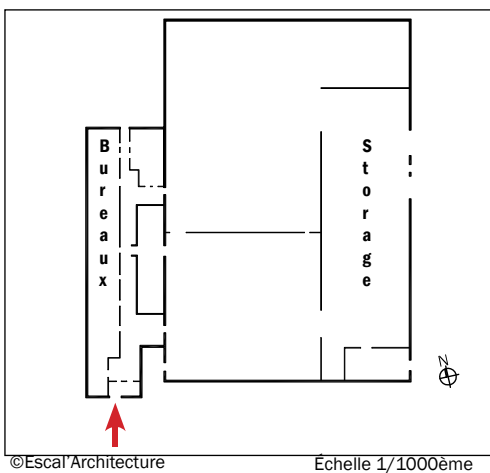




CASE STUDY

# CARTOFFSET, France



Cartoffset is located in the west of France close to the city of Nantes. It was created in 1974 and has evolved from publishing and communication printing to the production, conversion and personalisation of compact cartons. The company's customers are mostly also located in the west of France and include agricultural, food, pharmaceutical and other industrial manufacturers. Cartoffset is a specialist in UV sheetfed printing with 2 presses completed by finishing that includes die-cutting, lamination, hot folding and folder-gluing. They employ a staff of 45.

Continuing growth created a need for more space to develop the carton converting business and they looked for a new site in 2007. However, because there were no suitable buildings available, they decided to construct their own new building on a new site.

The management's priority from the beginning of the project was to deliver a long-term vision of technical and financial conditions. The environmental dimension has been integrated into numerous facets of the project. For example, the using thermal inertia of raw concrete for internal walls, installing an adiabatic thermodynamic acclimatisation system in the workshop, the effective insulation of the external walls and roof. The project was accompanied by an architect and a company that co-ordinated the construction.

Cartoffset considers its new site an excellent showplace for their customers and a source of staff motivation. The exterior aspect of the building is particularly impressive. The conclusion of the project is that the company has a new functional building, with reduced operating costs and a lighter environmental footprint, combined in a high quality aesthetic format.

## THE COMPANY (WWW.CARTOFFSET.COM)

<b>Printing processes used at the site</b>	2 Manroland UV Offset Sheetfed presses
<b>Tonnage of substrate processed</b>	2500 tonnes of carton board, 500 tonnes of paper, 500 tonnes PET/PVC.
<b>Products</b>	Packaging (agricultural, food, pharmaceutical, industry), communication printing and covers for school binders.
<b>Number of staff</b>	45
<b>Annual sales target</b>	6,5 M€
<b>Environmental certifications</b>	mprim Vert, CoC PEFC



## THE SITE

<b>Location</b>	France in region of the Loire.
<b>Climatic zone</b>	Temperate - Oceanic
<b>Installation zone</b>	New greenfield industrial area
<b>Existing risks (seismic, flooding) or specific environmental constraints</b>	None
<b>Year of construction</b>	New construction - 2009
<b>Total surface of the site</b>	22 000 m <sup>2</sup>
<b>Total surface of the building</b>	3700 m <sup>2</sup> (1 level)
<b>Structure</b>	The office building is in concrete. The roofing structure uses metal beams that support a roof of steel boxes covered by a white reflective PVC membrane – recommended to help counter global warming. The high ceilings were not a functional need of Cartoffset but specified to allow flexibility of future activities other than printing.
<b>Flooring</b>	To ensure the homogeneity of the foundation pad and for economic reasons, the company made 4 places with a much higher resistance to take presses, two of which are currently used. The entire pad is finished in a smooth brushed concrete.

## THE PARTICIPANTS IN THE PROJET

### The president

Fabrice SORIN



#### What do you identify as the key success factors of the project?

- The first success factor is to consider the future functioning of the building – a global vision of its operations is imperative.

It is very important how the project team is organised. For example, the architect that we selected considered that supervising the construction was outside his domain, so we appointed a co-ordinating company who managed the contracting process and helped in choice of suppliers.

It is also important to question the solutions currently used. For example, the insulation is applied to the outside of the walls and not the interior because this is much more efficient, for aesthetic reasons we chose black as the colour of the exterior walls.

#### What would you change if you started again?

- We would reconsider certain points relative to the internal organisation of the production areas. For example, increasing the intermediate storage zones because carton printing needs much more space than paper printing – there are 75% less sheets of carton on a pallet compared to paper. We would also look at the internal aisle layout between the machines.

In a more general sense, we would like to better understand the evolutions of our activity.

### The architect

**Topos** architecture

TOPOS Architecture/ Thomas BONNIER

#### What do you identify as the key success factors of the project?

- This project consisted of a large production area with significant constraints from the printing process, an office area for reception, management, sales and administration, and social activities. The work of the architect began with the resolution of the challenge of the volume while anticipating scenarios of later extensions and a division of the site.

