# INDUSTRIAL ENERGY EFFICIENCY READINESS PROJECT IN GHANA

CASE STUDY

INDUSTRIAL DECARBONIZATION ACCELERATOR

UNIDO

# Fine-Print Ltd

## Tema, Ghana

**Size of company (based on energy consumption bill)**

| SMME | Medium | Large |
|---|---|---|
| (< GHS 250k) | (R750k –R24mil) | (Above 24mil) |

**Sector**

**Paper, printing, packaging and recycling industry**

**Location**

**Heavy Industrial Area, Tema, Ghana**

| Date of implementation | Duration |
|---|---|
| 2021 - 2022 | 12 (months) |

**Utility intervention**

**Energy management system (EnMS) implementation**

## Company profile

Fine Print Limited is a paper converting company in Ghana, located on 22 acres of land in the Heavy Industrial Area of Tema. The company started in 1978 purely as a trading company. The company positioned itself as a solution driven producer willing to research, design and develop product ranges according to the market requirements. Consequently, Fine Print Limited has diversified towards the manufacturing of various converted products of paper.

The Paper Division produces sheeted papers of all types needed by the market, including exercise books, tissue paper, whilst the paper recycling plant converts waste paper into core boards. The Sacks Division manufactures multiwall paper bags for use in cement and agricultural products packaging. The Print Division provides a wide range of highly functional quality light packaging for the Ghanaian market.

With a history of success connecting brands with consumers, superior product quality has allowed the company to be positioned amongst the first choice of big multinational companies. This has also provided the opportunity to produce products abroad, with the company now viewed as a large exporter.

## Plant profile

Fine Print is located within an industrial zone which offers some advantage in cost of resources. As a result of the continual adaptation to market requirements within the printing, paper and packaging industry, the company has grown organically and has added and developed different departments. Each department is housed in a separate production area or hall. The main active halls now include:

1. Waste Paper Recycling Plant
2. Multiwall cement paper bags production
3. Agricultural paper bags production
4. Exercise books hall
5. Sheeting hall
6. A4/A3 cut-size sheeter production hall
7. Flexo-print division hall
8. Offset division hall
9. Waste Paper baling hall
10. Toilet-roll production hall

Electrical energy is the major energy source, followed by liquified petroleum gas (LPG), together accounting for more than 90% of all energy input to the plant. Diesel and petrol are used as minor energy sources mainly to fuel the standby generators (less than 10% of the time) and forklifts serving all halls.


## The challenges

Rising costs, especially electrical energy has driven the need to become more efficient. With the company positioning itself for exports, global competitiveness has become essential for business sustainability. Optimisation of production costs are thus necessary.

Frequent interruption of supply has forced the company to acquire self generation, but at a significant capital and operating cost. Hence, energy efficiency is seen to be a good opportunity to improve both competitiveness as well as reduced dependence on the local utility.

## IEE capacity building programme

Two employees were selected to attend the UNIDO-Ghana Industrial Energy Efficiency Readiness Project EnMS Expert Training Programme during from June 2021 to February 2022. The selected employees immediately developed an appreciation for the benefits of this training and immediately set about implementation after the first module of the training. Good support from management allowed the basic principles of energy efficiency to be workshopped to operational personnel within the plant.

The training has resulted in significant benefits for the company, including the ability to conduct energy performance assessments, identify significant energy users, identify savings opportunities, and propose methods of improving energy performance as well as quantify savings. Operational personnel are also more aware of their influence on energy consumption.

## Key achievements

| | |
|---|---|
| Implementation period | November 2021 to July 2022 |
| Implemented measures | Awareness, training and communication of daily energy performance |
| Monetary savings in GHS (for 9 months) | Electrical consumption saving GHS 143 000 |
| Energy savings in kWh (for 9 months) | Electrical consumption saving: 125 000 kWh |
| Total investment made GHS | nil |
| Overall % of total consumption saved | Electrical consumption saving for 9 months amounted to 7.5% of Recycle Plant |
| Payback time period in years | immediate |
| GHG emission reduction (ton $CO_2e$)[1] (for 9 months) | 53.75 $tCO_2e$ |

1 MWh to $tCO_2e$ Conversion Factor set at 0.43 as per the EPC
2 For the kWh rate use GHS1.1475 /kWh

## Scope and boundaries

For this first phase of the implementation of the energy management system, the focus was placed on electricity and liquefied petroleum gas (LPG) consumption in the Recycle Plant. This single plant represented more than 50% of the total energy consumption of the total site. Electricity and LPG make up more than 90% of the total energy usage.

