



CASE STUDY

LOKAY, Germany



The family company was founded in 1932 by the grandfather of the current owner Ralf Lokay. He introduced an environmental value added approach to move away from a price-focussed business. Lokay's «sustainable by nature» strategy integrates the environment into all aspects of the company's business that supplies eco friendly high quality printing that costs no more than conventional products. While Lokay has an online eco print shop this has not undermined the continuing demand for their traditional print services.

The company operates climate-neutral logistics and production with alcohol-free printing, mineral oil-free organic inks, environmental papers, green electricity, EMAS environmental management system, and was the first German company to lease a bicycle fleet for its employees.

The final pillar was an environmentally efficient building as the original 1967 building badly needed renovation. It was decided to re-build and extend the house and steel frame factory on this site rather than move, because this was more sustainable and gave continuity with their customers and staff.

The principal sustainable characteristics of project include:

- Renewal of insulation throughout the building strongly contributes to an overall reduction in energy.
- Heat recovery system installed on the printing presses to heat the manufacturing areas.
- Installation of windows in production areas to provide staff external views.
- Light zones created in all production areas with improved natural light, higher efficiency artificial systems, with presence detectors in areas of low frequency use.
- Rainwater collection is used for flushing toilets and irrigation of plants. The choice of process-less plates has significantly reduced water use and effluent evacuation. Reverse osmosis helps stabilise water for alcohol-free printing and decreases dampening solution replenishment.

The strategy of the new eco print plant is to use it as a demonstration of what can be done by a small company. A multi purpose area has been created around the staff canteen that is also used to host customer events and workshops.

THE COMPANY (WWW.LOKAY24.DE)

Printing processes used at the site	2 Heidelberg sheetfed offset presses, die-cutter and postpress.
Tonnage of substrate processed	1127 tonnes (+14,4% vs 2012) 42% recycled.
Tonnage of substrates held in stock	30 tonnes
Products	magazines, books, labels, commercial.
Number of staff	27 – open 24h/5-6 days/week
Annual turnover	4,7 M€
Environmental certifications	EMAS, FSC (Chain of Custody), Eco Profit, Environmental Alliance Hessen, Initiative Pro Recycling Paper, klimaneutral.
Other certifications (ISO9001, ISO12647...)	Process Standard Offset ISO 12647-2.
Awards	2014 EMAS Award Germany, 2010 Druck & Medien 'Environmental Print' and 'Family Print Shop Of The Year', Green-Fleed-Award.

THE SITE

Location	Reinheim, Hesse, Germany.
Climatic zone	Continental.
Installation zone	New industrial zone
Existing risks (seismic, flooding) or specific environmental constraints	Adjacent to a category 2 water protection area.
Project	Renovated existing site + extension.
Year of construction	1967 and 2013/2014
Total surface of the site	3 000 m ²
Total surface of the building	1800 m ² – 1400 m ² production (200 m ² added) 400 m ² office.
Paper storage surface area	400 m ²
Work in progress storage area	1000 m ²
Building efficiency & materials	Removal of asbestos. Roof and walls replaced with an insulated aluminium sandwich, A new 7 m wide bay added along length of factory is big enough to add a new large press without stopping production on existing presses. External walls are covered in wood, treated with a water based lazure coating to simulate its look when aged. Existing 15-year-old aluminium double glazed windows and doors re-used, only new used where needed. Windows were added to bindery from a staff request to see outside. New lighting, heating and cooling and facilities added along with rainwater collection.
Floor finish	Epoxy resin, unsatisfactory wear resistance.
Organisation of traffic flow and parking	Parking along length of building with also loading bay doors (no dock)

THE PARTICIPANTS IN THE PROJET

Owner & Manager

Company owner Ralf Lokay and manager Thomas Fleckenstein



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

- Complete integration of environment into all aspects of company strategy, operations and sales. We live total sustainability as a team – when commuting, in production, in logistics. The final pillar is an environmentally efficient building. Essential to communicate effectively with customers and staff and if they are better organised between them staff time can be reduced by 30%.
- Essential to have clear specifications of need with a clear explanation to non-printers in the project. Establishing synergies between architect, engineer, consultant and suppliers is essential. Having a nearby specialist engineer who we could trust to implement the project was very important.
- If you work with the process to optimise its environmental impact then you also improve total productivity. Success requires a long term view that takes into account the total cost of operation and not simply purchase cost.

