consiste? (2015). In Ecointeligencia. Retrieved, May 5, 2018, from https://www.ecointeligencia.com/2015/06/protocolo-kioto/#lightbox/1/

- Simón, M.A. (2017). Sector cerámico español: una perspectiva. Retrieved April 4, 2018, from http://acef.cef.es/sector-ceramico-espa%C3%B1ol-perspectiva.html

- Sobre el “Clúster cerámico de Castellón”. (2009). In Rankia. Retrieved April 1, 2018, from https://www.rankia.com/blog/cuadernosdeeconomia/414151-cluster-ceramico-castellon

- Veral, S. (2015). Principales datos del estudio sobre la distribución de cerámica y materiales de construcción en España. Retrieved, April 7, 2018, from http://www.vigilancer.es/noticias/principales-datos-del-estudio-sobre-la-distribución-de-cerámica-y-materiales-de

APPENDICES

These appendices have not been translated into English since they are official documents published by a public body.

APPENDIX 1. LEGISLACIÓN DE AGUAS

RESUMEN ORDEN ARM/1312/2009, POR LA QUE SE REGULAN LOS SISTEMAS PARA EL CONTROL DE LOS APROVECHAMIENTOS, RETORNOS Y VERTIDOS AL DOMINIO PÚBLICO HIDRÁULICO (BOE nº 128, de 27/05/2009)

Objeto y ámbito de aplicación

La presente Orden tiene por objeto regular los sistemas de aplicación para el control efectivo de los volúmenes de agua utilizados por los aprovechamientos de agua del dominio público hidráulico, de los retornos al citado dominio público hidráulico y de los vertidos al mismo. Además de regular las condiciones en las que deben efectuarse las mediciones y sus registros, la información que deberán remitir los usuarios en relación con las mediciones practicadas y la facultad de comprobación e inspección de los organismos de cuenca sobre las instalaciones de medición, el registro de los datos obtenidos y, en su caso, el envío de éstos.

Control efectivo de agua en captaciones mediante tubería a presión

Los titulares de aprovechamiento de agua a través de pozos tendrán que cumplir los siguientes requisitos (art. 4): o Instalar y mantener un contador que permita proporcionar el volumen de agua extraído, como volumen acumulado en m3 . o Instalar un elemento específico cuya función sea limitar el caudal máximo, de acuerdo a las determinaciones de la concesión. o Los titulares de aprovechamientos de aguas de categoría 3, instalarán un sistema para determinar con frecuencia diaria, los volúmenes acumulados circulantes. o Los titulares de aprovechamientos de aguas de categoría 4, instalarán un sistema para determinar de forma continua (al menos cada hora), los volúmenes acumulados circulantes. Además de elementos informáticos para el almacenamiento y tratamiento de la medición horaria. o La instalación y mantenimiento del contador, el limitador y el resto de dispositivos se realizará de acuerdo a la legislación vigente relativa al control metrológico y a las instrucciones técnicas de sus fabricantes. o Conservar un documento acreditativo de las características técnicas del contador, y en los casos de categorías tercera y cuarta además se conservará un certificado del responsable de la instalación acreditando el

cumplimiento del contador de las prescripciones mínimas fijadas por el fabricante respecto a la instalación.

Control efectivo de los vertidos de agua residual

Los titulares de vertidos autorizados de naturaleza industrial al dominio público hidráulico realizarán un control de los volúmenes evacuados de acuerdo a la siguiente tabla:

Vertido anual <100.000 m^3	Vertido anual entre 100.000 - 1.000.000 m^3	Vertido anual >1.000.000 m^3
Instalación de un tramo revestido	Instalación de un aforador	Instalación de un aforador y un sistema de acumulación.
Estimación anual por medición periódica de alturas	Estimación anual del volumen circulante por medición mensual del nivel alcanzado	Estimación anual del volumen circulante por medición semanal del nivel alcanzado.
Comprobación de las estimaciones por el organismo de cuenca.	Comprobación de las estimaciones por el organismo de cuenca	Comprobación anual de las estimaciones por el organismo de cuenca
Registro anual del vertido.	Registro mensual del volumen vertido	Registro semanal del volumen vertido.

Las eventuales diferencias entre el volumen de vertido autorizado y el volumen realmente medido no darán lugar a variaciones en el correspondiente canon, sin perjuicio de lo previsto en la legislación vigente de esta materia.

