60 plus HUNG HING
YEARS OF PRINTING EXCELLENCE

Green Manufacturing Report

Dennis Wong
Oct 2013

Hung Hing Printing (Heshan) Co., Ltd.

Content

1 Introduction

Hung Hing is one of the world's leading providers of comprehensive, one-stop printing and packaging products. Its vertically integrated operations include product design, printing, manufacture of paper and corrugate board, cartons and boxes as well as paper trading.

Hung Hing was founded in 1950 as a small printing shop. It now has five plants in China, three in the Guangdong province in South China, one in Wuxi near Shanghai and another in Hong Kong, with a total production floor space of 6 million square feet and a workforce of over 13,000.

Hung Hing is committed to Green Manufacturing and intends to use the World's limited resources wisely, in the manufacturing of products that benefit people. To achieve this goal, we are adopting advance technology in manufacturing and have equipped our employees with the proper attitude to Reduce, Reuse and Recycle (3Rs). We have established policies and procedures that will enable us to monitor and improve our resource usage. This has been reinforced by training, education and promotion of the environmental protection message to all our employees, suppliers, business partners and stakeholders.

Our Green Manufacturing Policy is attached in Appendix 1 which was signed off by our Group Executive Chairman Matthew Yum in Jan 2013. List of the documentation relating to green issues and environmental protection is detailed in Appendix 2.

In pursuing Green Manufacturing, we understand that attitude, knowledge and continuous improvement are essential. We have established procedures and work instruction to educate our employees; monitor and control our use of resource; and encourage employees to suggest improvement initiatives.

Environmental protection has long been the priority concern of the company. Our Shenzhen factory had achieved ISO14001 back in 2003 to establish a system for continuous improvement in environmental protection, now all the group's production facilities have ISO14001 certificates.

Paper is the single major material in our business, although the raw material, pulp are renewable source from plant, we understand that this natural resource must be properly managed otherwise it will damage the world eco-system as well as the sustainability of the forest itself. Therefore in 2007 and 2008 we applied and obtained FSC CoC and PEFC certificates respectively to support the best practice in forest management and protection of the eco-system related to forest plantation. The purchase of certified paper for Shenzhen and Heshan together have raised from 1600 tons in 2008 and now up to 34,000 tons in 2013 (from Jan to September). The used of certified paper and high recycled content paper accounted over 80% of paper used in year 2012 by both factory. Currently, all our direct deal paper mills are either FSC or PEFC certified.

In 2007, Hung Hing also committed to use soya based ink for processing colours (Cyan, Yellow, Magenta, Black) and applied to use Soya ink logo from American Soy Association. To claim ink is soya base, it must contains at least 20% soy oil to replace the equivalent amount of mineral oil, the latter is Volatile Organic Chemical (VOC) material.

Besides the use of more environmental-friendly materials, Hung Hing has continuous effort to implement environmental improvement project whenever is available, we also participated in environmental campaign and awarded some recognitions, detail is listed in Appendix 3.

The carbon footprint for our Shenzhen factory is improved from 0.087 to 0.078 ton coal equivalent (tce) per 1,000 RMB value added unit from 2008 to 2012 respectively.

In this report, we are using our Heshan factory achievement to demonstrate our Green Manufacturing initiatives and it will serve as a role model for other factories in the Group.

2 HeShan Factory Aim for Eco factory

Heshan is our newest factory specializing in the production books and greeting cards and is primarily dedicated for export business. Heshan employs over 4200 people at peak season. The factory was built in June 2007 and was designed to be energy and environmentally efficient.

In printing industries, colour consistency is the major concern. However as ink pigments fade out under continuous and prolonged exposure to UV light, measures must be taken to prevent color inconsistency in printing. In order to maximize the use of sunlight while reducing the UV effect on product, Heshan factory is built with windows at lower height so strong sunlight does not shine directly on printed items. Sunlight rays coming in lower angle also help to diffuse the light intensity which is more comfortable and suitable for production and quality check.

Since 2010 we have been actively recording and monitoring our key environmental measures and working to improve our green credentials. This is a continuous long term commitment.

This report details our main achievements to date.

3 Energy

3.1 Environmental Audit

Heshan has done a lot of environmental improvement projects in the past. In Aug 2013, we engaged a professional body to carry out a full environmental audit to review the effectiveness of our improvement projects and also to give suggestions for further improvement.

The study covered areas of electricity quality, production facilities, lighting, air conditioning, compress air system, water usage and air quality. The study showed our major energy cost is Electricity, which accounted 91.73% cost in year 2012, while Water and Diesel accounted 5.7% and Diesel 2.58%. The consumption of Diesel was to maintain the in-house electricity generators. The latter were installed to supplement electricity supply if there is an electricity shortage in regional grid.

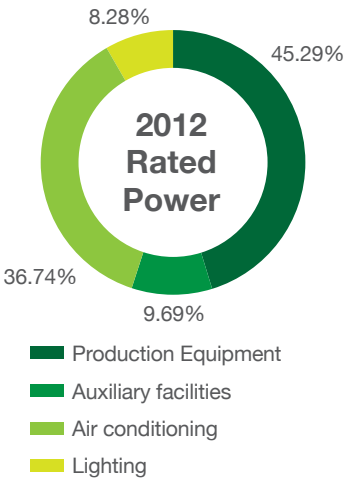
The recommendation is listed in Appendix 4.