What would you change if you started again?

- Avoid overly stretching the financial planning..

Architect

Karl Gaydoul, Dipl.-Ing, Ingenieurbüro für Architektur und Baumanagement Gaydoul. - baumanagement-gaydoul@t-online.de

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

- Incorporating three sustainable actions: Heating from the waste energy of the printing machines; reuse of rainwater in the toilets; and Feng-Shui planning.
- Lokay were the first Germany company to lease a bicycle fleet for their employees. In 2014 they financed 13 bikes for employees (about 50% of staff) that make at least 50 commuting trips a year.

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	
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		
Reduced building maintenance / Cleaning		X		
Lower lifetime operating cost building			X	
Overall sustainable environmental profile				X



PROJECT CONCEPTION/ SUSTAINABLE CONSTRUCTION

Origin of renovation-extension	The 1967 building badly needed renovation, asbestos in roof, poor gas heating, poor natural light, leaking roof, no ventilation, very high internal VOC levels were a health hazard, high summer temperatures 38/39°C meant variable quality, low efficiency. For sustainable reasons, it was decided to re-build and extend on this site (house and a steel frame hall) rather than move.
Motivation for an ecological construction	Company strategy is complete integration of environment into all aspects of company – the last aspect to achieve was an environmentally sustainable building.
Project organisation	Every construction project involves a variety of problems but a good team will solve them in a rational and effective manner. Lokay management defined production hall specifications with assistance from Heidelberg. A first architect provided the concept, then a specialist engineering consultant made detailed plans and implementation. A second architect was a co-ordinator with staff and made proposals to improve working conditions, office layout, position of windows, doors, etc. – this process was aided by a Feng Shui specialist. All facilities like toilets, desks, chairs, etc are identical throughout – there is no division between office and workshop.
Planning	From the idea to architectural concept took about 2 years with another 8 months to develop detailed plans. Final construction plans were prepared by the engineer with close co-operation to Lokay team. Heidelberg helped plan print plant layout and provided static loads and electrical specifications. A major decision was to install a Cofely heat recovery system. Construction took one year and was completed in July 2014. Production only stopped for 2 weeks when the roof was changed.
Cost of works (excluding investment in production)	(excluding investment in production) 1,5 million €
Durable construction cost	About 30% more than a conventional renovation – 75% of additional cost is from Cofely i.cool calefaction system.
Direct and indirect impact on the production	uch more stable and motivating production conditions. The extension has provided a more efficient structure to improved the different workflows.
Principal sustainable characteristics – pillars for HQE®	<ul style="list-style-type: none"> • Heat recovery system from the presses to heat the manufacturing areas. Heat pump for heating and conditioning of the manufacturing and office areas. • Installation of windows in production areas to provide staff external views. • Renewal of insulation throughout the building. • Rainwater collection.
Public or private financial aid	90 000 € grant from BAFA for reduction of energy and climate impact.

WATER

Network	Incoming fresh water for print process use is treated by reverse osmosis with continuous conditioning to maintain desired pH. Only the company's sanitary water is evacuated by the communal sewerage system. Lokay rejects no industrial liquid waste.
Reduction actions	Rainwater from the roof is collected in an 8000 litre basement tank and is used for all toilets and to water the garden. Changing to process-less plates eliminated rinsing to significantly reduce water consumption and effluent evacuation. A reverse osmosis system in the basement stabilise water for alcohol-free printing and decrease dampening solution replenishment. Filtration of dampening water to reduce water replacement frequency.

ENERGY



Consumption

Before the investment the top 6 electricity consuming devices/systems were:

1. Electrical Motors	(21,5%)	5. Pressurized air	(12,9%)
2. Vacuum generation	(19,5%)	6. Lighting	(12,4%)
3. Cooling	(13,6%)	7. Other	(6,9%)
4. Process heat	(13,3%)		

Annual consumption in 2013 was 649,29 MW/h total energy, 72% of which is electricity—a priority is to use power from renewable sources to minimise CO² emission.)

Sources of consumption are:

- Production equipment
- Heat pump used for heating and cooling of the workshop
- Convection radiators for heating office areas.
- Prepress air conditioning system.
- Central compressed air system.
- Water-to-water press cooling system
- Reverse osmosis system
- Diesel for cars and transportation

Estimation of need

The needs and electrical power specifications were defined in partnership with Heidelberg and Cofely. It has been anticipated that the total power saving would be about 57%.

