Green Production Assessment Scheme for Plastic Bag Manufacturing Industry

塑料袋業之綠色生產評估計劃

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此刊物乃香港特別行政區政府工業貿易署中小企業發展支援基金撥款資助之「推動與實踐有關塑料薄膜包裝之生命周期的綠色環保概念與技術」項目的其中一項成果。此刊物及相關活動上（或項目小組成員）提供的任何意見、研究成果、結論或建議，並不代表香港特別行政區政府、工業貿易署及中小企業發展支援基金評審委員會的觀點。

Foreword

"Solid Waste Reduction" is one of the hottest topics in the territory recently. The production rate of solid waste is now at an unacceptable level that the landfills in Hong Kong will be filled up in 6 to 10 years. Out of the many different kinds of solid waste, plastic shopping bags and packaging are regarded as extraordinarily harmful substances to our environment. Voices for banning the free distribution of plastic bags and levying taxes to deter their uses are all around. Usage and production of plastic bag become highly concerned issues in the world as well. International communities have actively set up measures to reduce plastic bag waste. Several countries have already enforced taxes on plastic bag in the hope to reduce the plastic bag consumption while encourage the recycling.

Everything seems to go right. However, there are some occasions where plastic bag and film packaging are unavoidable. "Problems" still exist. The Government has taken some measure in dealing with the disposal and recycling of plastic bag and film packaging products. However, not much effort has been paid to work with the "root" cause of the problem, i.e. the design and the production of these products. The industry now faces a crisis that has never existed. In order to deal with this challenge, plastic film packaging manufacturers have to step forward to adopt the green design and production concepts for their industry.

To assist the industry to understand plastic bag ecodesign and green production concepts as well as the technical requirements, and to foster a positive image towards plastic bag production, Hong Kong Plastic Bag Manufacturers' Association, cooperated with Hong Kong Productivity Council, applied and was successfully granted the SME Development Fund to run the project "To promote and adopt environmental friendly concepts and technologies for the life cycle of plastic film packaging". The project aims to research advanced environmental friendly technologies, concepts and practices regarding the production of plastic film packaging and define a set of green assessment criteria concerning the whole plastic bag production cycle. The criteria were defined regarding to 4 categories: Energy Management, Noise Pollution, Management System and Product Design. The assessment scheme aims to credit the efforts the industry has put to improve green product development and production. It also aims to identify the weaknesses of the industry in these areas. Hong Kong Plastic Bag Manufacturers' Association will decide whether to present a Green Certificate to the audited company based on the assessment results.

On-site auditing of 5 representing companies from the industry were carried out to identify the advanced technologies and operation practices that are feasible for the industry and to develop guidelines focusing on 4 categories: energy management, noise pollution, management systems and product design such that they were able to revise their management practices to a more environmentally friendly level in response to the stringent environmental protection obligations as well as the social responsibility requirements demanded by various regulatory or voluntary bodies in Hong Kong, Mainland China and overseas.

A set of 2 guidebooks that feature all the technical issues about the green production assessment scheme of the plastic film packaging, and recommendation and advice on possible measures to achieve green design and production was published. Guidebook 1 details all the technical issues about the green production assessment scheme and Guidebook 2 focuses on industry green production analysis, technology and "best operation practices".

We would like to thank the Hong Kong Plastic Bag Manufacturers' Association and the participated pilot companies for their kind consent to support the pilot run. We also wish that, through this assessment scheme, the Hong Kong plastic bag manufacturing industry could enhance their competitiveness by continuously identifying their weaknesses and adopting the "best operation practices".

前言

「減少固體廢物」是近年本地其中一個最熱門的話題。現時本港固體廢物的產生速度，已達致不能接受的水平，香港的堆填區將會在6至10年內填滿。因此，政府的首要工作是訂立一套可行的解決方案。在芸芸眾多的固體廢物中，塑料購物袋和包裝材料被認定為對環境異常有害的物質。「反對免費派發膠袋」以及「徵收膠袋稅」之聲絡驛不絕，希望藉此起阻嚇作用。加上全球環保意識日漸提高，國際社會對塑料袋的製造與應用日益關注，很多國家已經積極地採取措施，以冀減少塑料袋廢物，多個國家已開始強制徵收膠袋稅，希望大眾減少濫用膠袋，並鼓勵回收循環再造。

所有行動似乎理所當然。但是，在現實生活中，總有些情況是無可避免地要使用塑料袋及塑料薄膜包裝材料。這個問題依然存在。另外，現時政府已在塑料袋或塑料薄膜產品的棄置及回收方面推行改善措施。但是，在針對這些問題的根本成因，即產品設計及生產方面，則著墨不多。業界正面臨一個從未出現過的危機。為了應付這種挑戰，塑料袋及包裝製造商必須向前踏出一步，採納綠色環保設計及生產等概念。

為幫助業界更了解塑料袋環保設計及生產的理念及技術上的考慮，及改變大眾對塑料袋固有的印象，香港塑料袋業廠商會聯同香港生產力促進局早前已申請並成功獲得中小企業發展支援基金撥款資助開展了一個名為“推動與實踐有關塑料薄膜包裝之生命周期的綠色環保概念與技術”的項目。這個計劃旨在對環球市場上出現的一些綠色生產先進技術、概念及典範運作模式進行研究及參考，並訂立一套涵蓋整個塑料袋和包裝的生命週期的綠色生產評估系統，作為本地塑料薄膜包裝生產商進行專業評估的指標。量度指標包括: 能源管理、噪音污染、管理系統及產品設計，目的是讚揚業界在綠色開發和生產的表現及協助業界找出不足之處。香港塑料袋業廠商將會跟據評審結果決定是否頒予綠色認証。

計劃中為本地5間具代表性的公司進行先導審核，藉此鑑別出業界可行的技術及運作方案，以及編制一套針對能源管理、噪音污染、管理系統及產品設計四方面的通用守則，以協助他們將其管理運作提昇至更環保的水平，令本地塑料薄膜包

裝製造商更有能力應對本地、中國大陸和海外各監管或志願機構的嚴格環境保護規條和社會責任。

計劃並將所有關於塑料薄膜包裝綠色生產評估計劃的技術性資料、本地業界的現況分析、達致綠色設計及生產可行方案的建議等，整理結集成一套兩本的手冊供業界參考。手冊一內將詳列了綠色生產評估的評審資料，手冊二內則詳列了本地業界的現況分析、技術及『最佳運作典範』等。

我們在此鳴謝香港塑料袋業廠商會及參與計劃的先導公司的支持，謹希望香港的塑料袋業能夠善用此綠色生產評估計劃，找出弱點，並應用『最佳運作典範』來提升競爭力。

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Benchmarking Model

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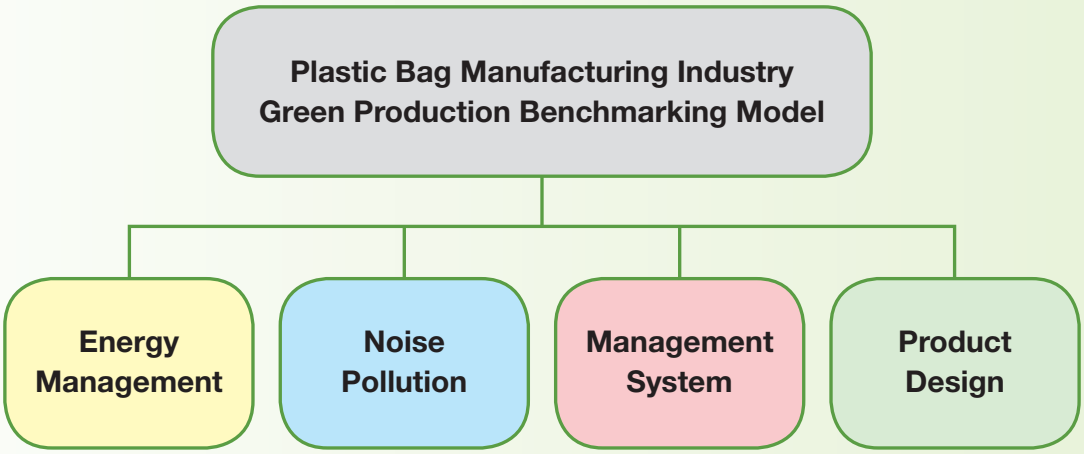
Benchmarking Model

Benchmarking is essentially a process of measuring and comparing operational efficiency and effectiveness across companies and industries. Through continuously comparing with the business process with the world leading companies, operation improvement information will be obtained. The objective is to learn from the most successful companies and find the "Best Practices" that lead to the excellence and continuous improvement.

1.1 The Four-Category Model

The "Green Production Assessment Scheme for plastic bag manufacturing industry" adopts a specially designed benchmarking model to assess the plastic bag manufacturing companies. A set of green assessment criteria concerning the whole plastic bag production cycle has been defined regarding to 4 categories: Energy Management, Noise Pollution, Management System and Product Design. The assessment scheme aims to assist the companies to understand their environmental performance, identify their strengths and weaknesses and define appropriate strategies for continuous improvement.



