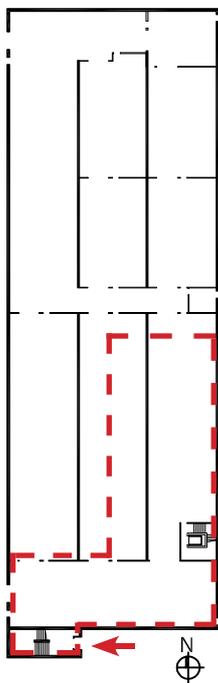
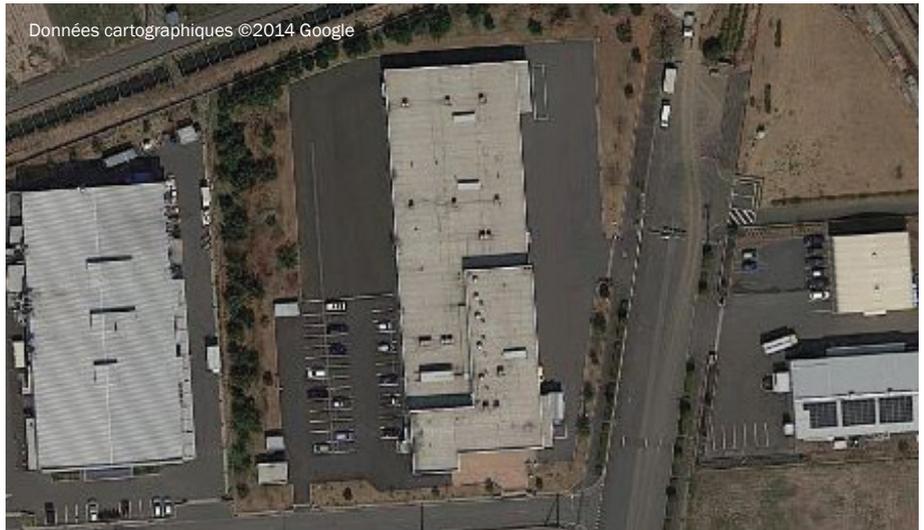




CASE STUDY

SHIMIZU, Japan



1st floor
Offices - Lockers - Cafeteria - Storage
©Escal'Architecture

Scale 1/1000ème

Shimizu Printing is a world leader in waterless UV high definition printing to produce cosmetic and commodity packaging on paper and plastic substrates. They are also pro-active in optimizing the environmental impact for their entire production process.

The company decided to construct a larger new factory to implement the change of its business focus toward packaging, for which its previous city centre location was unsuitable. The new site is 80km from Tokyo and near the company founder's birthplace that is a site of ancestral importance (grandfather of the current CEO). In addition, most of the staff now live within a 10-minute drive from the new site, and no longer commute on overcrowded trains.

The new factory combines the best properties for efficient manufacturing while also creating a showplace for sales activities to attract new clients. Eco-friendly construction was a key design factor to correspond to the company's environmentally efficient manufacturing and to reduce overall energy consumption and costs. Good temperature and humidity control are key factors for waterless UV printing to ensure quality, productivity, and to prevent substrate distortion. This is achieved by placing each machine in a separate enclosure to maintain the optimum conditions specific to different substrates. There are no peripherals in the press rooms to avoid heat and noise from pumps, compressors and water-cooled chiller. This significantly improves air conditioning efficiency, optimizes energy use and the carbon footprint. The individual production cells also allows different customers to be independently present for quality checks at the same time.

Seismic and cyclone risks also define the design. The special structured has 170 foundation piles supporting the concrete floor of the entire building and the roof is covered by concrete and protected by lightning rods.

THE COMPANY (WWW.SHZPP.CO.JP)

Printing processes used at the site	3 waterless UV sheetfed offset presses 740 x 1020 mm (5-colour+coater, 7-colour+coater, 10-colour+coater+perfecting).
Tonnage of substrate processed	1650 tonnes/year –1300 tonnes paper, 350 tonnes plastic (PP, PET)
Products	Cosmetic packaging (paper/plastic). Commodity packaging (plastic). Plastic panels for games machines.
Number of staff	35
Environmental certifications	FSC, ISO14001, CoC FSC
Other certifications (ISO9001, ISO12647...)	<ul style="list-style-type: none"> • “UV Waterless High definition Printing Method”, 2011 Encouragement Prize from Japanese Society of Printing Science and Technology. • “Establishment Of Quantitative Assessment For Printing Service”. 2010 Best Paper from Japanese Society of Printing Science and Technology. • “Establishment Of Printing Service LCA To Propose Environmental-Conscious Solution”, 2010 Chairman’s award (2nd best) from 6th LCA Japan Forum.