Prescripciones para todas las instalaciones de control efectivo de caudales

- El titular deberá ser el responsable de la instalación y el mantenimiento de los diferentes sistemas de medida, determinaciones temporales y limitación del caudal. Todos los equipos para el control efectivo de agua captado o retornada, se instalarán de forma que el Organismo de Cuenca pueda precintarlos, para evitar su manipulación.
- Todos los elementos cumplirán los protocolos y normas de obligado cumplimiento vigentes.
- Si fuesen varios los puntos de captación se les puede hacer confluir todas las conducciones en un único elemento de medida común, midiendo de esta forma el volumen global captado. O
- El titular deberá disponer de baterías para asegurar el suministro de energía en los elementos en los que se necesite alimentación de electricidad. O
- Los contadores y demás elementos complementarios deberán estar instalados de forma que se encuentren libres de obstáculos permitiendo una fácil observación y acceso, a cubierto del exterior mediante un recinto, caseta o

arqueta. Y se deberán diseñar de forma que la comprobación de las mediciones pueda efectuarse desde el exterior de las instalaciones.

Obligaciones de los titulares de aprovechamientos

- Facilitar el acceso a los equipos de medida al personal designado para realizar funciones de comprobación de los equipos.
- Conservar a disposición del personal del organismo de cuenca, documentos donde se especifican las características de los equipos instalados y que acrediten el cumplimiento de la normativa vigente.
- Notificar al organismo de cuenca la superación de las revisiones previstas en la normativa para el control metrológico de los equipos.
- Disponer de un libro registro del control efectivo de los caudales del aprovechamiento, debidamente foliado y sellado con el formado y condiciones definidas en el Anexo de la Orden. El Organismo de cuenta facilitará un modelo de libre en formato electrónico y en papel, y en el que se incluirán los registros de los 4 últimos años.
- Procedimientos de medición y registro en función de caudal máximo autorizado:

  - Categoría primera: anotación en el libro de control el volumen captado anualmente (m3 /año) determinado por contador o por estimación en función de la medición de niveles. La anotación se realizará durante el mes de enero.

  - Categoría segunda: anotación en el libro de control del volumen mensual captado obtenido por lectura de contador o estimación del nivel medio mensual determinado en escala limnimétrica. Igualmente se anotará la acumulación de volúmenes anuales captados.

  - Categoría tercera: anotación en el libro de control estimación del volumen semanal captado obtenida a través de contador o por estimación del nivel medio semanal determinado en escala limnimétrica. En el primer trimestre de cada año natural se remitirá al organismo de cuenca información de los volúmenes captados cada semana, así como una acumulación referida al año natural anterior.

- Categoría cuarta: anotación en el libro de control, el volumen diario captado y generar un archivo automático de la información contenido en el Anexo de la Orden, especificando el consumo realizado.

- En el primer trimestre de cada año natural el titular del aprovechamiento remitirá al organismo de cuenca información de los volúmenes captados así como una acumulación referida al año natural anterior.

Sistemas alternativos de control

De forma excepcional, cuando por motivos debidamente justificados no sea factible la instalación de un sistema de medición de las características mencionadas en la Orden, el titular del aprovechamiento deberá proponer un sistema alternativo de medición de volúmenes, adaptado a las circunstancias y cuya validez habrá de ser admitida expresamente por el organismo de cuenca.

Alteraciones de los sistemas de medición y comprobación de los mismos

En caso de avería, funcionamiento incorrecto o sustitución del sistema de medición, se deberá advertir al organismo de cuenca, no se podrán manipular dichos aparatos y se deberán reparar en el plazo que lo estime oportuno el organismo de cuenca. Mientras el sistema funciona incorrectamente se deberá realizar una estimación de los datos. En caso de aparentar incorrectas las estimaciones, el organismo de cuenca podrá demandar al titular la corrección de las mismas salvo que se justifique claramente. El organismo de cuenca podrá, para el control de las instalaciones:

- Comprobar en todo momento el funcionamiento de los sistemas de medición, así como los datos trasladados al libro de control.
- Realizar tantas visitas de comprobación considere necesario previo requerimiento al titular.
- Será exigible el correcto funcionamiento del contador y equipos complementarios.

Las funciones de comprobación de las instalaciones de medición y de los sistemas para el registro de datos se podrán realizar por personal autorizado al efecto por el organismo de cuenca. Las funciones específicas de inspección se reservan al personal funcionario de los organismos de cuenca.
Toda manipulación o alteración voluntaria de los sistemas de control efectivo de caudales podrá dar lugar a un expediente sancionador.

Control efectivo en las comunidades de usuarios

Las comunidades de usuarios pueden exigir análogos sistemas de medición y de registro a los comuneros que las integran.