1.2 Categories Definition and Relation

The model is divided into 4 categories composing of 9 key performance indicators (KPIs) which represent the key concerns of green production for the plastic bag and film packaging industry as follows:

- **Category 1 - Energy Management** is the outcome which reflects the overall efficiency in energy consumption. In order to conserve and sustain a green environment, the efficient use of energy makes a significant contribution in this direction, ensuring both the wiser use of the world's resources and the generation of less pollution in the production of energy.
  - KPI-1 Critical Process Energy Consumption (kWh/kg)
  - KPI-2 Workshops Specific Energy Consumption (kWh/kg)
  - KPI-3 Office Energy Consumption (kWh/m²/annum)
- **Category 2 - Noise Pollution** is a direct measure on the noise level of a manufacturing plant. The bottom line is that the noise produced does not affect the environment around.
  - KPI-4 Noise Level (dB)
- **Category 3 - Management System** reflects the degree of commitment or comprehensiveness of a company's management standards towards the environment.
  - KPI-5 Environmental Management System Standards
- **Category 4 - Product Design** measures the efforts a company put in to develop more environmentally friendly products. To determine if a product is environmentally friendly, we have to look into the whole product life cycle including material selection, production, packaging, transportation, usage and disposal.
  - KPI-6 Resin
  - KPI-7a Printing Inks and Solvents – RoHS Compliance
  - KPI-7b Printing Inks and Solvents – Volatile Organic Compound (VOC) Contents
  - KPI-8 Resin Consumption Reduction
  - KPI-9 Design Methodology (for ODM & OBM products)

Chapter 2

KEY PERFORMANCE INDICATORS (KPIs)

Chapter 2

KEY PERFORMANCE INDICATORS (KPIs)

As refer to Chapter 1-1.2, there are a total of nine key performance indicators. They are individually numbered under each category as summarized in Figure 2.1.

There may be more specific performance indicators for measuring a company's environmental related performance. The selected performance indicators in this model are only part of the possible indicators which are considered as critical, minimum, basic and useful for comparison among different companies.

Figure 2.1 Plastic Bag Manufacturing Industry
Green Production Benchmarking Model Key Performance Indicators

Category 1 - Energy Management

- KPI-1 Critical Process Energy Consumption (kWh/kg)
- KPI-2 Workshops Specific Energy Consumption (kWh/kg)
- KPI-3 Office Energy Consumption (kWh/m²/annum)

Category 2 - Noise Pollution

- KPI-4 Noise Level (dB)

Category 3 - Management System

- KPI-5 Environmental Management System Standards

Category 4 - Product Design

- KPI-6 Resin
- KPI-7a Printing Inks and Solvents – RoHS Compliance
- KPI-7b Printing Inks and Solvents – Volatile Organic Compound (VOC) Contents
- KPI-8 Resin Consumption Reduction
- KPI-9 Design Methodology (for ODM & OBM products)

2.1 Performance Grading System

This plastic bag manufacturing industry green production benchmarking model is an industrialized model. "Grade 0" is the poorest practice while "Grade 5" is considered as the world's best industrial standard. Considerations should be taken for errors in data capturing and therefore the auditor should exercise his/her professional judgement in determining the most appropriate grade if the data fall between two grades.

2.2 Definitions of Key Performance Indicators

Category 1 - Energy Management

The indicators inside this category evaluate the efficiency of energy consumption inside the factory.

- **KPI-1 Critical Process Energy Consumption (kWh/kg)**
  - Film extrusion is considered to be the critical energy consumption process in plastic bag manufacturing.
  - This indicator serves to compare if energy is used in an efficient way in the film extrusion process.

  - ***Scope***

    Only energy consumptions in the immediate past 12-month period of ***PP and PE film extrusion machines*** are taken into account.

  - ***Performance Grading Reference***
    - *"2005 European Benchmarking Survey of Energy Consumption and Adoption of Best Practice"*, supported by the EU Commission under the Intelligent Energy-EU Programme, suggests that the theoretical minimum for specific energy consumption can be arrived by examining the energy required to melt a polymer and raise its temperature to the processing temperature. For polyolefins, this figure is around ***0.2 kW/kg/hr***, and for high temperature polymers such as polyaromatics and some nylons, this rises to ***0.4 kW/kg/hr***. We should therefore expect the minimum range of machine specific energy consumption 'M-SEC' to be approximately ***0.2-0.4 kW/kg/hr***.

Formula	**z (kWh/kg)** **= Machine Specific Energy Consumption (M-SEC)** **= x/y** where x (kWh) = Power used in film extrusion machine y (kg) = Total kg of PP/PE film produced per hour	
Performance Grading	**Grade** 0 1 2 3 4 5	**Rating** >2.45 >1.89 & ≤2.45 >1.33& ≤1.89 >0.76 & ≤1.33 >0.2 & ≤0.76 ≤0.2

- **KPI-2 Workshops Specific Energy Consumption (kWh/kg)**

  — Other than extrusion, workshops consume energy in their overheads, e.g. auxiliary equipment, lighting, ventilations.

  — This indicator serves to compare if energy is used efficiently in other related plastic bag production workshops, i.e. except for plastic extrusion.

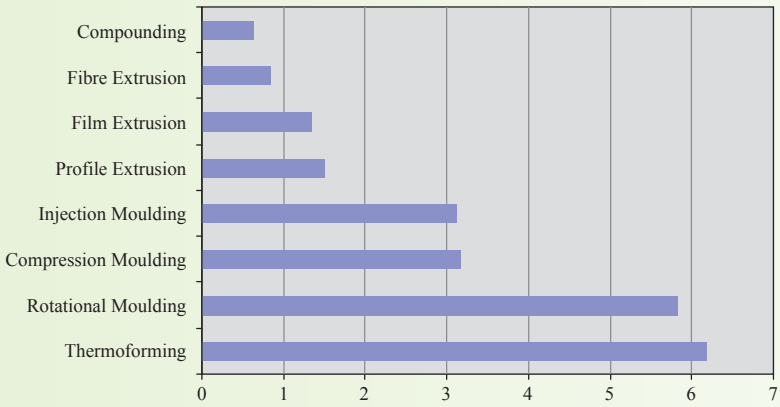
  - ***Scope***

    This indicator takes into account all the energy consumed in other ***plastic bag production related processes workshops***, including auxiliary equipment, lighting and general site services in the immediate past 12-month period.

  - ***Performance Grading Reference***

    — *"2005 European Benchmarking Survey of Energy Consumption an Adoption of Best Practice"* supported by the EU Commission under the Intelligent Energy-EU Programme, states that the average site-specific energy consumption for film extrusion process is ***1.346kW/kg/hr***.
    (Source: http://www.eurecipe.com/Final_Project_Results.pdf)

Average specific energy consumption (kW/kg/hr)



Business Type	*Average SEC kW/kg/hr*
Thermoforming	6.179
Rotational Moulding	5.828
Compression Moulding	3.168
Injection Moulding	3.118
Profile Extrusion	1.506
Film Extrusion	1.346
Fibre Extrusion	0.850
Compounding	0.631
Overall Average	2.811

Formula	**z (kWh/kg)** **= Workshop Specific Energy Consumption W-SEC** **= x/y** where x (kWh) = Total Power used in plastic bag production related processes workshop in immediate past 12-month period y (kg) = Total tonnage of product produced in 12-month period	
Performance Grading	**Grade** 0 1 2 3 4 5	**Rating** >2.4 >2.0& ≤ 2.4 >1.6 & ≤ 2.0 >1.2 & ≤ 1.6 >0.8 & ≤ 1.2 ≤ 0.8

KPI-3 Office Energy Consumption (kWh/m²/annum)

— Although offices normally consume less energy than production workshops, if everyone can do a little bit more, much energy can be saved.

— This indicator serves to compare if energy is used efficiently in the office areas.

Scope

This indicator takes into account all the energy consumed in ***all offices in the factory*** in the immediate past 12-month period.

◆ ***Performance Grading Reference***

— *"Consultancy Study on the Development of Energy Consumption Indicators and Benchmarks for Selected Energy-consuming Groups in Hong Kong"* supported by the Electrical and Mechanical Services Department, HKSAR indicates that "Tenant Units for Central Air-conditioning Buildings" consume a median of ***112.5 kWh/m ² /annum***.
(Source: http://www.emsd.gov.hk/emsd/e_download/pee/esab.pdf)

The 10th , 30th , 50th , 70th and 90th percentile benchmarks (in kWh/m^2/annum) are :				
10th	30th	50th	70th	90th
53.3	84.0	112.5	133.5	160.6

Formula	**z (kWh/m ² /annum)** **= Office Overhead Energy Consumption/unit floor area** **= x/y** where x (kWh) = Total energy consumed in all offices in the immediate past 12-month period y (m ²) = Total unit office floor area	
Performance Grading	**Grade** 0 1 2 3 4 5	**Rating** >210 >180 & ≤ 210 >140 & ≤ 180 >100& ≤ 140 > 60 & ≤ 100 ≤ 60

Category 2 – Noise Pollution

This category serves to measure the noise level of the plastic bag production plant to see if it affects the environment.

KPI-4 Noise Level (db)

— This indicator assess the noise level of the manufacturing plant in accordance with GB 12349-90《Method of measuring noise at boundary of industrial enterprises》and GB 12348-90 《Standard on noise from industrial enterprise sites》.

- ***Scope***

  This indicator takes into account the noise level of the ***whole manufacturing plant***.

- ***Performance Grading Reference***

  — The measurement method is made reference to GB 12349-90《Method of measuring noise at boundary of industrial enterprises》and the performance grading has made reference to GB 12348-90 《Standard of noise from industrial enterprise sites》. The locating district of the manufacturing plant would be considered as well when setting the performance grading.

Formula	Measure the average noise level (db) 1 meter outside the factory parameter at a height of 1.2m adjusted for background noise	
Performance Grading	**Grade**	**Rating**
	0	>70
	1	>65 & ≤ 70
	2	>60 & ≤ 65
	3	>55 & ≤ 60
	4	> 50 & ≤ 55
	5	≤ 50

Category 3 - Management System

This category serves to look at the measures and efforts a company puts in for environmental manufacturing management. Industry norms have been established in these areas.

KPI-5 Environmental Management System Standards

— This indicator measures a company's degree of applying environmental management practices or standards.

— Adoption of international recognized environmental management standard is well accepted as an independent and objective measure of the environmental management level of a company.

Scope

This indicator takes into account the management system standards implemented in the ***whole factory*** in the immediate past 12-month period.

Performance Grading Reference

— Upon the discussion among the assessment committee, companies adopted the internationally recognized ISO 14000 environmental management standard should be considered to be up to the industrial norm. While for those not yet been certified, their efforts put on setting up and implementation of "Green Procurement Policy" and "Environmental improvement program(s)", etc., will also be recognized.