THE SITE

Location	Gunma prefecture, Japan (80km from centre of Tokyo).
Climatic zone	Temperate – with high summer temperatures.
Installation zone	Industrial zone.
Existing risks (seismic, flooding) or specific environmental constraints	Earthquake, gale force wind in winter, typhoons
Year of construction	New construction - 2007
Total surface of the site	10 910 m ²
Total surface of the building	3 763m ² (2 levels) - 300 m ² for paper storage surface area + 664 m ² for work in progress storage area.
Structure	Special structure has 170 foundation piles supporting the concrete floor. The walls and roof uses pre-fabricated concrete structural panels with a tectonic finish. The roof is protected by lightning rods. The lower half of walls are concrete, with the upper walls in laminated board with polystyrene insulation.
Flooring	Cast concrete with a maximum load intensity of about 6t/m ² to support 120+ tonne 10-colour press. The floor has a multiple layer painted finish.

THE PARTICIPANTS IN THE PROJECT

President of the company

Dr. Hirokazu SHIMIZU



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

- The project began with the strong idea to provide the best production environment for UV production as core facilities, including the capacity to install long presses.
- Separate walled cells for each of the core printing and die-cutting machines allows individual control of their environment as paper and plastic substrates need different temperature and humidity conditions for optimum production
- Separated rooms also enhance customer satisfaction because the can independently host different print buyers for quality checks at the same time.
- All peripheral equipment (pumps, compressors, water cooled chillers) are located outside the press cells to avoids their related temperature variations. This optimizes air conditioning efficiency and reduces noise level in the press rooms.
- Development of trusting relationships between our factory managers, equipment suppliers and the construction company allowed them to work very closely to achieve the final goal.

The architect - Builder

Nagura Co. Ltd.

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

- The client clearly defined their primary design concept at the beginning of the project was to produce the best printing quality – it was then not so difficult to convert their exacting goals into tangible form.
- Their focus on combining the best quality for special printing, along with eco friendly efficiency, allows them passionate and dual directional communication.

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

Origin of construction/reorganisation.	The previous site was located in the centre of Tokyo and surrounded by high-rise apartments and office buildings and the co-existence with a factory was not easy. It was also too small to allow a change of business focus to packaging – that included installing a new long press for special UV printing. We needed a new building that combined the best properties of a manufacturing centre while also providing an exhibition area for sales activities to attract new clients. We finally found a site of ancestral importance that is near the birthplace of our founder (grandfather of current CEO).
Motivation for an ecological construction	An eco-friendly construction was one of the key factors for the building design since our business concerns responsible manufacturing, e.g. waterless printing to reduce water use, high definition printing to reduce ink consumption, carbon footprint evaluation to lower environmental impact and so on. Energy reduction related to eco-friendly issues was a preferred consideration for both environmentally conscious manufacturing and cost savings.
Project organisation	The project concept was originated by the CEO and implemented by the Nagura construction company who have been a sole supplier to Shimizu because they have a good track record for construction of our other buildings over 60 years.
Planning	During the first year we examined 10 sites to find the best geographical environment to meet the project’s objectives. During the next 10 months, the building design was developed from the specifications of new production facilities – UV presses, die-cutters and gluers. The construction took around 9 months – a bit longer than for a conventional building because of the “more than enough” construction approach for heavy printing machines.
Cost of works (excluding investment in production)	Total cost for building the new factory was around 5.5 M €, including 2 M € for the site.
Durable construction cost	Estimated eco-friendly specification costs about 30% more than for a conventional construction.
Direct and indirect impact on the production	Maintaining optimum temperature and humidity for UV printing with smooth non-stop feeding on a range substrates delivers superb printing quality and productivity. In addition, most employees live within a 10-minute drive from the factory to avoid them commuting in overcrowded trains that triggers fatigue, this minimises severe mental and physical stress at work.
Principal sustainable characteristics – pillars for HQE®	The separate enclosures for each core production facility helps reduce energy consumption and related green house gas emissions and is fundamental for high quality printing. Locating the press peripherals (pumps, compressors and chillers) to a separate room further stabilises production conditions.
Public or private financial aid	No financial aid was applied for the project.

WATER



Supply

Water is supplied by local authorities from a local filtration plant.
Rainwater from the roof is collected into a large basement tank for fire control.

Reduction actions

UV waterless printing reduces water consumption because there is no dampening system.
Drained water is collected and filtered by 4-level purifying tanks to lower its pollution level to allow discharge to the river.
The CTP developer has a liquid compression device (strong alkali) to reduce its waste to 12,5% of total volume and returns 87,5% of filtered water back to the developer this drastically reduces both prepress water consumption and liquid waste disposal. The company is implanted in one of the hottest zones in Japan.
The air conditioning units are cooled with a water spray. To limit consumption, the cooling system uses fine water drops for two hours per day.