Control en los aprovechamiento de agua existentes

Los titulares de aprovechamientos de agua existentes, presentarán antes del 28 de mayo de 2010 al organismo de cuenca correspondiente una propuesta del sistema de control efectivo a instalar, que cumpla lo establecido en la Orden. El plazo de un año anterior, se extenderá a dos años en los casos de aprovechamientos de agua de caudal máximo autorizado inferior a 4 l/seg (categoría primera) o un consumo anual inferior a 20.000 m3, salvo en el caso de aprovechamientos de acuíferos declarados sobreexplotados o en riesgo de estarlo y en aquellos sistemas de explotación que el organismo de cuenca determine por ser severamente deficitarios. Pasado un plazo de seis meses desde la presentación de la propuesta sin contestación ninguna se entenderá aceptada la propuesta. En el plazo máximo adicional de tres meses a partir, bien de la aprobación de la documentación técnica o bien, tras haber transcurrido el plazo precitado de seis meses, deberá estar instalado y totalmente operativo el sistema de medición propuesto y de registro de las mediciones, debiendo comunicarse al organismo de cuenca la fecha de finalización de la instalación del sistema a efectos de su comprobación.

APPENDIX 2. LEGISLACIÓN DEL AIRE

La Directiva 2008/50, aparece con el fin de responder a la necesidad de una profunda revisión de la normativa relativa a la gestión y evaluación de la calidad del aire ambiente, incorporando los últimos avances sanitarios y científicos, así como la experiencia de los distintos Estados Miembros.

Por motivos de simplificación y eficacia, esta nueva directiva incorpora cuatro directivas anteriores, Directiva 92/62/CE, 99/30/CE, 2000/69/CE, 2002/3/CE y la Decisión 97/101/CE, fusionando toda la legislación en materia de contaminación

atmosférica de partículas (PM10 y PM2.5), plomo, ozono óxidos de nitrógeno, dióxido de azufre, benceno y monóxido de carbono.

Objeto

Se definen y establecen los sistemas y criterios de evaluación de la calidad del aire ambiente, asegurando que esa información se halla a disposición de los ciudadanos.

Se definen los criterios de ubicación de puntos de muestreo así como los métodos de medición de referencia para los distintos parámetros evaluados.

Se especifican **valores límite** para la protección de la salud humana para contaminantes como el PM10, dióxido de azufre, plomo y monóxido de carbono, estableciéndose márgenes de tolerancia, hasta alcanzar un valor límite objetivo en 2010 para el dióxido de nitrógeno y el benceno.

En relación a los umbrales, se establece un **umbral de información y de alerta** para el ozono, y para el dióxido de azufre y dióxido de nitrógeno, umbrales que deberán medirse durante 3 horas consecutivas en lugares representativos de la calidad del aire en un área de al menos 100 km2 o en una zona o aglomeración, si esta última superficie es menor.

Estrategias

Se establecen las directrices y procedimientos para la realización de los Planes de Calidad del aire (tanto a nivel local, regional y nacional) y los Planes de Acción a corto plazo, en caso de superación de los Valores límite u objetivo, o de riesgo de superación de umbrales alerta.

Información y comunicación de datos

La directiva contempla en uno de sus capítulos los mecanismos de información y comunicación de datos, respondiendo a la necesidad de asegurar que la población y organismos y entidades interesadas tengan acceso a la información de calidad del aire, y que de igual forma, existan mecanismos comunes de transmisión de información y comunicación de datos entre los distintos Estados miembros y la Comisión Europea.

Plazos y entrada en vigor

Los Estados miembros deberán incorporar a su derecho interno esta directiva, antes del 11 de junio de 2010.

No obstante, deben asegurarse de poner en marcha, a más tardar el 1 de enero de 2009, el número de estaciones de medición de fondo urbano de exposición a las PM2.5, necesario para calcular el Indicador Medio de Exposición.
Esta directiva entró en vigor el pasado 11 de junio de 2008.

Aplicación de la Directiva en el sector cerámico

Las obligaciones impuestas por esta nueva normativa afectan directamente a las Autoridades y Organismos Competentes de cada Estado Miembro. Ellos son los responsables de realizar el control de la calidad del aire, así como de la coordinación del seguimiento.
Por tanto esta Directiva no impone obligaciones adicionales a las ya existentes para las instalaciones industriales, que generalmente vienen fijadas en las Autorizaciones Ambientales Integradas. Si bien es cierto que en las zonas donde se rebasen los valores objetivo o valores límites de calidad del aire, se prevé, mediante los Planes de Calidad del aire (como el "Plan de Mejora de la Calidad del Aire de la Zona Cerámica de Castellón", aprobado en diciembre de 2008), imponer medidas más restrictivas a las actuales para las instalaciones industriales, tanto en sus emisiones canalizadas como en las emisiones difusas. Entre las medidas adicionales contempladas se encuentra el cese temporal de las actividades industriales.