Formula	Check the degree of achievement	
Performance Grading	**Grade**	**Rating**
	0	None
	1	Set up and implement "Green Procurement Policy"
	2	Set up and implement "Green Procurement Policy "+ "Environmental improvement program (s)"
	3	ISO 14000 in place but not yet certified
	4	ISO 14000 certified
	5	ISO 14000 certificated + other environmental management standard(s) in place or certified (e.g. follow ISO 14062 or QC080000 certified)

Category 4 – Product Design

This category serves to measure if there are enough considerations on material selection and life cycle impacts on the environment at the product design stage.

KPI-6 Resin

— Resin is the major material of a plastic bag. This indicator measures if the company has considered the environmental issues when selecting materials.

— When selecting green resins, the following criteria are identified as most critical:

- RoHS compliance or equivalent
- Renewable materials (e.g. PHA, PLA)
- Degradable (Bio-/Photo-/Hydro-/Oxo-degradable)

Scope

The criteria below take into account ***only the resins used in PP and PE plastic bag production*** in the immediate past 12-month period.

Performance Grading Reference

— Upon the discussion among the assessment committee, it is consented that companies should use RoHS (Restriction of Hazardous Substances) or equivalent compliance resin to ensure the contents of the following six substances are restricted to certain limit:

- Lead (Pb) (1000 ppm)
- Mercury (Hg) (1000 ppm)
- Cadmium (Cd) (100 ppm)
- Hexavalent chromium (Cr^{6+}) (1000 ppm)
- Polybrominated biphenyls (PBB) (1000 ppm)
- Polybrominated diphenyl ether (PBDE) (1000 ppm)

— The committee also encourages the production of renewable and degradable products to reduce the solid wastes that cause damages to the environment.

Formula	Check the degree of achievement	
Performance Grading	**Grade**	**Rating**
	0	Resins are not RoHS Compliance or equivalent; no Renewable material application & no Degradable material application
	1	>60% Resins are RoHS Compliance or equivalent; no Renewable material application & no Degradable material application
	2	≥ 70% Resins are RoHS Compliance or equivalent; no Renewable material application & no Degradable material application
	3	≥ 80% Resins are RoHS Compliance or equivalent; >0% Resins are Renewable materials OR ≥ 5% Resins of the remaining (less Renewable materials) is Degradable materials
	4	100% Resins are RoHS Compliance or equivalent; ≥ 15% Resins are Renewable materials OR ≥ 50% Resins of the remaining (less Renewable materials) are Degradable materials
	5	100% Resins are RoHS Compliance or equivalent; ≥ 50% Resins are Renewable materials OR ≥ 75% Resins of the remaining (less Renewable materials) are Degradable materials

- **KPI-7a Printing Inks and Solvent – RoHS Compliance**

  — The major concern over printing inks is its content of hazardous substance.

  — When selecting green materials, the following criterion is identified as one of the most critical:

  - RoHS Compliance or equivalent

◆ ***Scope***

The criterion below takes into account ***only the printing inks and solvents used in PP and PE plastic bag production*** in the immediate past 12-month period.

◆ ***Performance Grading Reference***

— Upon the discussion among the assessment committee, it is consented that companies should use RoHS (Restriction of Hazardous Substances) or equivalent compliance printing inks and solvents to ensure the contents of the following six substances are restricted to certain limit:

- Lead (Pb) (1000 ppm)
- Mercury (Hg) (1000 ppm)
- Cadmium (Cd) (100 ppm)
- Hexavalent chromium (Cr^{6+}) (1000 ppm)
- Polybrominated biphenyls (PBB) (1000 ppm)
- Polybrominated diphenyl ether (PBDE) (1000 ppm)

Formula	Check the degree of achievement	
Performance Grading	**Grade**	**Rating**
	0	Inks and solvents are not RoHS Compliance or equivalent
	1	≥ 60% Inks and solvents are RoHS Compliance or equivalent
	2	≥ 70% Inks and solvents are RoHS Compliance or equivalent
	3	≥ 80% Inks and solvents are RoHS Compliance or equivalent
	4	≥ 90% Inks and solvents are RoHS Compliance or equivalent
	5	100% Inks and solvents are RoHS Compliance or equivalent

KPI -7b Printing Inks and Solvent – Volatile Organic Compound (VOC) Contents

— One of the major concerns over printing inks and solvents is its content of VOC.

— When selecting green materials, the following criterion is identified as one of the most critical:

- VOC contents

Scope

The criteria below take into account ***only the printing inks and solvents used in PP and PE plastic bag production*** in the immediate past 12-month period.

Performance Grading Reference

— Since the VOC problem has aroused worldwide concerns, different countries have set up regulations to restrict the VOC contents of different printing inks and solvents. Hong Kong government also issued ***"The Air Pollution Control Ordinance (Volatile Organic Compounds) Regulation"***. The regulation, effective from 1April 2007, is a measure that controls the VOC emissions from architectural paints/coatings, printing inks and selected consumer products. It is believed that the Mainland China will issue similar regulations in the near future.

— VOC Limits (expressed as grams of VOC per litre of printing ink in a ready to use condition) and effective dates for "The Air Pollution Control Ordinance (Volatile Organic Compounds) Regulation" regulated printing inks are listed as follows:

	Regulated Printing Inks	Max. Limits of VOC Contentand Effective Dates	
		1 Apr 2007	1 Jan 2009
1	Flexographic fluorescent ink	300	-
2	Flexographic ink non-porous substrate	300	-
3	Flexographic ink porous substrate	225	-
4	Letterpress ink	300	-
5	Lithographic ink (except heatset ink)	300	-
6	Gravure ink	-	300
7	Screen printing ink	-	400

— When defining the performance gradings, the committee therefore made reference to the above regulated limits to VOC contents. If the factory does not install any VOC removal system, the maximum average VOC contents accepted for printing inks and solvents are 400g/L.
(Source:http://www.epd.gov.hk/epd/english/environmentinhk/air/prob_solutions/files/Notification_letter.pdf)

Formula	Check the degree of achievement	
Performance Grading	**Grade**	**Rating**
	0	VOC contents of inks and solvents > 400g/L
	1	VOC contents of inks and solvents ≤ 400g/L
	2	VOC contents of inks and solvents ≤ 300g/L
	3	VOC contents of inks and solvents ≤ 200g/L
	4	VOC contents of inks and solvents ≤ 100g/L
	5	VOC contents of inks and solvents ≤ 1g/L

KPI-8 Resin Consumption Reduction

— When designing a green plastic bag, 3R concepts (Reduce/Reuse/Recycle) can be applied to save resources.

— The following methods are identified as some practical applications to reduce the use of virgin materials:

- Use of recycled resin
- Use of Calcium Carbonate ($CaCO_3$) as fillings
- Use of metallocene catalyst to improve the strength of plastic bag

Scope

The criteria below take into account ***all PP and PE plastic bag production related application*** of the company.

◆ ***Performance Grading Reference***

— Upon the discussion among the assessment committee, it is consented that the application of recycled resin is the most effective ways to reduce the use of virgin resin and Calcium Carbonate ($CaCO_3$) has been widely used by the industry. Therefore, when defining the performance grading, their application requirements are higher than that of metallocene catalyst.

Formula	Check the degree of achievement	
Performance Grading	**Grade**	**Rating**
	0	no recycled resin applications in products; no $CaCO_3$ applications in products AND no metallocene catalyst applications in products
	1	≥ 10% of products applied recycled resin AND > 0% of products applied $CaCO_3$ OR > 0% of products applied metallocene catalyst
	2	≥ 20% of products applied recycled resin AND ≥ 10% of products applied $CaCO_3$ OR ≥ 10% of products applied metallocene catalyst
	3	≥ 50% of products applied recycled resin AND ≥ 20% of products applied $CaCO_3$ OR ≥ 20% of products applied metallocene catalyst
	4	≥ 70% of products applied recycled resin AND ≥ 30% of products applied $CaCO_3$ OR ≥ 30% of products applied metallocene catalyst
	5	≥ 90% of products applied recycled resin AND ≥ 40% of products applied $CaCO_3$ OR ≥ 40% of products applied metallocene catalyst

KPI-9 Methodology (for ODM & OBM products)

— When designing a green plastic bag, applying some ecodesign tools or following some green certification guidelines helps the design team to consider all the environmental factors systematically and comprehensively.

— The following criteria are identified as most critical:

- Application of advanced ecodesign tools into product design, e.g.
  - — Ecodesign Checklist
  - — Philips Fast Five Checklist
  - — ABC Analysis
- Acquirement of Certification/ Green/ Biodegradable/ Compostable Marks
  - — Degradability/Compostability qualified by recognized standards (e.g. ASTM D6400/ EN13432 / DIN V 54900)
  - — HK Green Label Scheme – Product Environmental Criteria for Degradable Non-Food/Drink Containers and Non-Food Bags (GL-005-006)
  - — HK Green Label Scheme – Plastic bags for non-food products (GL-002-003)

Scope

The criteria below take into account of ***all ODM (Original Design Manufacturing) & OBM (Original Band Manufacturing) plastic bag products*** of the company in the immediate past 12-month period.

Performance Grading Reference

— Upon the discussion among the assessment committee, it is consented that ecodesign tools are new and advanced to the industry. And there are only a few of plastic bag products that have obtained green certificates or green marks around the world. Therefore, when defining the performance grading, their requirements are not that high. However, the committee still would like to make use of this KPI assessment to encourage the industry to improve their green product design ability that will lead the industry in the future.

