

HIDDEN COSTS AND DEVELOPMENT OF THE FINISHED PRODUCT WAREHOUSE

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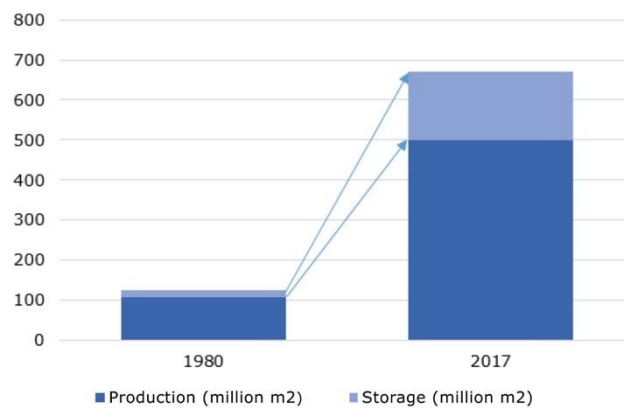
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1. ABSTRACT

The ceramic industry is characterised by rapid technological development in its processes and equipment. Manufacturing with ever more modern and efficient technologies and equipment and the progressive reduction of transport costs and increased demand have resulted in specialised business management companies, which have significant capital and target strong and remote markets.

However, the FINISHED PRODUCT WAREHOUSE has not experienced similar technical and management development. From being just a short wait before the customer collected the finished product and even an annoyance with little impact on the balance sheet, today it is another profit-generating link that culminates in the delivery of the finished product to the client or carrier.

Although in this sense there are already many examples of specifically designed warehouses, with a suitable location adapted to modern working and management methods, this paper seeks to highlight the need for serious, thoughtful attention to the design and operation of the finished product warehouse, its 'hidden' costs and the fact that addressing these issues could provide significant benefits.



Evolution of finished product warehouses vs. manufacturing. Source: own estimations based on sector data.

2. CHARACTERISATION OF FINISHED PRODUCT WAREHOUSES IN CERAMICS

Common to nearly all industrial sectors, all finished product warehouses in the industrial ceramic sector face short delivery times, very variable order volumes, extensive catalogues and constant design changes. In addition, small volume orders of various models are becoming increasingly frequent, requiring the implementation of methods for splitting up loading units.

In general terms, finished product warehouses in the industrial ceramic sector are characterised by being:

- **Company-owned:** Finished product warehouses are always company-owned as an additional section to production. However, in the quest for profitability, this way of thinking develops into renting-leasing from a specialised organisation with greater economies of scale.
- **Finished product warehouses:** These are warehouses exclusively used for the finished product and their functions are those of a permanent warehouse, for regulation and loading/distribution. They also share sale functions for special products and trims.
- **Open-air stores:** This is the most common type, resulting from the need to store more and more products without having sufficient available surface area. It is defined by block storage and the use of conventional forklifts. The products deteriorate and degrade due to weather conditions.
- **Covered warehouses:** They are a complement for storing products with higher-value, which are special, or for housing operations like picking. They are defined by block storage shared with pallet racking, and use of conventional forklifts and/or reach trucks. They offer complete protection to the materials stored there and mitigate changes in conditions such as temperature, relative humidity, etc.
- **Automated warehouses or standalone silos:** They constitute the highest technical expression applied to logistics for finished product warehouses.

Despite the high capital outlay, their operating costs for moving loading units are the lowest.

In finished product warehouses, the operations that take place are as follows:

- Inventory.
- Load consolidation.
- Preparation of orders-picking (ever more important).
- Packaging.
- Labelling.
- Issue of delivery notes.

And their functional areas are:

- Loading bays and manoeuvring areas.
- Receipt and returns area.
- Finished product and empty pallet storage.
- Picking and order preparation.
- Dispatch area, scales and checking.
- Offices, services and maintenance.

3. FINANCIAL IMPORTANCE OF FINISHED PRODUCT WAREHOUSES

Frozen capital, investments in fixed assets and the costs, both direct and indirect, of managing and handling the LOADING UNITS-PALLETS, are an important part of the industrial and structural costs. For an organisation in the industrial ceramic sector, reducing these and keeping the inventory turnover rate as high as possible would be a COMPETITIVE ADVANTAGE over their competitors.

The finished product warehouse is the link in the value chain that coordinates manufacturing and sales. Therefore, in order to allow a reasonable delivery term, their storage capacity is in the region of four months relating to the company's annual sales, therefore assuming three annual inventory turnovers.

With production for the whole Spanish industrial ceramic sector estimated for the 2017 fiscal year at 500 million m² per year, the stored finished product could amount to about 165 million m². At an average sale price of €7/m², the frozen capital amounts to €1,155 million, truly excessively large tangible fixed assets.

Consequently, vast amounts of economic resources are permanently frozen and, in too many cases, stored in wind and weather. For premium products or those with high added value, the realisable asset "FINISHED PRODUCT WAREHOUSE" (for 10 million m²/year ≈ €40 million) exceeds the investment in production factors.

Therefore, finished product warehouses must be rigorously designed, introducing the most efficient logistics techniques and seeking to reduce their direct and indirect costs.