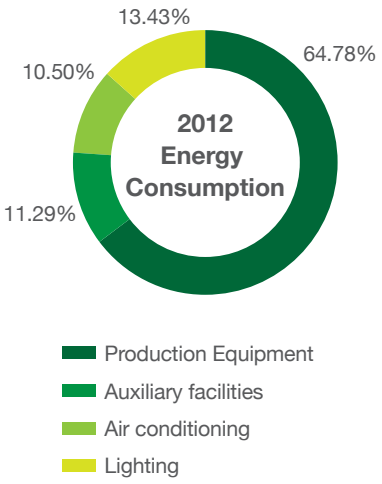
Some of the recommendations received have been considered by the Management prior to the audit, such as the installation of additional transformer to further improve electricity quality. A preliminary study estimated the investment cost was around 4 million RMB and it could only be carried out during long holiday shutdowns. Detailed feasibility study is being carried out and the project is now being considered at top management level.

Improvement on lighting is listed as first priority due to a less investment amount involved and a fast payback period. Electrical Engineering department is now carrying stringent tests on selected products to ensure the quality and effectiveness of the investments

Year 2012 Energy cost

	Unit	Usage	Amount	Percentage
Electricity	KwH	10,894,400	8,149,011	91.73%
Water	T	331,115	506,043	5.70%
Diesel	Kg	33,405	228,820	2.58%





fulfills the company's requirements and avoid costly investment mistakes. Heshan factory priority project for 2014 is to achieve energy saving of around 30-50% in their lighting energy consumption. In considering all projects under study, we expect energy saving in year 2014 will be around 5 – 7%.

3.2 Energy Efficiency and Reduction Plan

Some energy efficiency improvement and reduction plan was carried out in the period of 2011-2012 with energy reduction of around 1million kwh.

3.3 Energy Reduction

As a result of improved monitoring, analyzing and subsequent investment in equipment and production methods, we have been able to improve our energy efficiency from 2010 to 2012 by over 16%.

To measure energy efficiency, we found the most appropriate benchmark is to record the number of finished sheets produced in any given

Item	Unit	Cost in RMB	Annual Saving in KwH	Payback Period
1	Replace 14 units air ventilation system for staff canteen	70,500	16,650	5 years
2	Replace 24 units air ventilation system for production area	90,000	120,000	<1 years
3	Install 12 inverter units in main air-conditioning system	60,000	315,000	1 year
4	Upgrade 30 units solar heating system at dormitory area	375,000	202,500	28M
5	Installation of 7,351 T5 lighting at production area	529,000	367,550	2 years
6	Installation of 1000 T5 lighting at dormitory area	72,000	50,000	2 years

3 Energy

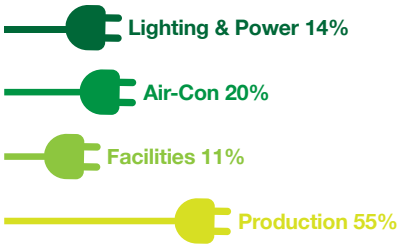
period. Weight is not an option as different product type will use different weights of paper and card.

Figures in Appendix 5, show that the total energy usage per 1000 sheets. In year 2012 it was 47.10 kWh while in year 2010 it was 56.30 kWh. This was a reduction of 16.3%.The total energy usage for the Heshan factory in 2012 was 9.5 million kWh. If same 2012 output was to achieve in 2010 (without the improvements), would have required another 1.9 million kWh.

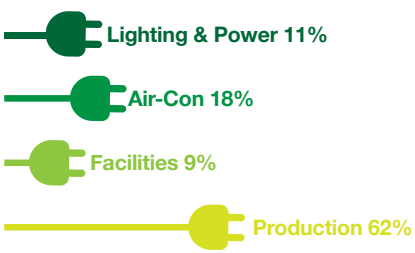
This is 20% of the total energy usage in 2012 and equivalent to the weekly energy consumption of over 6,000 UK houses.

The charts below illustrate the energy usage by category in 2010 and 2012.

Year 2010 Proportion of electricity usage



Year 2012 Proportion of electricity usage



The largest energy consumption is for production, accounting for over 50% of the total energy usage. Unfortunately this is also the hardest area to achieve significant energy savings.

The Heshan factory has more than 11 printing presses and over 160 post-printing machines, some of which are designed to run 24 hours a day. Most of the large machines are technically advanced machines, mainly from Germany, Italy and Japan, with built-in energy efficiency as part of their design. Modifications to improve their energy rating are limited hence the best method to improve energy performance is through better planning to increase productivity.

In comparing the energy efficiency of new and old machine, below is a case study

Case 1 – Case Making Machine

Old machine
rated power 50KW, output rate 800pcs/hour, energy per pcs = 62.5w/pcs

New machine
rated power 50KW, output rate 3,000pcs per hour,
energy consumption per pcs = 16.6w/pcs

New machine is almost 4 times more efficient then old machine.