Formula	Check the degree of achievement	
Performance Grading	**Grade**	**Rating**
	0	no Ecodesign tools applications AND no Green Certificates/Marks
	1	>0% of products applied Ecodesign tools AND No Green Certificates/Marks
	2	≥ 25% of products applied Ecodesign tools OR ≥ 0% of products obtained Green Certificates/Marks
	3	≥ 50% f products applied Ecodesign tools OR ≥ 5% of products obtained Green Certificates/Marks
	4	≥ 75% of products applied Ecodesign tools OR ≥ 10% of products obtained Green Certificates/Marks
	5	100% of products applied Ecodesign tools OR ≥ 20% of products obtained Green Certificates/Marks

Chapter 3

KPI CALCULATION METHOD

Chapter 3

KPI CALCULATION METHOD

KPI-1 Critical Process Energy Consumption (kWh/kg)

Please measure and fill in the following table for all the extrusion machines producing plastic bags. For the current measurement method, please refer to the guidelines below.

Machine	Annual Production Volume (Tones)	Voltage (V)	3-phase Current (I)	Power (kWh)	Throughput per Hour (kg/hr)
1					
2					
3					
4					
5					
6					

Method for measurement of 3-phase current and calculation of power consumption

Step 1	— Check the status of the Extrusion Machine and make sure that all heaters are 'ON'
Step 2	— Identify L1, L2 and L3 in the electric cabinet
Step 3	— Pick any 3 models, measure and record the voltage between L1 and N, L2 and N, L3 and N. Normally, the values should be 220V for a 3-phase powered machinery. — If all 3 measurements show 220V, then we can assume all models have a 220V voltage between the Live and the Neutral line. No further measurement on the voltage is needed.
Step 4	a) For models without "Ammeter" on the electric cabinet: — Measure and record the current of L1, L2 and L3 with a "rms clamp meter"[1]. — The power consumed can be obtained by (kWh): (L1 + L2 + L3) x 220V/1000 b) For models with "Ammeter" on the electric cabinet: — Simply record and "SUM UP" ALL ammeters readings. — The power consumed is obtained by: (Total Current * 380V)/1000
Step 5	***If there are more than 1 extruder on the machine*** a) For models without "Ammeter" on the electric cabinet: — Normally, the number of electric cabinet is equal to the number of extrusion screws on the extrusion machine. — For each electric cabinet, measure and record the current of L1, L2 and L3 with a "rms clamp meter"[1]. The current consumed by the machine is the sum of all currents in the electric cabinets. For the current of a particular Line, e.g. L1*, is obtained by summing the values of L1 in each individual cabinet. — The power consumed can be obtained by (kWh): (L1*+ L2* + L3*) x 220V/1000 b) For models with "Ammeter" on the electric cabinet: — Simply record and "SUM UP" ALL ammeters readings. — The power consumed is obtained by: (Total Current * 380V)/1000

[1] ***The correct use of a "rms clamp meter":***

Correct

Wrong

Calculation method for "Throughput per hour"

Check the total throughput of the day as recorded on the record sheet on the machine on the day of current measurement. ***Throughput per hour = (Total throughput of the machine/ total production hour)***

Example:

Machine	Annual Production Volume (Tones)	Voltage (V)	3-phase Current (I)	Power (kWh)	Throughput per Hour (kg/hr)	Critical Process Energy Consumption/ throughput (kWh/kg)
1	5000	220	16 18 16	11	50	0.22
2	8000	220	25 27 30	18.04	60	0.30
3	3000	220	20 24 22	14.52	50	0.29
4	6000	220	24 20 21	14.3	65	0.22
5	6000	220	22 26 24	15.84	45	0.35

Critical Process Energy Consumption/ throughput (kWh/kg)	=(0.22+0.30+0.29+0.22+0.35) /5 = 0.276

KPI-2 Workshops Specific Energy Consumption (kWh/kg)

Please fill in the following energy consumption data in the immediate past 12-month period for all other plastic bag production related workshops, i.e. except for plastic extrusion.

In the immediate past 12-month period	
PP & PE plastic bag total production volume (kg)	
Other plastic bag production related workshops (Please specify)	**Energy Consumption (kWh)**

Example:

In the immediate past 12-month period	
PP & PE plastic bag total production volume (kg)	12000000
Other plastic bag production related workshops (Please specify)	**Energy Consumption (kWh)**
Cutting Workshop	2,000,000
Post-processing Workshop	3,000,000
Testing Laboratory	1,000,000
Printing Workshop	6,000,000
Packaging Workshop	1,000,000
Recycling Workshop	60,000,000
Warehouse	500,000

PP & PE plastic bag total production volume (kg)	12,000,000
Total Energy Consumption (kWh)	73,500,000
Site-SEC (kWh/kg)	= 73,500,000 kWh/120,000,000 kg = 0.6125 kWh/kg

KPI-3 Office Energy Consumption (kWh/m²/annum)

Please fill in the following energy consumption data in the immediate past 12-month period for all the offices inside the factory.

In the immediate past 12-month period		
Offices (Please specify)	**Energy Consumption (kWh)**	**Floor Areas (m²)**

Example:

In the immediate past 12-month period		
Offices (Please specify)	**Energy Consumption (kWh)**	**Floor Areas (m²)**
1	20,000	250
2	30,000	300
3	50,000	450

Total Energy Consumption (kWh)	100,000
Total floor areas of the offices (m²)	1,000
Average energy consumption per square meter (kWh/ m²)	= 100,000 kWh/1,000 m² = 100 kWh/ m²

KPI-4 Noise Level (dB)

The company should provide the floor plan to the assessor in advance for the assessor to define the measurement points along the boundary of the manufacturing plant. On the on-site assessment day, the assessor will measure the noise level at the defined measurement points according to the measurement method detailed below:

Noise Measurement Form

Assessor : _____

Date : _____

Time : _____

Company Name:		**Locating district: (Pls circle)** district mainly for residential or education/ residential, business, industrial mixed district and business center/ industrial district / district besides arteries		
Remarks				
Measurement no.	**Time**	**Major source of noise**	**Noise level (dB)**	**Background Noise level (dB)**
Measurement point A				
Measurement point B				

Measurement point C				
Measurement point D				

Measurement method for noise level

i. According to the floor plan of the manufacturing plant, define the specific measurement points which are 1 meter away from each side of the factory boundary.

ii. Define the background noise measurement points which are 2 meters away from each specific measurement point at height of 1.2m.

iii. Measure and record the noise level (dB) at each specific measurement point and background noise measurement point every 5s for 8 times.

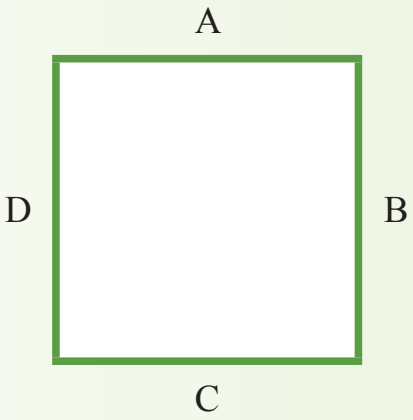
iv. Eliminate the highest and lowest records for each specific measurement point.

v. Calculate the average noise level (dB) for each specific measurement point. Then calculate the overall average noise level (dB).

vi. Background adjustment: Background noise level should be equal to or more than 10dB below that of the specific measurement point, otherwise the noise level of the specific measurement point will be adjusted according to:

Noise difference between background and measurement point (dB)	3	4-6	7-9
Specific point noise level adjustment	3	-2	-1

Example:



Company Name:		**Locating district: (Pls circle)** district mainly for residential or education/ residential, business, ~~industrial~~ mixed district and business center/ industrial district/ district besides arteries		
Remarks				
Measurement no.	**Time**	**Major source of noise**	**Noise level (dB)**	**Background Noise level (dB)**
Measurement point A				
A1	10:40	-	50	52
A2		-	55	49
A3		-	54	52
A4		-	62	50
A5		-	53	53
A6		-	49.5	51
A7		-	52	51
A8		-	54	52
Measurement point B				
B1		-	65	62
B2		-	60	62
B3		-	72	60
B4		-	64	64
B5		-	62	63
B6		-	57	58
B7		-	63	62
B8		-	64	61

Measurement point C				
C1		-	60	60
C2		-	55	58
C3		-	67	56
C4		-	59	58
C5		-	57	58
C6		-	52	55
C7		-	58	57
C8		-	59	58
Measurement point D				
D1		-	45	44
D2		-	40	45
D3		-	44	43
D4		-	52	41
D5		-	42	40
D6		-	37	43
D7		-	44	46
D8		-	43	47

Average noise level (dB)	Background average noise level (dB)	Noise level adjustment (dB)	Average noise level (dB)
Measurement point A			
53	51.3	-3	50
Measurement point B			
63	61.7	-3	60
Measurement point C			
58	57.6	-3	55
Measurement point D			
43	43.7	-3	40
Overall average noise level (dB)		= (50+60+55+40)/4 =52.5	

KPI-5 Environmental Management System Standards

Please state the implementation status of the environmental management system for the whole company in the immediate past 12-month period.

In the immediate past 12-month period	
Any Green Procurement Policies have been set up and implemented? If yes, please specify with example(s).	
Any Environmental Improvement Program(s) have been set up and implemented? If yes, please specify with example(s).	
Is your company certified with ISO –14000 environmental management system? If certified, certified date and certification no. are:	
Does your company implement any other environmental management systems? (e.g. ISO 14062, QC080000, etc.) If yes, the environmental management system is: If certified, certified date and certification no. are:	

Example:

In the immediate past 12-month period	
Any Green Procurement Policies have been set up and implemented? If yes, please specify with example(s).	Yes We have organized environmental improvement team in different departments. The teams have meeting each month to generate improvement ideas. Representative of each team will set up improvement plan and supervise the implementation. The progress will be presented to the management meeting every quarter.
Any Environmental Improvement Program(s) have been set up and implemented? If yes, please specify with example(s).	Yes
Is your company certified with ISO –14000 environmental management system? If certified, certified date and certification no. are:	Not yet We have learnt the requirements of the ISO –14000 environmental management system. Now, we are working with the consultants to prepare related documents and conduct trainings. It is expected the certification process will be carried out in March 2009.
Does your company implement any other environmental management systems? (e.g. ISO 14062, QC080000, etc.) If yes, the environmental management system is: If certified, certified date and certification no. are:	No

KPI-6 Resin

Please provide the resin usage data related to PP and PE plastic bag production in the immediate past 12-month period.