APPENDIX 3. COMERCIO DE EMISIONES

RESUMEN DIRECTIVA QUE MODIFICACA EL SISTEMA COMUNITARIO DE COMERCIO DE DERECHOS DE EMISIÓN (DIRECTIVA 2003/87/CE) 17 MARZO 2009

La propuesta de Directiva por la que se modifica la Directiva 2003/87/CE, para perfeccionar y ampliar el Régimen Comunitario de Derecho de Emisión de gases de efecto invernadero (GEI), fue presentada por la Comisión europea el 23 de enero de 2008. A partir de ahí se abrió un período intenso de negociaciones, tanto en el Consejo como en el Parlamento, que se ha prolongado durante casi un año. Como hito fundamental de este proceso cabe mencionar el Consejo europeo de 11 y 12 de diciembre de 2008, donde se alcanzó un acuerdo político sobre las cuestiones más relevantes que todavía quedaban abiertas. El pleno del Parlamento europeo votó y aprobó mayoritariamente el paquete el 17 de diciembre de 2008.

A continuación se presenta de forma resumida los elementos principales de los componentes clave de la Directiva de comercio de derechos de emisión:

Ámbito de aplicación (Anexo I)

Se ha modificado la definición correspondiente al sector cerámico, quedando como sigue:

“Instalaciones para la fabricación de productos cerámicos mediante horneado, en particular de tejas, ladrillos, ladrillos refractarios, azulejos, gres cerámico o porcelanas, con una capacidad de producción superior a 75 toneladas por día”., y/o una capacidad de horneado de más de 4 m3 y de más de 300 kg/m3 de densidad de carga por horno

Esto implica que el ámbito de aplicación del sector se amplía considerablemente, ya que todas las plantas de fabricación de baldosas que a día de hoy están afectadas por la IPPC (casi todas), lo estarán también a partir de 2013 por comercio de emisiones.

Los atomizadores y cogeneraciones independientes quedarán afectados en caso de que su potencia térmica instalada supere los 20MW, con la salvedad de que para contabilizar la potencia instalada no se tendrán en cuenta equipos con potencia inferior a 3 MW. Pero en caso de superarse los 20 MW todos los equipos quedaran afectados, incluidos los de menos de 3 MW.

Exclusión voluntaria para pequeñas instalaciones

Se establece la posibilidad de excluir las instalaciones de pequeño tamaño. Se entiende por tal, aquellas cuyas emisiones hayan sido inferiores a 25.000 tCO_2 en los últimos tres años y cuyo umbral de capacidad térmica sea inferior a 35MW.

Las instalaciones que queden excluidas serán sometidas a medidas equivalentes, que serán definidas por cada Estado Miembro, y además deberán establecer un sistema de seguimiento y notificación de la emisiones de CO_2, que permita verificar que la instalación se mantiene por debajo del umbral establecido, y que se consigue la reducción de emisiones establecida.

Las medidas equivalentes que la Directiva nombra a modo de ejemplo son impuestos, acuerdos voluntarios sectoriales, comercio de emisiones nacional,...

Objetivos de reducción

El objetivo de reducción fijado por la Directiva para el año 2020 es del 20% respecto a las emisiones de 1990, y del 30% en caso de que se alcance un acuerdo internacional. En 2050 la reducción debería ser de al menos el 50% respecto a 1990.

Este objetivo se traduce para los sectores afectados en una reducción de las emisiones de gases de efecto invernadero (GEI) para 2020 del 21% respecto a sus emisiones de 2005.

Métodos de asignación

El sector de generación de energía desde 2013 estará sometido a subasta de los derechos, ya que tienen la capacidad de trasladar el coste del CO_2 a sus precios de venta.

En la cogeneración de alta eficiencia es necesario distinguir entre las emisiones procedentes de la generación de electricidad, que estarán sometidas a subasta desde 2013; y las emisiones procedentes de la generación de calor, que podrán recibir asignación gratuita.

Entre los sectores industriales debemos distinguir entre:

- Sectores con riesgo de deslocalización (fuga de carbono o carbon leakage) que recibirán asignación gratuita en base a benchmarkings sectoriales.

- Sectores sin riesgo de deslocalización que tendrán una introducción gradual de la subasta del 20% en 2013 al 70% en 2020. El resto de asignación será gratuita mediante benchmarkings.

Es necesario matizar que la parte de asignación gratuita no corresponderá con el 80% o 100% de las emisiones reales de cada instalación en 2013, sino con la estimación que la Comisión realice en base a los datos de emisiones de 2005-2007.