ENERGY

Consumption

Annual electricity consumption is 1 280 000 kWh. Electricity is the primary energy supply, no gas is used. Total energy cost is 3,5% of turnover. Principal sources of consumption are:

- Production equipment and Air conditioning units
- Office and workshop heating (by electricity)
- Central compressed air system
- Electric lift trucks

Estimation of need

Energy need was estimated from the base of past consumption.

Reduction actions

Electricity costs in Japan surged after the Fukushima tsunami closed down most nuclear power plants. Therefore “visualization” of electricity use is a key to reduce electricity cost. Electricity monitoring devices measure rated outputs and load factors of all production facilities including peripherals. This allows peak energy (kW) and consumption (kWh) to be estimated and forecast by looking at the production schedule and operational status of facilities.

UV curing devices have a much higher electricity consumption than conventional presses. Consumption is regularly checked by measuring the exact amount of electricity needed to cure UV inks at the lowest energy.

Monitoring

A web camera in the high voltage receiving facility transmits current use to a server that managers can access on their PC, tablet or smart phone. The monitoring device software calculates forecast and actual kW and kWh. It sends an alert e-mail if electricity use overruns target value that is usually set lower than that of the same day the previous year.

LIGHTING



ネットワークカメラを用いて電力計を撮影
Web camera takes shots of numbers displaying energy consumption status

OpenCVを用いた画像認識で消費電力の変化を数値データ化

数値データ化処理



0.053 0.086 0.061 0.018



PCやスマホでグラフ表示
アラートメール送信
Current energy consumption can be seen on iPhone, iPad and PC



Types of lighting

Most windows in the production area are blacked out to avoid degradation of UV print quality and curing by daylight. Special colour temperature lights are used in the press rooms.

Reduction actions

Infrequently used areas have either about 20% less light fittings or sensor equipped lighting reacts to workers' presence in certain areas to avoid permanent lighting.

CIRCULATION



Organisation

Three electric lift trucks in the building handle substrates, finished products and related materials. No docks are used – two pallet trucks at the entrance provide loading and unloading.

Optimization actions

All lift trucks are adjusted to avoid exceeding speed limits for safe material handling. The building shape is a long horizontal long to optimise material flow in one direction with a strictly fixed sequence from unloading substrates, to printing, die-cutting, packaging, and loading finished products.

Traffic flow and parking

Capacity for 50 cars in west parking lot and 6 large trucks in east parking lot.



AIR QUALITY/ NOISE



Ventilation & heating control

Each UV press has an air ventilation systems for its curing system; main air ventilation (60 m³/minute) is mounted on each press to extract air inside the press delivery; each UV lamp housing has a smaller air ventilation systems (15 m³/minute); each production room has air ventilators at both ends of the room to frequently circulate and refresh the entire air of the room

Indoor air quality control

Solvents use is minimised and only a cleaning agent is used for UV ink, no other solvents (e.g. IPA) are allowed in the building. Cleaning detergent for UV inks is programmed to minimise the amount used for each press.

Constraint of particles (clean room : contamination . . .)

Humidifying systems in production zones help stabilize substrates condition so that they can be correctly handled. UV eliminates powder in press delivery.

Noise reduction actions in the work areas

The best way to reduce noise is to place its sources away from production facilities to more effectively control them in one location. Sound absorption materials are used in the machine rooms of the elevator, and the peripherals room to lower heat and noise – nobody can hear any noise in the CTP room next door.

FIRE SAFETY

DANGEROUS MATERIALS / WASTE



Sorting of waste at the site



Unsafe waste —such as liquid waste from printing plate developer, empty UV ink containers, used non-woven fabrics for blanket cleaning, and used UV lamps — are separated from normal waste and disposed according to environmental regulations. A crushing machine compresses metal ink cans, while plastic ones are collected by ink manufacturers for recycling. No UV ink remains in the containers since it does not dry by oxidation.

Equipment to minimise accidental pollution (retention)

All unsafe wastes are collected and concentrated in one place that is located at the edge of the building separate from production areas.

Waste collection conditions

Waste liquid is collected in 200 litre containers. The company does not have a trim waste extraction system

Fire protection/ Definition of needs

Regulations requires a smoke exhaustion system that opens windows in seconds after a fire starts to avert smoke asphyxiation — all production rooms have semi-automatic window opening systems.

Fire protection equipment

There is no automatic extinction system (sprinkler sprays). Only the pressrooms have carbon dioxide extinguishers to lower oxygen level in case of misuse of UV curing.

LANDSCAPE/ BIODIVERSITY



Landscape integration



The building is surrounded by different species of trees and a variety of plants that offer a palate of different scenery in each season to employees and visitors.

Green spaces

Local government requires 20% of the total area to be green space to avoid a stark environment even though the building is in an industrial zones. Green areas are professionally maintained each two months.