Case 2 – Printing Press

Old machine
Mitsubishi 6C+6-LD Year Buy - 2008

New machine
Heidelberg XL-105-5+L. Year Buy - 2012
with Pre-press to press data linkage (CIP3)

	Old machine	New machine
Set up time	Average 30 minutes	Average 15 minutes
Maximum speed	12,000 sheets/hr	18,000 sheets/hr
Average speed	9,000 sheets/hr	12,000 sheets/hr
Average set up wastage	500 sheets	300 sheets
Below date are for period Jan - Jul 2013		
Total output	10,791,000 sheets	15,644,000 sheets
Total wastage in set	271,000 sheets	358,000 sheets
Total energy consumed	124,470 kwh	175,920 kwh
Energy per 100 sheets	11.5kwh / k sheets	11.2kwh / k sheets
Wastage per 1000 sheets	25.1 sheets / k sheets	22.8 sheets / k sheets

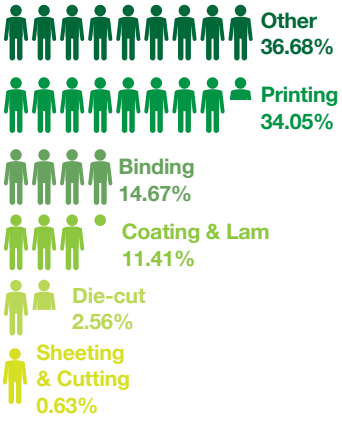
From above table, new machine produced 44% more output than old machine and if same amount of sheets are produced, new machine saved around 3,237kwh and 24,800 sheets of paper.

3 Energy

A typical production in Heshan requires lots of post-printing stages which are labor intensive and employs a lot of small machines to fulfill the process. These small machines can be moved around and take power from any power outlet and classified as "Other" in below electricity usage by production department. This is the largest energy consumption accounting for 37% out of all machines production energy consumption.

A better alignment and efficiency improvement in using small machines would greatly improve the energy performance per production unit.

Aug 2013 Prod Elec Usage by dept



The case below shows one such efficiency improvement initiative.

Case 3 – Punching operation

In children book production, punching operation is required for many books design with shape or index. Assume a book with 6 punching steps, the old production steps were

- Assistant pass book to operator, perform punching, pass to second assistant to punched item on pallet.
- Pallet full, move to next stage
- Repeat step 1 and 2 until finish.

In such an arrangement, a total 18 workers were needed. There was also higher chance of defects caused by moving materials on and off pallet, and the punching machine is left idle when awaiting pallet transfers

In early 2012, Heshan purchased conveyer belt systems to improve the process. Each production line has 6 operators and 2 assistants. Assistants at the front and end of production line move items onto and off conveyer belts. Operator takes item out of conveyor belt, punch it and put onto next conveyer belt. The punching operation can thus be performed seamlessly with minimal work-in-progress and idling.

Although conveyer belts do consume energy, it is generally minimized by using servo motor. This arrangement shortens overall production time. The reduced idle time has already compensated for the extra electricity consumed by conveyer belts.

In addition we have ensured that we select new machinery based on their energy rating and have installed servo type or inverter on all key motors, fans and compressors in the factory. Currently, servo or inverter motors accounts over 80% for all high powered motors.

We estimate that the improvements to manufacturing methods and machinery from 2010 to 2012 have resulted in savings of 5.7% of the energy used on machinery, when compared to the relative energy use in 2010.Figures are detailed in Appendix 6.

An additional 360,000 kWh would have been needed without the improvements, which equates to approximately the weekly energy usage of over 1,100 UK houses.

Figures are detailed in Appendix 7.

3.4 Energy Monitoring Meters

The majority of our work floors have installed electricity sub-meters to monitor electricity usage. Meter reading is taken weekly. All high powered machines have their own sub-meters. At the moment it is not possible to isolate the lighting component as this is linked in with the power supply for small machines. The sub-meter layout in our factory is detailed in Appendix 8.

We intend to install sub meters to additional energy users mainly machinery and lighting and power for first floor in the next 3 months. After that, all electricity consumption in second level will be metered and enables us to further improve our understanding of energy usage.

Regular meter reading helps identify problems earlier, no matter whether this is due to meter error, machine problem or improper energy usage. Energy consumption statistic also helps better planning in improving electricity quality.

4 Green Energy

4.1 Green Renewable Energy Sourcing

Unfortunately Green Energy is not immediately available in Heshan , so it can not be used to supply to our factory. We will investigate whether it is feasible to install photovoltaic power supply in the factory as a Green Energy source.

Our canteen, which is operated by an outsource vendor, is using bio diesel as burning fuel. Consuming around 7-8 Ton of bio-diesel monthly.

4.2 Solar Thermal Energy

Solar heating panels are in installed in dormitory area. During 2011 and 2012 the system was upgraded, resulting in an estimated annual saving of 202,500 kWh, and a return on investment of 28 months

Project
Upgrade 30 units solar heating system at dormitary area
Annual Saving in kwh
202,500
Payback Period
28 months

Appendix 9 has details of all the Energy saving projects during 2011-2012

5 Insulation

5.1 Insulation

The windows of the factory are insulated with light filter film. We have checked that this can reduce temperature by approximately 6 degrees C in summer time.

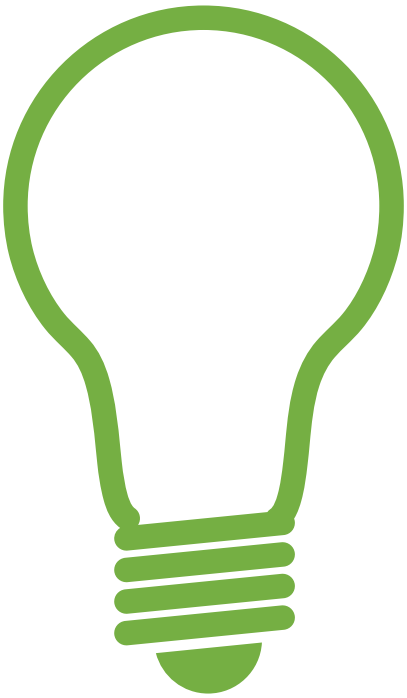
Our factory is constructed with concrete walls and roof, which provide good insulation from external temperature. In addition we have ensured that effective insulation is in place for any potential heat loss equipment, for example all our pipes are lagged, regularly checked and maintained.