In the immediate past 12-month period				
Resins (PP, PE, Corn Starch, e.g. PLA, PHA)	Symbol	Weight (Tones)	Formula	Result (%)
Total resin usage amount	**x**		-	
Renewable materials (e.g. PHA, PLA)	**a1**		**a1/x**	
Residual amount less Renewable materials	**y**		**x-a**	
RoHS Compliance or equivalent resin	**a2**		**a2/x**	
Degradable material amount (Bio-/ Photo-/Hydro-/Oxo-degradable) (Base on Residual amount less Renewable materials)	**a3**		**a3/y**	

Example:

In the immediate past 12-month period				
Resins (PP, PE, Corn Starch, e.g. PLA, PHA)	Symbol	Weight (Tones)	Formula	Result (%)
Total resin usage amount	**x**	10,000	-	-
Renewable materials (e.g. PHA, PLA)	**a1**	500	**a1/x**	5
Residual amount less Renewable materials	**y**	99,500	**x-a**	95
RoHS Compliance or equivalent resin	**a2**	10,000	**a2/x**	100
Degradable material amount (Bio-/ Photo-/Hydro-/Oxo-degradable) (Base on Residual amount less Renewable materials)	**a3**	2,000	**a3/y**	21.05

KPI-7a Printing Inks and Solvent – RoHS Compliance

Please provide the printing inks and solvents usage data related to PP and PE plastic bag production in the immediate past 12-month period.

In the immediate past 12-month period				
	Symbol	**Amount**	**Formula**	**Result**
Total printing inks and solvents usage (L)	**x**		-	
RoHS Compliance or equivalent printing ink and solvents usage (L)	**b1**		-	
Percentage of RoHS Compliance (%)	-		**b1/x**	

Example:

In the immediate past 12-month period				
	Symbol	**Amount**	**Formula**	**Result**
Total printing inks and solvents usage (L)	**x**	10,000	-	-
RoHS Compliance or equivalent printing ink and solvents usage (L)	**b1**	3000	-	-
Percentage of RoHS Compliance (%)	-		**b1/x**	30%

KPI-7b Printing Inks and Solvent – VOC Content

Please provide the printing inks and solvents usage data related to PP and PE plastic bag production in the immediate past 12-month period.

In the immediate past 12-month period				
	Symbol	**Amount**	**Formula**	**Result**
Total printing inks and solvents usage (L)	**z**		-	
RoHS Compliance or equivalent amount (g)	**b2**		-	
VOC removal system efficiency	**b3**		-	
VOC content (g/L)	-		**b2(1-b3)/z**	

Example:

In the immediate past 12-month period				
	Symbol	**Amount**	**Formula**	**Result**
Total printing inks and solvents usage (L)	**z**	10,000	-	-
RoHS Compliance or equivalent amount (g)	**b2**	8,000,000	-	-
VOC removal system efficiency	**b3**	70%	-	-
VOC content (g/L)	-	-	**b2(1-b3)/z**	240g/L

KPI-8 Resin Consumption Reduction

Please provide the following production data related to PP and PE plastic bag in the immediate past 12-month period.

In the immediate past 12-month period				
	Symbol	Amount (Tones)	Formula	Result (%)
Total PP & PE plastic bag production volume	**x**		**-**	**-**
PP & PE plastic bags have applied recycled materials	**c1**		**c1/x**	
PP & PE plastic bags have applied $CaCO_3$	**c2**		**c2/x**	
PP & PE plastic bags have applied Metallocene catalyst	**c3**		**c3/x**	

Example:

In the immediate past 12-month period				
	Symbol	Amount (Tones)	Formula	Result (%)
Total PP & PE plastic bag production volume	**x**	80,000	**-**	**-**
PP & PE plastic bags have applied recycled materials	**c1**	50,000	**c1/x**	63
PP & PE plastic bags have applied $CaCO_3$	**c2**	40,000	**c2/x**	50
PP & PE plastic bags have applied Metallocene catalyst	**c3**	20,000	**c3/x**	25

KPI-9 Design Methodology (for ODM & OBM products)

If your company is a producer of ODM or OBM products, please provide the following data related to ODM and OBM PP and PE plastic bag product design and development in the immediate past 12-month period.

In the immediate past 12-month period				
	Symbol	Amount (No. of models)	Formula	Result (%)
ODM/OBM PP & PE plastic bags models	**x**		**-**	**-**
ODM/OBM PP & PE plastic bags models have applied Ecodesign Tools	**d1**		**c1/x**	
ODM/OBM PP & PE plastic bags models have obtained Green/ Biodegradable or Compostable Marks	**d2**		**c2/x**	

Example:

In the immediate past 12-month period				
	Symbol	Amount (No. of models)	Formula	Result (%)
ODM/OBM PP & PE plastic bags models	**x**	1000	**-**	**-**
ODM/OBM PP & PE plastic bags models have applied Ecodesign Tools	**d1**	30	**c1/x**	3
ODM/OBM PP & PE plastic bags models have obtained Green/ Biodegradable or Compostable Marks	**d2**	10	**c2/x**	1

Chapter 4

SITE ASSESSMENT CHECKLIST

Chapter 4

SITE ASSESSMENT CHECKLIST

4.1 General Guidelines

— All data should be extracted from the immediate past 12-month period unless specified.

— The assessment should be bounded to PP and PE plastic bag production related issues only unless specified.

— The submitted data should be endorsed by the responsible person and is traceable.

4.2 Specific Guidelines

Key Performance Indicators (KPIs)	Checked
■ **Category 1 - Energy Management**	
KPI-1 Critical Process Energy Consumption (kWh/kg)	
— Only extrusion machines for producing PP and PE films for plastic bag products will be included.	
— Onsite checking will be performed on energy consumption records or bills and production records.	
— 3 extrusion machines which have the highest throughput will be selected for the on-site measurement of their voltage (V), current (A) consumption and their throughput per hour (kg/hr). For detailed measurement and calculation methods, please refer to Chapter 5.	
KPI-2 Workshops Specific Energy Consumption (kWh/kg)	
— Only power consumption of related workshops for producing PP and PE plastic bag products will be assessed, i.e. except for extrusion workshop. For example, cutting workshop, post-processing workshop, testing laboratory, printing workshop, packaging workshop, recycling workshop, warehouse, etc.	
— Onsite checking will be performed on energy consumption records or bills and production records.	

KPI-3 Office Energy Consumption (kWh/m²/annum)	
— Power consumption of all the offices in the manufacturing plant is assessed.	
— Onsite checking will be performed on energy consumption records or bills and the floor area.	
■ **Category 2 - Noise Pollution**	
KPI-4 Noise Level (dB)	
— Only the manufacturing plant of the applicant company will be considered. Areas rented to other companies will not be counted.	
— The company should provide the floor plan to the assessor in advance for the assessor to define the measurement points along the boundary of the manufacturing plant.	
— If the outside of the manufacturing plant cannot be reached, then the background noise measurement point will be defined immediately to the parameter of the plant and specific measurement point should be defined 2m inwards of it. This should be marked on the record sheet for noise adjustment discussion if necessary. For detail measurement and calculation methods, please refer to Chapter 5.	
■ **Category 3 - Management System**	
KPI-5 Environmental Management System Standards	
Green Procurement Policy — Responsible person should provide clear description of the green procurement policy. — Supporting documents of the green procurement policy should be provided, e.g. green procurement guidelines, green guidelines to suppliers, supplier checking form, approved supplier lists, etc.	
Environmental Improvement Program — Responsible person should provide clear description of the stated environmental related improvement program(s). — Supporting documents of environmental improvement program(s) should be provided, e.g. internal circulars to staff, meeting minutes, improvement program reports, etc. — Onsite checking of the progress or deliverables of the improved areas will be conducted as well.	

Environment Management System — For non-certified environment management system, implementation documents should be provided, e.g. operation manual or procedures, working instructions and records. These should be provided to prove the system is in place. — For certified environment management system, relevant certifications issued by external authorities should be provided.	
■ **Category4 – Product Design**	
KPI-6 Resin	
— Supporting documents of total PP and PE consumption volume should be provided.	
RoHS Compliance or equivalent — Supporting documents of resin's RoHS Compliance or equivalent (e.g. EN71, heavy element composition certificates, etc) should be provided, e.g. supplier declaration, MSDS, etc.	
Renewable materials (e.g. PHA, PLA) application — Supporting documents of usage of renewable materials (e.g. PHA, PLA) should be provided, e.g. purchasing orders, usage, production records, etc.	
Degradable materials (Bio-/Photo-/Hydro-/Oxo-degradable) application — Supporting documents of amounts of degradable (Bio-/Photo-/Hydro-/Oxo-degradable) products produced should be provided, e.g. purchasing orders, usage, production records, etc. — If production records of degradable products cannot be provided: ● Usage records of degradable additives should be provided (a). ● Average percentage of degradable additives added into degradable plastic products should be provided (b%). ● Then the degradable products amount will be estimated by a/b%.	
KPI-7a Printing Inks and Solvent – RoHS Compliance	
RoHS compliance or equivalent — Supporting documents of printing inks and solvents' RoHS Compliance or equivalent (e.g. EN71, heavy element composition certificates, etc) should be provided, e.g. certificates, supplier declaration, MSDS, etc.	