## Implementation progress

The following phases of the energy management systems have been implemented or are in the process of being implemented:

### Phase 1: Preparation and commitment

- Energy policy developed
- Management rep and energy rep have been appointed
- Responsibility and authority matrix in process
- Scope defined for recycling plant (60% of total plant energy) as first phase
- Resource and time allocation provided by top management including the development of a new training centre dedicated to energy efficiency

### Phase 2: Planning – energy review

- Legal and other requirements still in review
- Energy sources identified
- SEUs identified for Electricity and LPG
- Baseline and Energy Performance Indicators (EnPIs) for Recycle Plant. Will be developed in next phase for other areas of the plant.
- Objectives, targets and action plans – in development for electricity and LPG

The following are in the planning and development phase:

- Measurement plan – upgrade of water and LPG meters to allow for better energy monitoring of Boiler

### Phase 3: Implementation and operation – focus on SEUs

- Operational controls and training developed for Recycle Plant personnel
- General energy awareness training already in progress for operational and production personnel in all areas
- Updated procedures for Recycle Plant in development
- Energy performance improvement – some EnPIs developed and now being tracked
- Full integration into an integrated management system (IMS) (future plan)

### Phase 4: Audit and management review

- Full integration into the internal IMS audits (future plan)
- Certification (future plan)

## Energy Baseline and EnPI

Monthly energy data was obtained from accounts. Production volumes were obtained from production personnel. Figure 1 below shows the relation between paper production and electricity consumption in the Recycle Plant. There is a good correlation between the two variables. Statistical analysis gives R2 = 0.94 and p-value < 0.001 for paper production. This can thus be used as a forecasting model for electricity consumption in the Recycle Plant. The baseline period included the monthly data from Feb 2019 to Oct 2022. This period included the covid-19 period as well as some months with zero production.

Annual electrical energy consumption for the Recycle Plant 1 681 000 kWh based on period from Nov 2020 to Oct 2021.

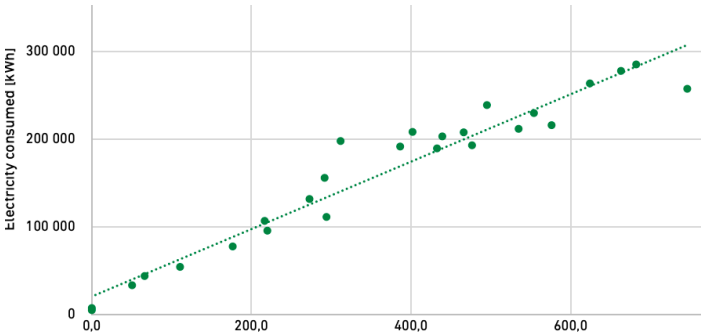
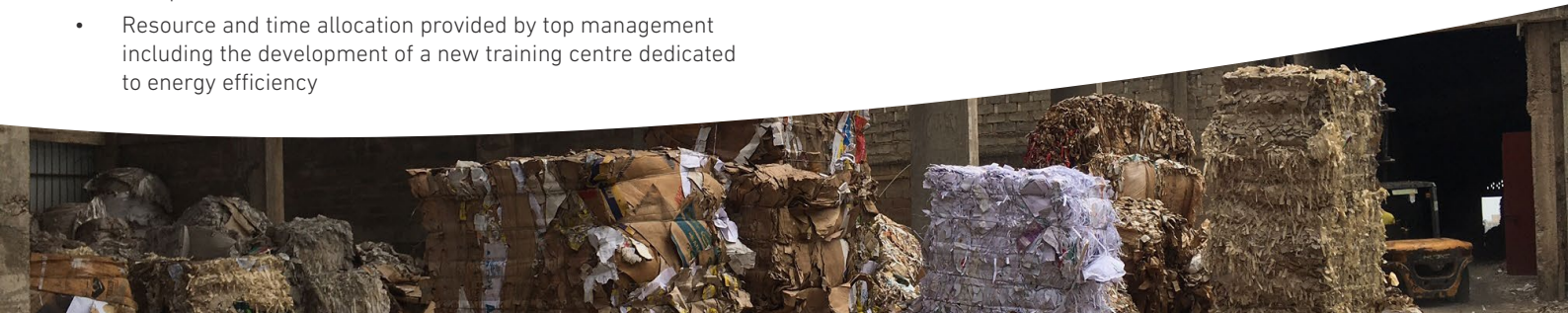



Figure 1: Relation between paper production and electricity



## Implementation challenges

Historical energy data was the biggest challenge. Data was not captured in an electronic format. All available energy information had to be transferred from paper records into digital to allow for analysis.