5.2 Compressed Air Leak

Compressed Air is the major energy user in auxiliary production support. In Aug 2013, centralized air compressors already consumed 110,320kwh which accounted for 8.7% of total 1,261,800 kwh electricity consumed by the factory. In Heshan, compressed air is supplied centrally and energy is optimized by using inverter control. Some additional small compressors are deployed in key machine areas for standby purpose, in case there is problem with the main supply. The compressed air piping is monitored regularly with pressure gauges at each floor to check for any possible leakage in the pipe.

Heshan is considering the suggestion recommended by the energy audit report to provide compressed air at different pressure level. If it is feasible, it may further reduce the energy cost of compressed air.

6 Lighting



6.1 LIGHTING INSTALLATION AND ENERGY REDUCTION

Lighting and power consumed at approximately 11% of the total energy consumption for the factory.

As a result of recent energy saving measures the energy consumption on lighting has been reduced by 34%. The figures are detailed in Appendix 6

Natural daylight is maximized by using wider windows all around the work floors. Areas close to windows are used to store small idle machines or materials. Working area is located in inner area with more evenly spread brightness. In addition overhead lighting has been positioned for optimal effect.

In Jun 2012 we started to convert all lighting from T8 to T5, and this project was completed in Dec 2012. By field test we found T5 consume 32.82W compared to T8 which consumes 43.45W; a saving of 25%. An additional bonus is that T5 is 20% brighter than T8.

Lighting used in the factory is either T5 tube or energy efficiency floodlight. The brightness is selected dependant on the working environment. All emergency lights have been replaced with LED type which uses less energy and have improved battery life which extends their replacement cycle.

The return on investment for the lighting improvements and the annual saving in kWh is shown below.

In addition there are currently further ongoing projects which include:

- Pilot testing LED light in warehouse area and low wattage LED light for staircase.
- Install Low wattage LED light in dormitory's shower rooms and toilets.
- Study to replace T5 with LED light

At the moment it is difficult to separate lighting from power supply, so the lighting is not sub metered as an entity.

Project	Annual Saving in kwh	Payback Period
Installation of 7,351 T5 lighting at production area	367,500	2 years
Installation of 1000 T5 lighting at dormitory area	50,000	2 years

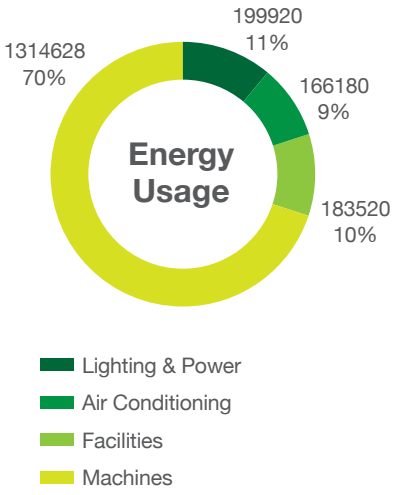
7 Temperature Management

7.1 Temperature Control

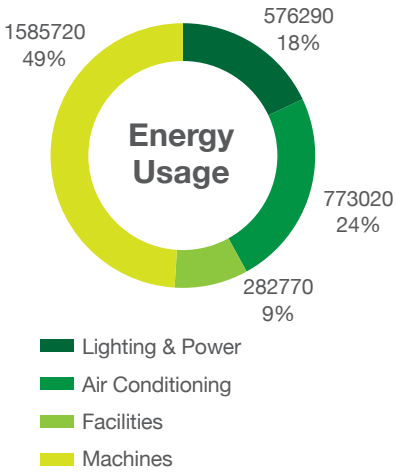
Heating and air conditioning are the second major energy users.

According to recent sub-meter readings , air conditioning alone accounts for approximately 9% of total annual energy usage of the factory in winter time. It rises to 24% of total energy usage during the summer months, as shown below.

Unit in kWh,
Winter Jan - Mar 2013



Unit in kWh,
Summer Jul - Sep 2012



26-28°C

We provide air conditioned workplace for our employees wherever appropriate. The air temperature is controlled between 26-28C in summer time.

On work floors where air conditioning is not appropriate, negative pressure ventilators are installed. This has better energy performance than normal velocity fans at lowering room temperature. We have also installed inverters for all water cooling pumps.

The improvement projects completed in year 2011-2012 are detailed below, together with their estimated annual energy savings and their return on investment.

When these projects are combined with those of heating and lighting, the total savings is around 1 MILLION kWh. This is approximately 10% of the total energy consumed by the factory in 2012 and equivalent to the weekly energy usage of over 3,000 UK homes.

Project	Annual Saving in kWh	Payback Period
Replace 14 units air ventilation system for staff canteen	16,650	5 years
Replace 24 units air ventilation system for production area	90,000	<1 years
Install 12 units inverter for main air-conditioning system	315,000	<1 years

8 Water Management

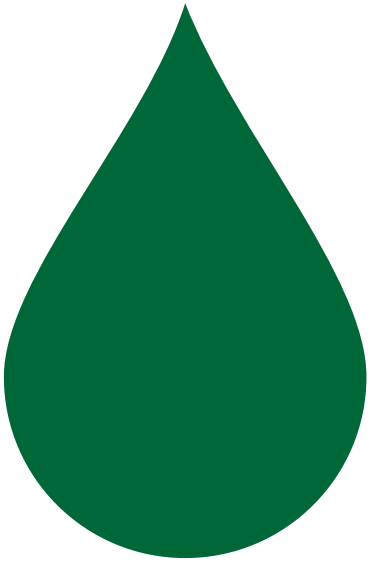
8.1 Water Management

Water accounted about 5.7% of total energy cost, but its usage is still closely monitored. From study of our records, it showed abnormally high water usage during Chinese New Year holidays. After investigation it was found that underground main water supply pipe leaked. The pipe was then replaced in May 2013 with surface pipe.