KPI-7b Printing Inks and Solvent – Volatile Organic Compound (VOC) Contents	
VOC contents — Supporting documents of VOC contents of the printing inks and solvents should be provided, e.g. suppliers' declaration, MSDS, etc. — If supporting documents of VOC contents cannot be provided, the following will be assumed: • Printing inks: VOC = 800g/L • Solvents: VOC = 900g/L • Inks: Density = 1.14kg/L • Solvents: Density = 0.9kg/L	
KPI-8 Resin Consumption Reduction	
Recycled resin applications — Supporting documents of amounts of products that have applied recycled resin should be provided, e.g. purchasing orders, usage, production records, etc. — If production records of cannot be provided: • Usage records of recycled resin should be provided (a). • Average percentage of recycled resin added into products should be provided (b%). • Then the amounts of products have applied recycled resin will be estimated by a/b%.	
$CaCO_3$ applications — Supporting documents of amounts of products that have applied $CaCO_3$ should be provided, e.g. purchasing orders, usage, production records, etc. — If production records cannot be provided: • Usage records of $CaCO_3$ should be provided (a). • Average percentage of $CaCO_3$ added into degradable plastic products should be provided (b%). • Then the amounts of products have applied $CaCO_3$ will be estimated by a/b%.	

<u>Metallocene catalyst applications</u> — Supporting documents of amounts of products that have applied metallocene catalyst should be provided, e.g. purchasing orders, usage, production records, etc. — If production records cannot be provided: • Usage records of metallocene catalyst should be provided (a). • Average percentage of metallocene catalyst added into degradable plastic products should be provided (b%). • Then the amounts of products have applied metallocene catalyst will be estimated by a/b%.	
KPI-9 Design Methodology (for ODM & OBM products)	
— **ODM: Original design manufacturing –** involving in designing a product which ultimately will be branded by another firm for sale. (Plastic bag material formula design will also be considered) — **OBM: Original brand manufacturing -** involving in designing a product and branded themselves. (Plastic bag material formula design will also be considered)	
<u>Ecodesign tools applications</u> — Supporting documents of amounts of products have applied ecodesign tools such as Ecodesign Checklists, Philips Fast Five Checklist, ABC Analysis, etc. should be provided.	
<u>Green/ Biodegradable or Compostable Marks obtainment</u> — Supporting documents of the certificates or marks obtained should be provided. — Product sample should be provided for reference.	

Chapter 5

PERFORMANCE DATA SUMMARY SHEET

Chapter 5

PERFORMANCE DATA SUMMARY SHEET

Green Production Assessment Scheme
For Plastic Bag Manufacturing Industry

Assessor (s) : _____

Date of Assessment : _____

Category	Key Performance Indicator	Performance Grading					
		0	1	2	3	4	5
Category 1 - Energy Management	KPI-1 Critical Process Energy Consumption (kWh/kg)						
	KPI-2 Workshops Specific Energy Consumption (kWh/kg)						
	KPI-3 Office Energy Consumption (kWh/m²/annum)						
Category 2 - Noise Pollution	KPI-4 Noise Level (dB)						
Category 3 - Management System	KPI-5 Environmental Management System Standards						
Category 4 - Product Design	KPI-6 Resin						
	KPI-7a Printing Inks and Solvents – RoHS Compliance						
	KPI-7b Printing Inks and Solvents – Volatile Organic Compound (VOC) Contents						
	KPI-8 Resin Consumption Reduction						
	KPI-9 Design Methodology (for ODM & OBM products)						

Chapter 6

ASSESSMENT REPORT TEMPLATE

Chapter 6

ASSESSMENT REPORT TEMPLATE

[SAMPLE ONLY]

Hong Kong Productivity Council
香港生產力促進局

絕對保密
STRICTLY CONFIDENTIAL

ASSESSMENT REPORT

Plastic Bags Company Limited

Hong Kong Productivity Council
香港生產力促進局

DD.MM.YEAR

Manufacturing Technology Division

Table of Contents

I) Introduction

Background and Objective of Green Production Assessment Scheme for Plastic Bag Manufacturing Industry

II) Assessment Methodology

Background of Benchmarking and Key Performance Indicators

Table 2.1 Plastic Bag Manufacturing Industry
Green Production Benchmarking Model: Key Performance Indicators

Category 1 - Energy Management

- KPI-1 Critical Process Energy Consumption (kWh/kg)
- KPI-2 Workshops Specific Energy Consumption (kWh/kg)
- KPI-3 Office Energy Consumption (kWh/m²/annum)

Category 2 - Noise Pollution

- KPI-4 Noise Level (dB)

Category 3 - Management System

- KPI-5 Environmental Management System Standards

Category 4 - Product Design

- KPI-6 Resin
- KPI-7a Printing Inks and Solvents – RoHS Compliance
- KPI-7b Printing Inks and Solvents – Volatile Organic Compound (VOC) Contents
- KPI-8 Resin Consumption Reduction
- KPI-9 Design Methodology (for ODM & OBM products)

PERFORMANCE GRADING SYSTEM

Table 2.2 Green Production Benchmarking Model: Grading System

Key Performance Indicators	Grading	
KPI-1 Critical Process Energy Consumption (kWh/kg) z (kWh/kg) = Machine Specific energy consumption (M-SEC) = x/ y where x (kWh) = Power used in film extrusion machine y (kg) = Total kg of PP/PE film produced per hour Average M-SEC of PP&PE film extrusion machines = (z1+z2+…zN)/N	5	≤ 0.20
	4	>0.20 & ≤ 0.76
	3	>0.76 & ≤ 1.33
	2	>1.33 & ≤ 1.89
	1	>1.89 & ≤ 2.45
	0	>2.45
KPI-2 Workshops Specific Energy Consumption (kWh/kg) z (kWh/kg) = Workshop Specific Energy Consumption W-SEC = x/y where x (kWh) = Total Power used in plastic bag production related processes workshop in immediate past 12-month period y (kg) = Total tonnage of product produced in 12-month period	5	≤ 0.8
	4	>0.8 & ≤ 1.2
	3	>1.2 & ≤ 1.6
	2	>1.6 & ≤ 2.0
	1	>2.0 & ≤ 2.4
	0	>2.4
KPI-3 Office Energy Consumption (kWh/m²/ annum) = Office Overhead Energy Consumption/unit floor area = x/y where x (kWh) = Total energy consumed in all offices in the immediate past 12-month period y (m ²) = Total unit office floor area	5	≤ 60
	4	>60 & ≤ 100
	3	>100 & ≤ 140
	2	>140 & ≤ 180
	1	>180 & ≤ 210
	0	>210

KPI-4 Noise Level (dB) Measure the average noise level (dB) 1 meter outside the factory parameter at a height of 1.2m adjusted for background noise. Average noise level (dB) = (z1+z2+…zN)/N	5	≤ 50
	4	>50 & ≤ 55
	3	>55 & ≤ 60
	2	>60 & ≤ 65
	1	>65 & ≤ 70
	0	>70
KPI-5 Environmental Management System Standards The degree of achievement was checked against the grading system.	5	ISO 14000 certificated + other environmental management standard(s)
	4	ISO 14000 certified
	3	ISO-14000 in place
	2	"Green Procurement Policy"+ "Environmental improvement program (s)"
	1	"Green Procurement Policy"
	0	None
KPI-6 Resin The degree of achievement was checked against the grading system.	5	≥ 100% RoHS & ≥ 50% Renewable OR ≥ 75% Degradable
	4	≥ 100% RoHS & ≥ 15% Renewable OR ≥ 50% Degradable
	3	≥ 80% RoHS & ≥ 0% Renewable OR ≥ 5% Degradable
	2	≥ 70% RoHS & No Renewable & No Degradable
	1	>60% RoHS & No Renewable & No Degradable
	0	No RoHS & No Renewable & No Degradable

KPI-7a Printing Inks and Solvents – RoHS Compliance The degree of achievement was checked against the grading system.	5	100% RoHS
	4	≥ 90% RoHS
	3	≥ 80% RoHS
	2	≥ 70% RoHS
	1	≥ 60% RoHS
	0	No RoHS
KPI-7b Printing Inks and Solvents – Volatile Organic Compound (VOC) Contents The degree of achievement was checked against the grading system.	5	≤ 1
	4	≤ 100
	3	≤ 200
	2	≤ 300
	1	≤ 400
	0	>400
KPI-8 Resin Consumption Reduction The degree of achievement was checked against the grading system.	5	≥ 90% Recycled & ≥ 40% $CaCO_3$ OR ≥ 40% Metallocene
	4	≥ 70% Recycled & ≥ 30% $CaCO_3$ OR ≥ 30% Metallocene
	3	≥ 50% Recycled & ≥ 20% $CaCO_3$ OR ≥ 20% Metallocene
	2	≥ 20% Recycled & ≥ 10% $CaCO_3$ OR ≥ 10% Metallocene
	1	≥ 10% Recycled & ≥ 0% $CaCO_3$ OR ≥ 0% Metallocene
	0	No Recycled & No $CaCO_3$ & No Metallocene

KPI-9 Design Methodology (for ODM & OBM Products) The degree of achievement was checked against the grading system.	5	100% Ecodesign OR ≥ 20% Green Cert
	4	≥ 75% Ecodesign OR ≥ 10% Green Cert
	3	≥ 50% Ecodesign OR ≥ 5% Green Cert
	2	≥ 25% Ecodesign OR ≥ 0% Green Cert
	1	>0% Ecodesign & No Green Cert
	0	No Ecodesign & No Green Cert

ASSESSMENT PROCEDURE

Background and Detailed Assessment Procedures for On-Site Audit

III) Benchmarking Results and Recommendations

ON-SITE ASSESSMENT PROCESSES

Assessment Team: [Name of Assessors]

DD/MM/YY	Assessor A	Assessor B	Assessor C
10:00 – 10:30	**Opening Meeting** — Assessment scope, objectives and schedules were briefly introduced by the assessment team. — All department supervisors attended the meeting to understand the objectives and processes.		
10:30 – 12:00	**KPI-5 Environmental Management System Standards** — Findings and Comments **KPI-6 Resin** — Findings and Comments	**KPI-4 Noise Level** — Findings and Comments	**KPI-1 Critical Process Energy Consumption** — Findings and Comments