4. HIDDEN COSTS OF THE FINISHED PRODUCT WAREHOUSE

The amortisation costs of buildings, construction works and facilities is easy to determine with recognised, standard accounting criteria. In addition, the time that a product spends in the finished product warehouse until it is dispatched will directly determine the assignable cost for this item.

Monitoring of the direct costs for the workforce, work equipment, energy and fuels, maintenance and general applicable expenses is also within reach of all companies with appropriate administration and control.

However, in a ceramic finished product warehouse there are also hidden costs, hidden as they are not often named, albeit evident, which are not broken down in the operating account, despite their causing inefficiencies, harm to the corporate image and economic losses. These hidden costs must be found, quantified and strictly controlled.

4.1. ERRORS

In a ceramic company, with hundreds of products in its catalogue and the need to consider different shades and calibres for the same model as well as to continuously renew its range, the references in the finished product warehouse rise into the thousands.

Even with the help of applied software, conventional management of such volumes of data and of the multiple factors acting upon the finished product warehouse leads to errors when:

- 1) organising products owing to misunderstandings on positioning the loading unit.
 - CONSEQUENCES:
 - unnecessarily prolonging the time to locate a model
 - misplacing models that are listed on the inventory but cannot be found
- 2) loading orders onto the carrier (lorry, platform, ...)
 - CONSEQUENCES:
 - claims from the buyer (discounts, non-payments, ...)
 - returns (inverse logistics) and forwarding the correct product, misplacing models listed on the inventory but that cannot be found

4.2. EXCESSIVE DISTANCES TRAVELLED

A finished product warehouse for an average ceramic company (30,000 m²/day) with cubic stacks at ground level needs a surface area of 55,000 m², to which must be added 15,000 m² for loading, picking and complementary services with a total of 70,000 m².

As most industrial grounds do not have this surface area and appropriate shape, the distances travelled to position the incoming products and to collect those for loading are excessive.

For the company mentioned, the loading units (pallets) handled in a year amount to about 180,000 and 90,000 kilometres travelled by self-propelled trucks, both in stacking products as well as in collecting and loading them onto lorries in the shipping area.

As a result, the line of reasoning must be uprooted according to which the key lies in covering the ground with production equipment. The finished product warehouse must also be designed in a controlled area, with the equipment and facilities that enable it to operate at the lowest cost.

4.3. WASTE AND BREAKAGES

In the industrial ceramic sector, only a few companies have automated warehouses: the movement of loading units is performed by conventional diesel or electrical self-propelled trucks with metal forks supported by metal frames.

Despite operators working carefully, the forks or frames frequently hit the wooden pallets and boxes of products. This results in breakages of the pallets and of the boxes of ceramic products.

The greatest harm is caused by the fact that such breakages are not evident, with broken pallets making stacking dangerous and broken products resulting in significant losses and justified customer complaints.

In the same sense are also to be considered the knocks caused by picking up the loading unit during manufacture, placing it on the stacks or on the floor, setting it on the lorry platform and by the jolting of the forklift in its movements across floors in poor shape.

These knocks by operator inaccuracies, defects in lorries, potholes or obstacles on the floor, etc., result in tears in the covers and in the cardboard boxes and cracks in the ceramic pieces involved. If not detected in time, costs due to claims, discounts and inverse logistics increase.

4.4 DETERIORATION, DIRT AND TORN PACKAGING

The most common finished product warehouse is an open-air store with pallets stacked on top of each other at ground level (cubic stacking). In this set-up, the loading units are exposed to the action of weathering agents: sun, heat, cold, rain and wind.

In many cases in these types of outdoor storage, covers have been developed for the loading units to stiffen the boxes in their position, stopping them from collapsing and, to a certain point, protecting the cardboard from the weathering mentioned. Some of these even include coloured components that lower the impact of UV rays.

Despite these precautions, after just a few months in wind and weather, dirt is deposited on the covers, puddles form on the top and the deterioration of this external protection becomes noticeable. This phenomenon sometimes forces the sale price to be reduced or the product to be remaindered.

But the most serious issue, from the first day of outdoor storage, is the humidity inside the covers. However airtight the covers may be, when the sun heats the top and side loading units, this effect is unavoidable: the large heating capacity of ceramics makes the temperature and humidity of the air trapped inside the cover increase.

At night, during temperature changes or rain, the ceramics temperature is maintained, but that of the cover drops and the humidity in the trapped air is reduced; this is deposited in the form of droplets on the inner surface of the cover and wets the adjacent cardboard box.

Successive cycles of sunlight and night and variations in humidity end up breaking up the cardboard, dispersing the ink, staining the box and ultimately destroying it, also causing instability in the boxes on the pallet. The ultimate result is product downgrading and costs from breaking up the stacks and disposing of the remains at a landfill.

4.5. OBSOLESCENCE OF MODELS

In the industrial ceramic sector, on responding to continuous technological improvements, to new and better applications in ceramics and to the inevitable impact of aesthetic trends, new models are constantly being introduced. In most cases, this implies loss of value of the existing unsold products.