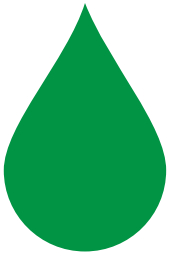
Water seems abundant but in fact China is in short of safe water supply. Its average water resource per capita is only 28% of world average. Every effort should be made to save water and more importantly is to educate people to save water.

Sep - 13

Production
4.27%
552m³



Air Conditioning
11.76%
1,520m³



Toilet & Potable
83.97%
10,855m³

From water meter statistic, toilet and portable water consumed most of the water with around 84% of water usage in factory, or 10,855cubic meter. In Dormitory, toilet and portable water also comprised over 52% of water consumed, or 2,880 cubic meter of water.

Heshan has installed sensor tapes in factory toilet and water saving tape in canteen area. Reminder stickers are posted in most water outlet to remind employees to save water.

Sensor tape in factory toilet

Sticker to remind saving water

Rain water is collected for use in gardening and cleaning of external areas. From Mar to Sep 2013, Heshan used over 360m³ rain water.

9 Waste Management

9.1 Waste And Waste Reduction

In order to minimize impact on environment by waste, recyclable raw materials and packaging, or material that is less harmful to the environment are sourced and used, as far as possible. Most of the paper we purchased are either coming from certified forest or with high percentage of post-consumer waste paper, such as 100% recycled grey board in our board books and covers.

Metal
65,204

Plastic
50,547

Sol Waste
61,870

Paper Bucket
33,885

Waste Cloth
35,525

Ink can
18,150

Waste Paper
6,319,100

Year 2012 Waste in kg

Wastes from production or material packaging are classified, below are waste generated from such source.

Except waste Cloth and Ink (which contain chemical waste) have to be collected by authorized agent, other wastes are collected by vendors who will eventually recycle the waste for other use.Waste paper is the major waste in production. Heshan has made savings in wastage in manufacturing, reducing our wastage percentage from 4.42 % in 2010 to 2.97 % in 2012. This is a significant saving of 33%.

Other wastes are mainly from packaging of raw material.

Air emission waste such as VOC is currently not measurable. Most of our air exhaust systems in production processes with VOC chemicals are installed with air filter system to eliminate harmful chemicals. In the past few years, Heshan implemented several initiatives to reduce use of high VOC raw materials.

Initiative 1

From 2008, all processing inks are Soy oil based. Soy oil based ink has at least 20% less VOC then mineral oil based ink. In year 2012, Heshan had used over 98,000kg of processing inks, which means 19,600kg of VOC is reduced if otherwise mineral oil inks were used.

Initiative 2

From 2011, water based PP lamination glue was used instead of solvent based glue. Solvent based glue need to mix with 50% of thinner, which is VOC material, and will be vaporized in the process. In year 2012, 85,800kg of water based glue is used which means same amount of VOC is reduced.

Initiative 3

From July 2012, low alcohol dampening solution was used to replace traditional dampening solution. Traditional dampening solution has around 11% of alcohol content while low alcohol version contains only 3%. In year 2012, Heshan used 6,875 kg of low alcohol dampening solution which means 687kg of VOC was reduced.

In year 2012, total of 19,600 + 85,800 + 687 = 106,087kg of VOC was reduced.

Inevitably, some other VOC chemicals are still used in some processes. Therefore, Heshan is monitoring VOC in work floor at regular interval. If abnormal level of VOC is found, further investigation will be taken to understand root cause and implement improvement.

Another improvement initiative that we are working on is to monitor and reduce the food waste in our canteen.

10 New Projects

Further improvement initiatives that are currently working on:

1 Pilot test LED and PIR light in warehouse area, LED light for staircases, and LED light to replace T5.

2 Monitor and reduce food waste in canteen

3 Investigate feasibility to install computerized energy monitoring system

4 Investigate how to reduce toilet water usage

5 **compressed air pressure**
Investigate feasibility to install regional compressed air tank in printing room, lower compressed air pressure

6 Investigate feasibility to install photovoltaic electricity supply

11 Summary

We are committed to achieve an average of 5% energy reduction per year, with 2010 as benchmark, until the end of 2014.

We have already made significant improvements in our key targets and have reduced energy usage by over 16% and waste reduction by 33%, from 2010 to 2012.

We estimate that our energy usage can be reduced by 21% by the end of this year.

Appendix 1

Hing Hing Green Manfacturing Policy

Hung Hing
HUNG HING
PRINTING (HESHAN) CO. LTD.
鸿兴印刷(鹤山)有限公司
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Fax:0750-8282318

Hung Hing Green Manufacturing Policy

We believe in Green Manufacturing and to use limited resources wisely in the manufacturing of products that benefit people. To achieve that, we will adopt advance technology in manufacturing and equip our employees with the proper attitude to Reduce, Reuse and Recycle (3Rs). We have established policies and procedures that enable us to monitor and improve our resource usage, enhancing this with training, education and promotion of the environmental protection message to our employees, suppliers, business partners and stakeholders.