12:00 – 13:30	Lunch	
13:30 – 14:30	**KPI-7 a Printing Inks and Solvents - RoHS Compliance)** — Findings and Comments **KPI-7 b Printing Inks and Solvents – Volatile Organic Compound (VOC) Contents** — Findings and Comments	**KPI-3 Office Energy Consumption** — Findings and Comments
	KPI-8 Resin Consumption Reduction — Findings and Comments	
14:30 – 15:30	**KPI-9 Design Methodology (For ODM & OBM Products)** — Findings and Comments	**KPI-2 Workshops Specific Energy Consumption** — Finding and Comments
15:30 – 16:00	**Factory Tour**	
16:00 – 16:30	**Conclusion Meeting**	

CATEGORY 1 –ENERGY MANAGEMENT

Key Performance Indicators	Grading		Company Results	Local Industry Results[1]
KPI-1 Critical Process Energy Consumption (kWh/kg) z (kWh/kg) = Machine Specific energy consumption (M-SEC) = x/ y where x (kWh) = Power used in film extrusion machine y (kg) = Total kg of PP/PE film produced per hour Average M-SEC of PP&PE film extrusion machines = (z1+z2+…zN)/N	5	≤ 0.20		
	4	>0.20 & ≤ 0.76		Best
	3	>0.76 & ≤ 1.33		Avg.
	2	>1.33 & ≤ 1.89		
	1	>1.89 & ≤ 2.45		
	0	>2.45		

KPI-2 Workshops Specific Energy Consumption (kWh/kg) z (kWh/kg) = Workshop Specific Energy Consumption W-SEC = x/y where x (kWh) = Total Power used in plastic bag production related processes workshop in immediate past 12-month period y (kg) = Total tonnage of product produced in 12-month period	5	≤ 0.8		Best
	4	>0.8 & ≤ 1.2		Avg.
	3	>1.2 & ≤ 1.6		
	2	>1.6 & ≤ 2.0		
	1	>2.0 & ≤ 2.4		
	0	>2.4		
KPI-3 Office Energy Consumption (kWh/m²/annum) z (kWh/m2/annum) = Office Overhead Energy Consumption/ unit floor area = x/y where x (kWh) = Total energy consumed in all offices in the immediate past 12-month period y (m2) = Total unit office floor area	5	≤ 60		
	4	>60 & ≤ 100		
	3	>100 & ≤ 140		Best
	2	>140 & ≤ 180		
	1	>180 & ≤ 210		Avg.
	0	>210		

COMMENTS AND AREAS FOR IMPROVEMENT

[Comments on the assessment results and suggests improvement areas]

[1] *The industry results are based on the aggregate data collected during the audit to the 5 pilot companies which have joined the "Green Production Assessment Scheme" during May to July 2008.*

CATEGORY 2 – NOISE POLLUTION

Key Performance Indicators	Grading		Company Results	Local Industry Results[2]
KPI-4 Noise Level (dB) Measure the average noise level (dB) 1 meter outside the factory parameter at a height of 1.2m adjusted for background noise. Average noise level (dB) = (z1+z2+…zN)/N	5	≤ 50		
	4	>50 & ≤ 55		Best
	3	>55 & ≤ 60		Avg.
	2	>60 & ≤ 65		
	1	>65 & ≤ 70		
	0	>70		

COMMENTS AND AREAS FOR IMPROVEMENT

[Comments on the assessment results and suggests improvement areas]

CATEGORY 3 – MANAGEMENT SYSTEM

Key Performance Indicators	Grading		Company Results	Local Industry Results[3]
KPI-5 Environmental Management System Standards The degree of achievement was checked against the grading system.	5	ISO 14000 certificated + other environmental management standard(s)		
	4	ISO 14000 certified		Best
	3	ISO 14000 certified		
	2	"Green Procurement Policy"+ "Environmental improvement program (s)"		
	1	"Green Procurement Policy"		Avg. "Green Procurement Policy"
	0	None		

COMMENTS & AREAS FOR IMPROVEMENT

[Comments on the assessment results and suggests improvement areas]

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[2] The industry results are based on the aggregate data collected during the audit to the 5 pilot companies which have joined the "Green Production Assessment Scheme" during May to July 2008.

[3] The industry results are based on the aggregate data collected during the audit to the 5 pilot companies which have joined the "Green Production Assessment Scheme" during May to July 2008.

CATEGORY 4 – PRODUCT DESIGN

Key Performance Indicators	Grading		Company Results	Local Industry Results[4]	
KPI-6 Resin The degree of achievement was checked against the grading system.	5	≥ 100% RoHS & ≥ 50% Renewable OR ≥ 75% Degradable			
	4	≥ 100% RoHS & ≥ 15% Renewable OR ≥ 50% Degradable			
	3	≥ 80% RoHS & ≥ 0% Renewable OR ≥ 5% Degradable		Best	Avg.
	2	≥ 70% RoHS & No Renewable & No Degradable			
	1	> 60% RoHS & No Renewable & No Degradable			
	0	NonNo RoHS & No Renewable & No Degradablee			
KPI-7a Printing Inks and Solvents – RoHS Compliance The degree of achievement was checked against the grading system.	5	100% RoHS		Best	Avg.
	4	≥ 90% RoHS			
	3	≥ 80% RoHS			
	2	≥ 70% RoHS			
	1	≥ 60% RoHS			
	0	No RoHS			
KPI-7b Printing Inks and Solvents – Volatile Organic Compound (VOC) Contents The degree of achievement was checked against the grading system.	5	≤ 1			
	4	≤ 100			
	3	≤ 200			
	2	≤ 300			
	1	≤ 400			
	0	>400		Best	Avg.

KPI-8 Resin Consumption Reduction The degree of achievement was checked against the grading system.	5	≥ 90% Recycled & ≥ 40% $CaCO_3$ OR ≥ 40% Metallocene		Best
	4	≥ 70% Recycled & ≥ 30% $CaCO_3$ OR ≥ 30% Metallocene		
	3	≥ 50% Recycled & ≥ 20% $CaCO_3$ OR ≥ 20% Metallocene		Avg.
	2	≥ 20% Recycled & ≥ 10% $CaCO_3$ OR ≥ 10% Metallocene		
	1	≥ 10% Recycled & ≥ 0% $CaCO_3$ OR ≥ 0% Metallocene		
	0	No Recycled & No $CaCO_3$ & No Metallocene		
KPI-9 Design Methodology (for ODM & OBM Products) The degree of achievement was checked against the grading system.	5	100% Ecodesign OR ≥ 20% Green Cert		
	4	≥ 75% Ecodesign OR ≥ 10% Green Cert		
	3	≥ 50% Ecodesign OR ≥ 5% Green Cert		Best
	2	≥ 25% Ecodesign OR >0% Green Cert		Avg.
	1	>0% Ecodesign & No Green Cert		
	0	No Ecodesign & No green cert		

COMMENTS AND AREAS FOR IMPROVEMENT

[Comments on the assessment results and suggests improvement areas]

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[4] The industry results are based on the aggregate data collected during the audit to the 5 pilot companies which have joined the "Green Production Assessment Scheme" during May to July 2008.

III) OVERALL ANALYSIS [Sample Only]

OVERALL RESULTS AS COMPARED TO THE LOCAL INDUSTRY1

Industry Maximum **Company Result** **Industry Average**

Category	Key Performance Indicators	Results Comparison Chart
Category 1 - Energy Management	KPI-1 Critical Process Energy Consumption (kWh/kg)	4
		3
		3
	KPI-2 Workshops Specific Energy Consumption (kWh/kg)	5
		3
		4
	KPI-3 Office Energy Consumption (kWh/m²/annum)	3
		3
		1
Category2 - Noise Pollution	KPI-4 Noise Level (dB)	4
		3
		2
Category3 - Management System	KPI-5 Environmental Management System Standards	4
		3
		1
Category4 - Product Design	KPI-6 Resin	3
		3
		3
	KPI-7a Printing Inks and Solvents – RoHS Compliance	5
		3
		5
	KPI-7b Printing Inks and Solvents – Volatile Organic Compound (VOC) Contents	0
		0
		0
	KPI-8 Resin Consumption Reduction	5
		3
		3
	KPI-9 Design Methodology (for ODM & OBM Products)	3
		3
		2

STRENGTHS AND WEAKNESSES

[Summarize the overall strengths and weaknesses]

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[5] *The industry results are based on the aggregate data collected during the audit to the 5 pilot companies which have joined the "Green Production Assessment Scheme" during May to July 2008.*

第一章

典範借鑑模式

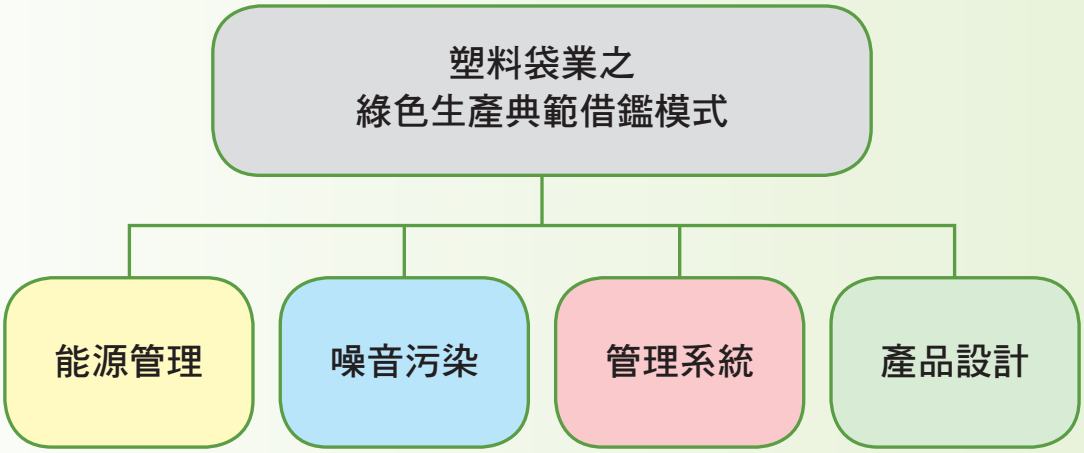
第一章

典範借鑑模式

『典範借鑑』是一項有系統、持續性的評估過程，透過不斷地將企業流程與世界上居領導地位之企業相互比較，以獲得協助改善營運績效的資訊，是量度及比較公司與行業之運作模式和效益的有效方法。其目的旨在向最成功的企業借鏡，尋找出「最佳運作」（Best Practices）能導向卓越成績的最佳方法，從而達到改進企業表現的目標。