- Concerning the building, the choice of simplicity quickly bought the support of the general contractor. The functional aspects are shown without any cosmetic treatment. Unity is provided by the colour black that both signalled the image of the printer and underlined a strong identity.

- Work on energy efficiency is particularly evident in the office area that features external wall insulation, window solar protection, and thermal inertia that have permitted a significant reduction in energy consumption.

#### How do you perceive the performance from the new building?

Function	Poor	Moderate	Good	Excellent
Better temperature humidity & dust conditions			X	
More stable production & storage conditions			X	
Improved productivity			X	
Reduced energy consumption & costs of building			X	
Better and lower cost lighting day/night		X		
Reduced water consumption		X		
Improved waste management			X	
Reduced contamination liability and risk			X	
Reduced noise disturbance			X	
Healthier & stimulating place to work			X	
Image to customers				X
Flexible & future-proofed assets				X
lower lifetime operating costs of building			X	
Overall sustainable environmental profile				X

## PROJECT CONCEPTION/ SUSTAINABLE CONSTRUCTION

<b>Origin of construction/reorganisation</b>	The origin of the project was the need for more space due to the evolution of the company and its growth. The switch from communication printing on paper to carton board packaging substantially increases the surface area required for production and storage. While the delivery delay for supplying paper is short, for carton it is usually 3 weeks from time of order to delivery requiring more stock to be held. As a result the company has more than doubled the area of its previous building (1500m <sup>2</sup> to 3700m <sup>2</sup> ), and an extension project is under consideration. No suitable existing building was available and this led to a rapid decision to construct a new factory. Owning a new building was also preferred to renting one for heritage reasons.
<b>Motivation for an ecological construction</b>	The primary motivation was the convictions of the manager: "If efforts need to be made for the environment, they need to be made." The second reason was to optimise the future operating costs of the building over the long term. Finally, from a commercial point of view the company wanted to communicate on its reduction of energy consumption.
<b>Project organisation</b>	Tandem of an architect and a co-ordinating company to manage the contracting selection process of multiple suppliers.
<b>Planning</b>	Early 2007 – Start of consideration of a construction project. August 2008 – Purchase of the ground. September 2008 – Start of construction. July 2009 – Transfer of company to new site
<b>Cost of works (excluding investment in production)</b>	Total cost 2,5M€ including cost of ground, but excluding investment in production equipment.
<b>Durable construction cost</b>	Estimated at about 15% over a conventional building.
<b>Direct and indirect impact on the production</b>	The better workflow has had a positive impact on productivity. Separating activities (like offices, prepress and production) has created better working conditions. The common open-space area between production management and prepress has improved their communication and working efficiency.
<b>Principal sustainable characteristics – pillars for HQE®</b>	1.- Exterior insulation of walls 2 - Geothermal office heating (horizontal) 3 - Use of the thermal inertia of the concrete construction to cool or heat the building depending on the season. The internal walls are left as raw concrete to provide heat transfer of energy accumulated during the night. 4 - The adiabatic thermodynamic cooling system of the printing hall.
<b>Public or private financial aid</b>	None.

## WATER

### Supply

There are two water supply networks – one for drinking water and the other for harvested rainwater. The only industrial waste liquid is rinsing water for plates that is disposed of in the community drainage system. Used developer and dampening solution are treated as dangerous waste.

### Reduction actions

The new water cooling system for UV machines features a closed circuit that has replaced the open system at the previous site. However, the adiabatic cooling system has increased water consumption because for health reasons (risk of Legionnaire's disease) the system is purged and completely regenerated hourly.

## ENERGY



### Consumption

Electricity is the only energy consumed at the site. Annual consumption is 930 770 kWh, about 1,5% of turnover.

Consumption sources include: Production equipment, heat pump connected to horizontal geothermal system used to heat the offices and Air conditioning in CTP and IT centres. Adiabatic system and centralised compressor system along with a back-up for maintenance. Automatic trimmed waste extraction system and associated compactor. Water cooling of UV curing units.

### Estimation of need

Electrical draw data from suppliers is only for maximum power. To better determine the electrical power needed, the company made a series of measures over 5 to 10 days at its old site, by installing captors on machines to measure consumption and identify peaks. The installed power estimate was made by doubling the value of the maximum peak.

Another over dimensioning was the transformer that was considered as a long term investment over 15-20 years. While today's requirement was estimated at 350kVA, the installed transformer was 800kVA. This company sees the additional investment costs as the right balance of a long term view, and the nature of the electricity supply contract.