We aimed to achieve average 5% energy reduction per year with 2010 as benchmark till end of 2014. Reduction target will be revised every two years according to available technology and environmental condition we achieved.

Matthew Yum
Group Chairman
Jan 2013

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Hung Hing Printing Group Limited
香港大埔工業村大寶街十七至十九號鴻興包裝印刷中心
Hung Hing Printing Centre, 17-19 Dai Hei St., Tai Po Ind. Est., N.T., Hong Kong
Tel:26648682
Fax:26642070

Appendix 2

Hung Hing Procedures

Document #	Title	Purpose
HS-COP-HB-03	Departmental responsibility in environmental management	Establish the duty and responsibility on different department and position on environmental matter
HS-COP-HB-04	Resource, Energy consumption control	Monitoring and control guideline on use of materials and energy
HS-COP-HB-05	Environmental knowledge training	Guideline on what kind of training should provide to different level of staff
HS-COP-HB-07	Environmental target and management procedure	Guideline on how to setup environmental target, control and monitoring
HS-COP-HB-09	Purchase Procedure	Purchase guideline including environmental performance of supplier
HS-COP-HB-11	Monitoring Procedure	Establish the reference standards on different environmental monitoring attributes
HS-COP-HB-18	Waste control procedure	General guideline on waste control, recycle and disposal
HS-COP-HB-21	Waste water, exhaust air and noise control procedure	Specific monitoring and control procedure of captioned items
HS-COP-HB-23	Air flow, lighting control procedure	Specific monitoring and control procedure of captioned items to ensure healthy and green working environment.

Appendix 3

Hung Hing Environmental Initiatives Recognition List

Factory	Year	Recognition
Heshan	2013	Hang Seng Pearl River Delta Environmental Awards Green Medal (For year 2011-2012)
Shenzhen	2013	Hang Seng Pearl River Delta Environmental Awards Green Medal 3 yrs + (For year 2011-2012)
Shenzhen	2013	Shenzhen Reduction Award (鵬城減廢)
Shenzhen	2012	Hang Seng Green Medal Awards (For year 2010-2011)
Heshan	2012	China Environmental Product Certificate
Shenzhen	2012	China Environmental Product Certificate
Shenzhen	2011	Hang Seng Pearl River Delta Environmental Awards Green Medal (2009-2010)
Shenzhen	2009	Installed Intelligent power regulator for central air compressor of Shenzhen plant which can save 120,000Kwh annually.
Shenzhen	2008	Installed a waste steam collection facility for our boiler which can save 720Tons of heavy oil and 9,360 tons of water per year.
Hong Kong	2007	Soy Ink Logo

Appendix 4

Recommended Clean Initiatives by professional body

CGNCLP (中廣核中電能源服務) Recommended Clean Production Initiatives

Item	Initiatives	Saving Opportunity	Payback Period
1	Install additional transformer to stabilize power supply and improve electricity quality	N/A	N/A
2	Re-arrange the time to use heat-pump in off-peak time for lower electricity cost	low	< 1 year
3	Install Noise reduction equipment in power supply	high	> 3 years
4	Replace all lighting with LED light	960,000	< 2 years
5	Centralize control of Compress air inverter control, lower compress air pressure	500,000	> 3 years

Appendix 5

Energy Consumption 2010 Vs 2012

	Year 2010 in ,000 pcs	Year 2012 in ,000 pcs
Total paper used	139,553	208,688
Total output	133,381	202,496
Total of wasted paper	6,173	6,192
% of waste	4.423%	2.967%
Wastage Reduction 2010 Vs 2012		**33%**

Total energy consumed in factory(KwH)	7.509,600	9,538,800
kWh /1000pcs	53.81	45.70
kWh/1,000pcs OUTPUT	56.30	47.10
Kwh / 1000pcs Output Reduction 2010 Vs 2012		**16.3%**

The figures compare 2010 and 2012 (whole year)

Energy consumed per 1,000 sheet processed improved by 16.3% over the period. Sheet wastage has improved by 33%.

Appendix 6

Energy Consumption By Category And % Reduction

	2010			2012			
		% of E Usage	kWh /1000pcs OUTPUT		%of E Usage	kWh /1000pcs OUTPUT	% Reductionin Energy Usage
Total energy consumed in Factory (kWh)	7,509,600			9,538,800			
Total output 1000 pcs	133,381			202,496			
Total			56.3			47.10	**16.3**
Machinery		55	30.97		62	29.20	**5.7**
Air Conditioning		20	11.26		18	8.48	**24.7**
Lighting and Power		14	7.88		11	5.18	**34.3**
Facilities		11	6.19		9	4.24	**31.5**