Reduction actions

The modular ventilation system (Cofely i.Cool LeanAirCenter) provides minimal energy consumption for optimal heating and cooling conditions for people, materials and machines and eliminates the uncertain future cost of gas. It takes waste process heat from press rollers with a liquid-to-liquid heat exchanger to warm up the cooler ambient air or, through a heat pump, to heat rooms. A 2500 litre water tank provides a buffer to heat the building for four hours and to allow pre-heating after a winter weekend. Low temperature radiators are used. An air heating pump is used for summer cooling. System is monitored by over 100 sensors connected to online monitoring by the supplier for continuous optimisation. It also eliminates the uncertain future cost of gas.

External cooling system for process water.

A centralised compressor system for all machines is now located in basement to reduce energy, noise and heat. Air pipes have been controlled to eliminate leaks that waste energy.

Improvement of wall and roof insulation of the entire building strongly contributes to an overall reduction in energy.

LIGHTING



Types of lighting

The lighting concept has three elements –natural light, higher efficiency artificial systems and avoiding unnecessary light. The T8 fluorescent tubes with magnetic ballast were changed for more energy efficient T5 fluorescent tubes with electronic ballast. These operates at a higher frequency to reduce flickering and increase the tubes lifetime. High efficiency reflectors increase the directed light to the workspace. The electronic ballast makes an immediate start possible and allows presence detectors to further reduce consumption. The total reduction of power energy is around 42% that gives the new lighting system an ROI of 3,2 years. The office building incorporate LED technology with panels and downlights.

Improving natural light – and views to the outside – was a key part of the renovation. The feng shui specialist interviewed the people and a view to the outside was one of the top important wishes. Natural lighting and exterior views are now features of all the production areas, except the prepress area. No sky lights are used.

Reduction actions

Light zones have been created in all areas of production. Areas of lower frequency use (e.g. toilets, storage areas) are supported by presence detectors to avoid unnecessary lighting. A further improvement could be the combination of natural lighting with light intensity sensors and dimming technology.

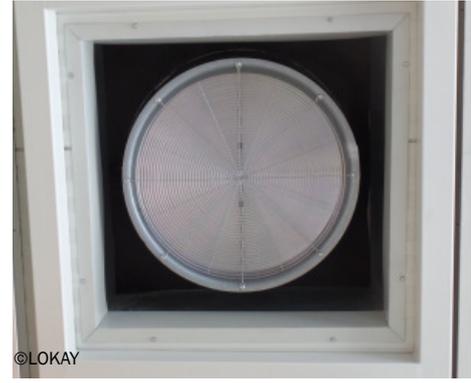
CIRCULATION



Organisation

Electric pallet lift trucks. Loading and unloading operations are carried out using a ramp leading in the workshop; the company does not have a dock.

AIR QUALITY/ NOISE



Ventilation & heating control

The modular ventilation system provides optimal heating and cooling conditions for people, materials and machines. The old gas systems and absence of ventilation led to very high internal VOC levels, high summer temperatures 38/39 °C meant variable quality, low efficiency.

Indoor air quality control

Only the bindery has humidity control. Air conditioning is only used for prepress – the CTP uses process-free Kodak plates

Humidification

Fresh air filters remove paper and powder particles. There are some issues of powder from presses

Noise reduction actions in the work areas

Noise reduction actions in the work areas include introducing air compressor to basement. However, noise levels remain higher than desired.

FIRE SAFETY

DANGEROUS MATERIALS / WASTE

Sorting of waste at the site

All waste is sorted at the site in separated containers that are clearly visible to visitors.

Equipment to minimise accidental pollution (retention)

Groundwater flood risk water protection in a category 2 zone means 100% retention of hazardous liquids (developer, cleaning agents, etc.).

Fire protection equipment

Centralised fire control ventilators can evacuate smoke-filled factory in 25 seconds in case of fire. No sprinkler system required.

LANDSCAPE/ BIODIVERSITY



Landscape integration

The entry to the office is completely landscaped and irrigated with collected rainwater.

Green spaces

Adequate parking for staff and visitors, no special surface treatment.