This phenomenon is not attributable to the finished product warehouse, but it does add to the fact that unsold products can spend significant time outdoors. The loss, i.e. the hidden cost, is therefore greater because on being an obsolete material and having a damaged appearance and packaging, it practically becomes waste.

4.6. THE COSTS OF PICKING ON PACKAGING

In picking operations, loading units are taken from the warehouse and disassembled to withdraw one or more boxes. These are placed on an empty pallet and more references from other loading units are added until the order is completed.

The result is that several loading units have been opened and must be returned to the finished product warehouse, with new covers being placed over them. Set in a row, these loading units do not allow others to be placed on top of them, resulting in increased costs for unnecessary covers and in the store surface area being occupied by just a single pallet.

The best arrangement to reduce these costs and repeated truck movements, is to set the open loading units on metallic racks in a covered area, so that they need not be protected by a new cover and all the surface area-volume of the area is occupied.

5. ESTIMATION OF THE HIDDEN COSTS OF THE FINISHED PRODUCT WAREHOUSE

There are no verified references regarding what the hidden costs may mean for the operating account of a ceramic finished product warehouse. Nevertheless, based on the experiences of many warehouses and on the quantification of the problems observed with deteriorated loading units, wasted time in search of a gap for loading units from production and for shipping, scrap from broken material and broken pallets, an approximate reference figure has been established.

This figure considers the effects of the hidden costs set out above and refers them to the value of the stored finished product. It does not include the conventional operating costs (amortisations, staff, overheads, energy...) belonging to a warehouse in general, as these are always produced, whether or not there are hidden costs.

Nor does it include the more arbitrary concepts such as the poor image that a finished product warehouse may convey with many dirty or broken loading units, or the effect of customer complaints due to errors with the loads.

In short, it was established that the hidden costs in an open-air store are about 7 to 10% of the cost of the stored material, or between 2.5 and 3.5% of the cost of the material produced in a year. The differences stem from better or worse flooring, lighting, good or poor design of the routes travelled and attention by the operators, among others.

In a fully covered finished product warehouse, the hidden costs due to atmospheric conditions and dirt practically disappear, thus off-setting the greater investment required to cover all the stockpiles and improving the image of the ceramic company and of the product when it is delivered, clean and without packaging defects, to customers.

An automated warehouse implies a very high investment in highly technological equipment, but needs much less surface area, reduces labour costs and avoids practically all hidden costs. Thus, the total real operating costs will be comparable to those of conventional warehouses.

The best finished product warehouse for a ceramic company is defined as having a balanced combination of automated storage for open loading units or those with a long inventory turnover, covered store for discrete inventory turnovers and outdoor storage solely for products for immediate delivery.

Picking should be entrusted exclusively to the automated warehouse feed and emptying equipment and container loading should be carried out without a ramp and only at the same level as the vehicle body.

Management of loading unit positions and of order preparation and picking needs to be entirely computerized, integrated with sales and production and with the automated warehouse, using radio communication systems for stockpiling on the floor, moving to the loading bays and pallet receipt.

6. UPDATED CONCEPTS OF THE FINISHED PRODUCT WAREHOUSE

As a result of rapid production growth, the demand for faster and higher-quality manufacturing, pursuit of the technical, commercial and aesthetic trends laid down by specifications writers and increasing market penetration, optimisation of the finished product warehouse as production factor was relegated to second place.

However, the greater demand for quality in service, appearance and packaging finish and the defence of competitiveness in the industrial ceramic sector make it necessary to improve finished product warehouses, as an important part of the value chain, with advanced organisational criteria.

The finished product warehouse, so critical in the cost structure of the industrial ceramic sector, contributes to the corporate image of quality and excellence (good will). Well-integrated in the organisation, it shortens delivery time (sales function), allows series to be extended (production function) and optimises invested capital (financial function).

In a finished product warehouse, the definition, mentality and quality of management will be a function of the size and strategic positioning of the company: COST LEADER, DIFFERENTIATED or FOCUSED. It varies from a simple open space in small factories, to several hectares in big companies with covered loading units, combining cubic stacking on the floor with automated storage silos on tall racks and powerful management programs.

Ceramic finished product warehouses have developed from a traditional concept of ordering and stacking, as judged by the operator in charge, to a concept of automated 'on-line' management between sales-production-storage-orders. Based on traceability and digitalisation, the finished product warehouse must be integrated into the environment of what is known as INDUSTRY 4.0.

7. CONCLUSION

Synchronised with the company's strategic plan, operational research designs the finished product warehouse/logistics function, for the various organisations determining:

- content (location, occupied surface area and floor or rack ordering methods, automated silo)
- admissible loading units (Europallets, for slabs/flat stones, ...)
- dedicated resources and techniques (staff, handling methods, equipment and platforms for loading, ...)
- management system (independent, related, integrated, ...)
- development programme, investment and funding needs
- growth potential that will follow that of the company

Finally, the trend must be highlighted of entrusting inventory management, order preparation, certain packagings and labellings and the issue of delivery notes and loading orders, to logistics platforms that, with a greater economy of scale, can help their corporate clients reduce costs of the store function.