Appendix 7

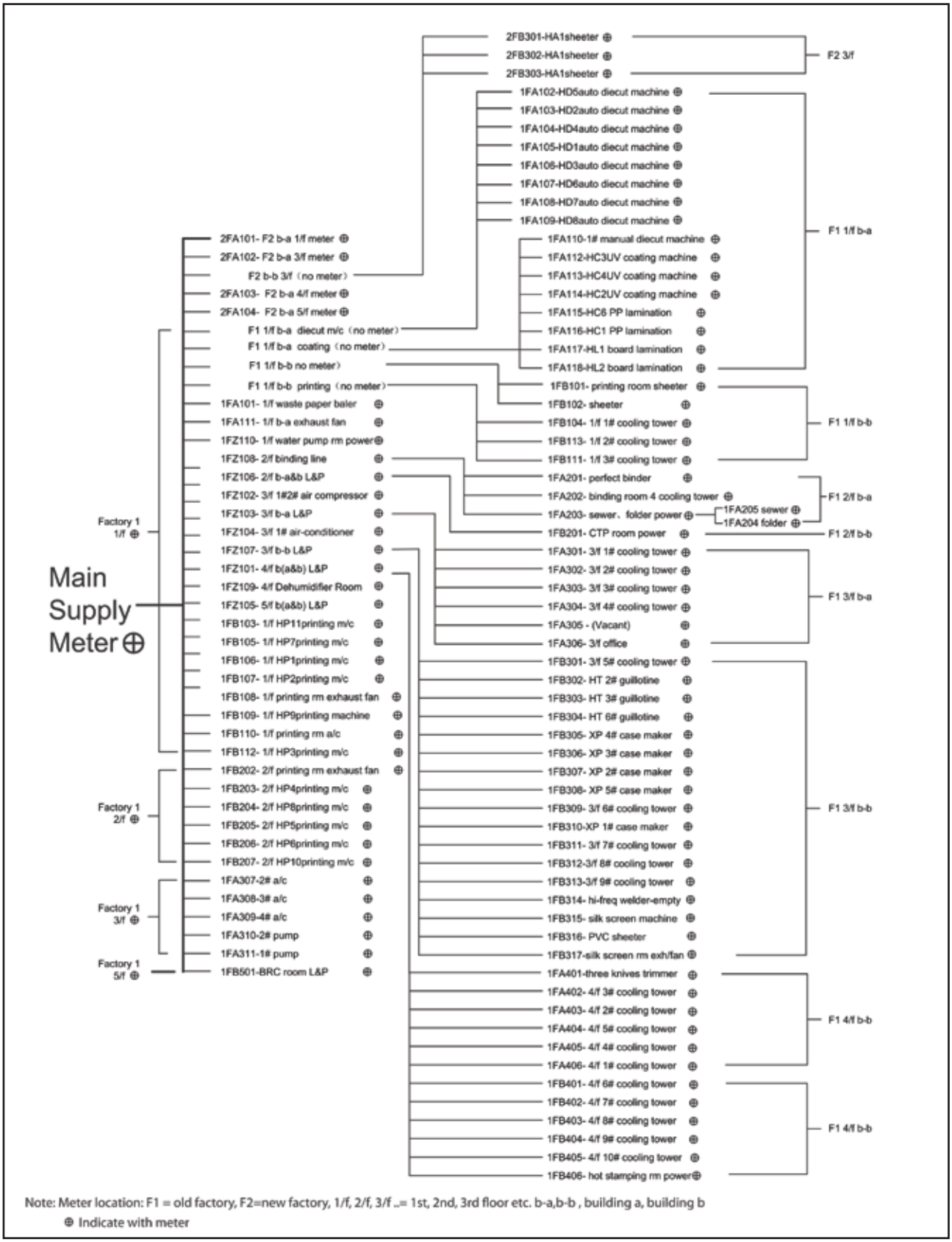
Approximate Reduction In Energy Usage By Category

	2010		2012			
		kWh /1000pcs OUTPUT Rate		kWh /1000pcs OUTPUT Rate	% Reductionin Energy Usage	Approximate reductionin Energy Usage if 2010 rate and 2012 outputkWh
Total energy consumed in Factory (KwH)	7,509,600		9,538,800			
Total output 1000 pcs	133,381		202,496			
Total		**56.3**		**47.10**	**16.3**	**1,900,000**
Machinery		30.97		29.20	**5.7**	**360,000**
Air Conditioning		11.26		8.48	**24.7**	**560,000**
Lighting and Power		7.88		5.18	**34.3**	**550,000**
Facilities		6.19		4.24	**31.5**	**390,000**

Appendi 8

Sub Meter Layout

Heshan Electricity Meters Layout



Note: Meter location: F1 = old factory, F2=new factory, 1/f, 2/f, 3/f ..= 1st, 2nd, 3rd floor etc. b-a,b-b , building a, building b

⊕ Indicate with meter

Appendix 9

Total Projects Undertaken In 2011 and 2012

HeShan Eco Printing Project

Item	Item Name/Description	Energy Saving Info	Investment	Payback Period	Remarks
1	Replace 14 units air ventilation system for staff canteen	New air ventilation system saves electricity consumption with same effect as air cond (8*3.5kw (air-cond)- 14* 1.1kw (new fans) - 2* 0.75(water curtain))* 5 hr per day * 300 day = 16650 kwh per yr * 0.74 per kwh = saving of 12,321 RMB/yr . Room temperature reduced around 3 - 5°C	3750 * 14 (ventilation) + 9,000 * 2 (water curtain) = 70,500	>5 years	ROI = 70,500/12,321
2	Upgrade 12 units main air-conditioning system (Inverter)	Estimated saving of electricity consumption at 315,000 Kw/H per year each.	5000 * 12 = 60,000	< 1 year	8.75 Kw x 12 units x 10 hours x 300 days = 315,000 Kw/H
3	Installation of 24 units air exhaust system in production area	Saving electricity consumption approx 70% .Average loading reduced from 50 Kw to 15 Kw.	3750 * 24 = 90,000	< 1 year	50 - 15 = 40kw x 10hr / day * 300 day = 120,000kwh /year * 0.74 =88,000
4	Upgrade 30 units solar heating system at dormitory area	Estimated saving of electricity consumption at 202,500 Kw/H per year.(4.5 Kw x 30 units x 5 hours x 300 days = 202,500 Kw/H)	30 * 12,500 = 375,000	28 months	Each heat pump save around 4.5kw / hr compare to heater 202,500 * 0.74 = 149,850
5	Installation of 7,351 pieces energy saving T5 lighting at production area	Estimated saving of electricity consumption at 367,550 Kw/H per year. (7,351 pcs x (0.4 Kw / 24 hours) x 10 hours x 300 days = 367,550 Kw/H)	72 * 7351 = 529,272	2 years	T8 = 48w, T5=32W (48-32) = 16 * 24 around 400w/day
6	Installation of 1,000 pieces energy saving T5 lighting at dormitory area	Estimated saving of electricity consumption at 50,000 Kw/H per year.(1,000 pcs x (0.4 Kw / 24 hours) x 10 hours x 300 days = 50,000 Kw/H)	72 * 1000 = 72,000	2 years	50,000 * 0.74 = 37,000