### Reduction actions

Compared to the previous building:

An important energy reduction is that workshops are refreshed with a rooftop adiabatic system that replaced air conditioning at the previous building. The horizontal geothermal system linked to a heat pump has proved to be very efficient.

The combination of thermal inertia of raw concrete interior walls with insulation on the outside of external walls has led to an overall energy reduction.

The UV curing systems are an important source of energy consumption, however, a LED system cannot be installed because of printing on PVC substrates. To minimise reactive energy consumption costs, the company has installed a battery of condensers that should provide an ROI estimated to be less than 2 years.

### Monitoring

Monthly monitoring of energy consumption is made. A procedure to check the compressed air supply system for leaks was also introduced.

## LIGHTING



### Types of lighting

The press hall has no natural lighting for production constraints of UV printing and colour management, and minimise temperature variations. In the finishing hall there are large window areas, and skylights in the warehouse.

### Reduction actions

None.

## CIRCULATION

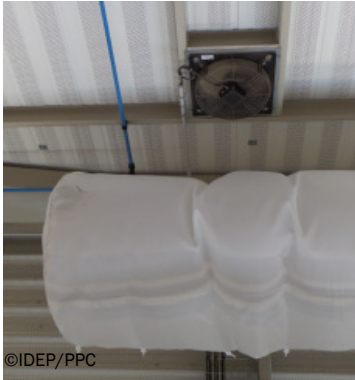


### Organisation

Material handling uses a combination of electric lift and manual pallet trucks. Incoming goods are handled at loading bays, lifting platforms and trucks are used for deliveries.

### Optimisation actions

The additional space in the new building has helped optimise materials workflow. To improve ergonomic working conditions the company has installed lifting tables to avoid staff bending down, automated peripheral systems for the guillotine, and pile turners.



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### Ventilation & heating control

Only the IT and CTP areas are air conditioned. The offices are over-ventilated at night using a double flow system to refresh the raw concrete interior walls that then reintroduce this cool air during the day. In winter this zone is heated with ceiling tiles that radiate heat generated from the heat pump connected to a geothermal system.

The production areas are refreshed by a roof top adiabatic system that reduces the internal air temperature 7-9°C below that of the exterior.

The heat generated by the two presses is adequate to heat the press room in winter. A portion of this heat is transferred to the finishing area by 2 fans in the separation wall. Radiant heaters are only occasionally used on cold Monday mornings before production starts.

A central air treatment system (conforming to ATEX standards to avoid dust explosion) limits heat loss from the automatic trim waste extraction system. This filters and reintroduces air back into the building using textile ducting "socks" to minimise heat loss and provide a constant air pressure.

De-stratification devices help provide a constant temperature at all heights in the finishing workshop.

Ozone from the UV curing systems is evacuated to the outside.

### Indoor air quality control

The company rigorously selects chemical products (cleaning solvents, dampening additives, no ISP alcohol) to minimise chemical emission at the source. In addition, extraction systems regularly renew the internal air.

### Humidity and dust

In the summer the humidity of the press room is controlled by the adiabatic system. UV printing uses no powder spray.

### Noise reduction actions in the work areas

The folding zones represents about 25% of the production area and is a major noise source. The ceilings in this area integrate structured steel phonic boxes to absorb machine-generated noise.

Centralised air compression system installed outside the workshop (in the warehouse) reduces noise.

## FIRE SAFETY

### DANGEROUS MATERIALS / WASTE



#### Sorting of waste at the site

The company applies regulation sorting of dangerous and ordinary waste.

#### Equipment to minimise accidental pollution

All dangerous liquids and waste are stored with retention devices.

#### Waste collection conditions

Dampening solution and solvents are collected in 200 l barrels. All liquids waste is stored in a separate area with retention devices. Next to the die-cutters are waste suction heads to evacuate trim manually or automatically.

#### Fire protection/ Definition of needs

The project architect defined the company's fire protection needs. This includes a central alarm, smoke detection network, alarm points (RIA) connected to an independent circuit with automatic door closure and operation of smoke evacuation devices, sprinkler systems and retention of extinguishing water. Each year an external company controls these precautions and issues the insurance company a conformity certificate.

#### Fire protection equipment

The company does not have its own water reserve for fire, there is no automatic extinction system. Local administration required no retention system for water used for fire fighting.

## LANDSCAPE/ BIODIVERSITY



#### Landscape integration

The walls of the building are all black which is a differentiated aesthetic choice to project a modern design image while conserving its industrial character. In spite of this original choice the building integrates perfectly with the surrounding roads and the adjoining agricultural zone.

#### Green spaces

About 15000 m<sup>2</sup> of the land area is planted with grass. Zones next to the parking and entrance are planted with bushes and floral beds. The ocean climate provides frequent rain to guarantee good growth with little artificial watering.