Lack of submetering points also limited the ability to ringfence the energy consumption of the various departments. Energy consumption estimates were developed for the various departments based on spot readings only.

## Highlights of Energy Intervention

The major interventions at the plant were based on behavioural change. Energy interventions included:

- Awareness training workshops for operational personnel.
- Regular communication with personnel through the placement of energy efficiency stickers and messages.
- Adapting Standard Operating Procedures (SOP) to ensure that machines in the Recycle Plant are switched off when not required.
- Publishing of daily energy performance at relevant operating stations in the Recycle plant to enable operators know their current performance compared with the past so they can track their own performance.

The energy team determined that energy performance can be improved through the means of People, Information, and Technology. A common sense approach was taken where available information was used to drive people to change their behaviour. This approach also required the least amount of capital and a minimum of support from top management.

Energy performance was tracked from November 2021 following the the module 3 EnMS training. By this time a few awareness workshops had already been conducted. Figure 2 below shows the cumulative electrical energy savings achieved for the period from November 2021 to July 2022. Using the baseline period as a reference, a cumulative saving of 125 000 kWh was achieved over this 9 month period. The projected estimate (assuming linear growth) would be 166 000 kWh per year, or 10% of annual consumption of the Recycle Plant.

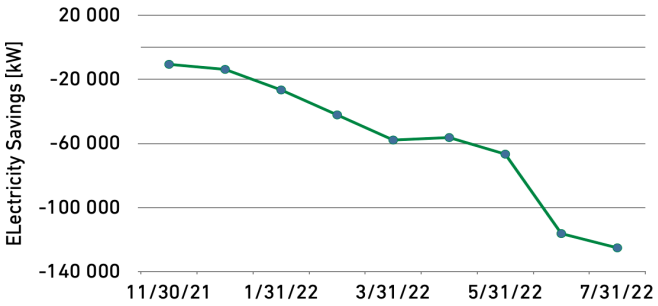



Figure 2: Cumulative Energy Savings (from Nov '21 to Jul '22)


## Summary of all energy interventions

**Energy uses/users**
**Recycle Plant Electricity**

**Intervention**
**Behaviour changes through awareness, training and communication**

**Utility saving period**
**9 months**

**Investment (GHS)**
**0**

| Savings(GHS) | Payback (Yrs) | Utility saving (kWh) |
|---|---|---|
| 143 000 | Immediate | 125 000 |

## Benefits

- Have proven that energy performance can be improved if some amount of care or attention is devoted to it.
- Improvements were possible due to using people (attitude, awareness, monitoring and reporting) and information to drive savings.
- Excitement amongst personnel that they are making a contribution towards improving the climate for future generations.
- Better understanding of process and operations
- Can track and respond to maintenance or operational problems faster.
- Personal development of employees.

## Lessons learnt

- Small energy team can be focused and make achievements.
- Start in a small manageable area to prove the system before expanding to the whole plant.
- Data recording, collection and conversion into digital format is critical to tracking performance.
- Energy savings can be achieved without major capital investment. Formal training and awareness can drive behaviour change which in turn can have a significant impact on energy consumption.
- Providing adequate resources and support for the energy team is vital for the continuity of the EnMS.

## Future plans

- The company aims at attaining the ISO 50001:2018 standard certification in the future.
- Work done in Recycle Plant should be replicated in other departments including training and awareness programmes.
- Energy team should be expanded to facilitate and enhance the use and implementation of the system in all departments.
- Develop more energy savings opportunities that include capital investments.
- Future phases of EnMS implementation will include other production areas as well.


**Company contact:**
**George F. Jelugu,** Recycle Plant Supervisor
Email: tema@fineprintindustries.com | Phone: +233 547343542



Ghana National Cleaner Production Centre GNCPC
INDUSTRIAL DECARBONIZATION ACCELERATOR
UNIDO