Appendix 9 (Continued)

Total Projects Undertaken In 2011 and 2012

HeShan Eco Printing Project

Item	Item Name/Description	Energy Saving Info	Investment	Payback Period	Remarks
7	nstallation of 126 electricity sub-meter in production area/machinery	Monitoring electricity consumption of production machinery and analyze possibility of energy saving plan.	150 * 126 = 18,900	N.A.	
8	Replace alcohol based damping solution with non-alcoholic solution in printing department	To reduce VOC emission, average saving of 20,000 litres alcohol per month.	N.A	N.A	
9	Installation of water sub-meter at staff canteen and production area	Monitoring water consumption and analyze possibility of water saving plan.	100* 15 = 1,500	N.A	
10	Installation of rain water collection tank	360 cubic meter of rain water was consumed for gardening and external floor cleaning from Mar to Sep 2013	N.A	N.A	

The total annual saving of the projects is around 1,000,000kWh,around 10% of total energy consumed in 2012 (9.5million kWh).

Appendix 10

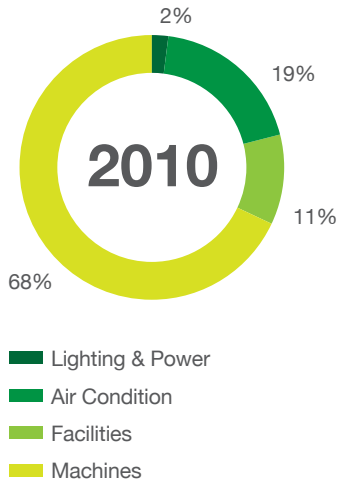
Recorded Energy usage by category

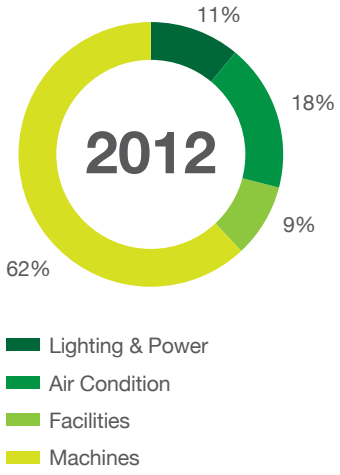
Document #	Year 2010	Year 2012	% improve
Total lighting & power kWh	146,960	1,088,640	
Total air Cond kWh	1,452,860	1,729,530	
Total facilities kWh	849,520	805,560,	
Machine kWh	5,060,260	5,915,070	
Lighting & power / K pcs (kWh)	1.05	5.21	-490%
Air condition / K pcs (kWh)	10.41	8.28	20%
Facilities / K pcs (kWh)	6.08	3.86	36.5%
Machines / K pcs (kWh)	36.26	28.34	21%
Prod / K pcs (kWh)	53.81	45.70	15%

NB THERE WERE NO SUB METERS ON LIGHTING

Appendix 10 (Continued)

Recorded Energy usage by category

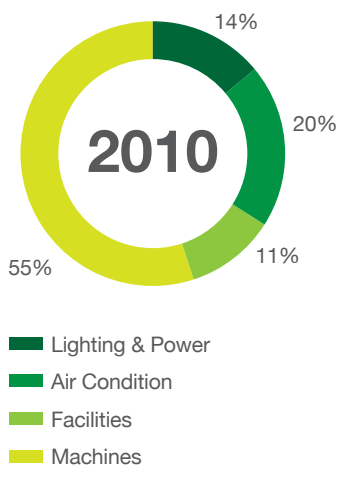


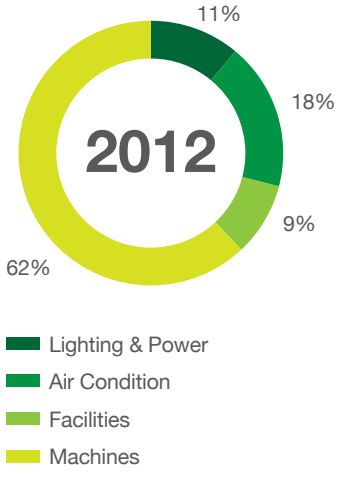


2010 table showed lighting & power consumed a far smaller proportion of the total usage than in 2012. This is due to the fact that no sub-meters were installed for lighting.

More accurate percentages are illustrated below.

Proportion of electricity usage





The reduction in the three categories demonstrated the achievement of our improvement project.