第一節　四個類別

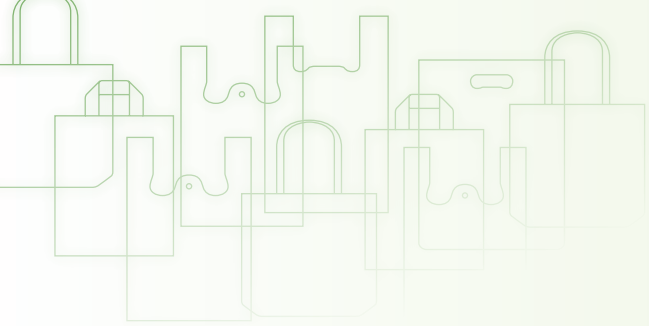
塑料袋業之綠色生產評估計劃利用一套特別設計之典範借鑑模式對塑膠袋生產商進行評估。計劃籌委會已針對塑料袋業生產特點定立了一套綠色生產評估系統，量度指標包括: 能源管理、噪音污染、管理系統及產品設計，讓參加計劃的機構了解本身在綠色生產方面的表現，確定本身的長處及缺點，以便作出持續改善。



第二節　各類別的定義與關係

本模式分為四個類別，共包括以下9個主要表現指標 (KPIs)，涵蓋塑料袋及薄膜包裝製造業的綠色生產主要考慮點:

- **類別 1 - 能源管理** 反映了公司的能源使用效率，有效地使用能源對保護環境及維持可持續發展有著重要的貢獻，這不但能善用地球的資源也能減少製造能源時同時產生出來的污染物。
  - KPI-1關鍵工藝能源消耗 (kWh/kg)
  - KPI-2工場能源消耗 (kWh/kg)
  - KPI-3辦公室能源消耗 (kWh/m^2/annum)
- **類別 2 - 噪音污染** 是用作直接量度生產廠房的噪音水平，底線是產生的噪音不能影響周圍的環境。
  - KPI-4 噪音水平 (dB)
- **類別 3 - 管理系統** 反映了公司對環保的承諾及其環保管理系統的完整性。
  - KPI-5 環境管理系統標準
- **類別 4 - 產品設計** 量度公司投入於環保產品設計的努力，要決定產品是否環保，要考慮整個產品週期，包括物料選擇、生產、包裝、運輸、使用及棄置等。
  - KPI-6 塑料
  - KPI-7a 印刷油墨及溶劑 — RoHS 認證
  - KPI-7b 印刷油墨及溶劑 — 揮發性有機物(VOC)含量
  - KPI-8 塑料減用
  - KPI-9 設計方法 (ODM 及 OBM 產品)



第二章

主要表現指標 (KPIs)

第二章

主要表現指標 (KPIs)

正如第一章第二節提及，這個綠色生典範借鑑模式共有九項主要表現指標 (KPIs)。這些指標被分別編上號數，如圖2.1示。

要量度一間公司的環保相關表現可能涉及很多特定的表現指標，以下選取的表現指標，只是作為公司之間進行比較時為最關鍵、最基本、最有用及最可行的其中部份指標。

圖2.1 塑料袋業之
綠色生產典範借鑑模式的九個主要表現指標

類別1 - 能源管理
- KPI-1關鍵工藝能源消耗 (kWh/kg)
- KPI-2工場能源消耗 (kWh/kg)
- KPI-3辦公室能源消耗 (kWh/m^2/annum)

類別 2 - 噪音污染
- KPI-4 噪音水平 (dB)

類別 3 - 管理系統
- KPI-5 環境管理系統標準

類別 4 - 產品設計
- KPI-6 塑料
- KPI-7a 印刷油墨及溶劑 — RoHS 認證
- KPI-7b 印刷油墨及溶劑 — 揮發性有機物(VOC)含量
- KPI-8 塑料減用
- KPI-9 設計方法 (ODM 及 OBM 產品)

第一節 表現評級

這個針對塑料袋業的綠色生產評估系統是一個行業通用的模式。當中，「0」級為最低級，亦表示表現最差劣；「5」級為最高級，表示已達到籌委會所認知的世界級最高水準。評核者在進行評核時會考慮到在收集數據時可能出現的誤差，如所得的數據界乎兩個級別之間，評核者會憑其本身專業的判斷決定最適合的評級。

第二節　主要表現指標的定義

類別 1 - 能源管理

在此類別的指標用作評估塑料袋製造活動中是否有效地使用能源。

KPI-1 關鍵工藝能源消耗 (kWh/kg)

— 在塑料袋生產中，塑料薄膜擠出是最主要的能源消耗工藝。

— 這指標將比較進行塑料薄膜擠出時，能源使用是否有效。

◆ ***範圍***

只評估過去連續12個月***用作生產PP及PE 塑料薄膜擠出機*** 的能源消耗。

◆ ***參考***

— 由歐盟智能能源計劃委員會發表的“*2005 歐洲能源使用典範借鑑調查及最佳手則應用*”中提出我們可以從量度熔化一公斤的塑料及提升其溫度所需的能量得出機械特殊能源消耗，處理1公斤的***polyolefins***之理論最少能量需求為 ***0.2kW/kg/h***，有些塑料需要較高的能量，如polyaromatics及nylons，其理論最少能量需求為 ***0.4kW/kg/h***。所以我們把最少“機械特殊能源消耗”範圍定義為 ***0.2-0.4kW/kg/h***。

計算方法	**z (kWh/kg)** **= 每公斤生產平均薄膜擠壓能源消耗 (M-SEC)** **= x/y** 當中 x (kWh) = 擠壓機的功率 y (kg) = 擠壓機每小時PP/PE薄膜的生產量 評級參考 M-SEC 的平均值 = (z1+z2+…zN)/N	
表現評級	**等級**	**範圍**
	0	>2.45
	1	>1.89 & ≤2.45
	2	>1.33& ≤1.89
	3	>0.76 & ≤1.33
	4	>0.2 & ≤0.76
	5	≤0.2

KPI-2 工場能源消耗 (kWh/kg)

— 除了塑料薄膜擠壓工藝以外，塑料薄膜生產工場裡的其他工藝設備，如輔助設備、燈管、通風系統等亦會使用能源。

— 這指標將比較進行塑料薄膜生產時，廠房內所有與塑料袋生相關工場（不包括塑料薄膜擠壓工藝）的能源使用是否有效。

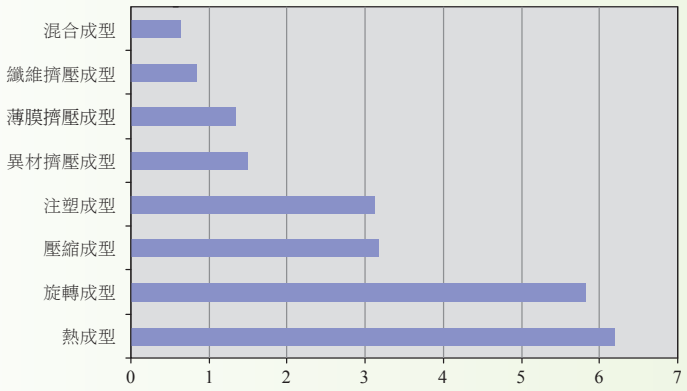
◆ *範圍*

只評估過去連續12個月 ***其他與 PP及PE 塑料袋生產相關的工場*** 的能源消耗。

◆ *參考*

— 由歐盟智能能源計劃委員會發表的“*2005 歐洲能源使用典範借鑑調查及最佳手則應用*”中提出平均塑料薄膜生產工藝的能源消耗為***1.346kW/kg/hr***。
(Source: http://www.eurecipe.com/Final_Project_Results.pdf)

平均特殊能源消耗 (每小時每公斤千瓦)



加工類別	平均SEC (每小時每公斤千瓦)
熱成型	6.179
旋轉成型	5.828
壓縮成型	3.168
注塑成型	3.118
異材擠壓成型	1.506
薄膜擠壓成型	1.346
纖維擠壓成型	0.850
混合成型	0.631
總體平均	2.811

計算方法	**z (kWh/kg)** **=每生產量工場能源消耗 (W-SEC)** **= x/y** 當中 x (kWh) = 過去連續12個月PP及PE 塑膠袋生產相關的工場能源消耗 y (kg) = 過去連續12個月PP及PE 塑膠袋的總產量	
表現評級	**等級**	**範圍**
	0	>2.4
	1	>2.0& ≤ 2.4
	2	>1.6 & ≤ 2.0
	3	>1.2 & ≤ 1.6
	4	>0.8 & ≤ 1.2
	5	≤ 0.8

KPI-3 辦公室能源消耗 (kWh/m^2/annum)

— 辦公室能源消耗相對地較少，但如能從小處著手，亦有助節約能源及成本。

— 這指標將比較廠房內所有辦公室的能源使用是否有效。

◆ *範圍*

評估過去連續12個月***所有工廠內的辦公室***能源消耗。

◆ *參考*

— 香港特別行政區政府機電工程署早前資助的一項"發展適用於香港的能源消耗指標及基準的顧問研究"中指出設有中央冷氣系統的大廈租戶的用電中位數為***112.5 kWh/m^2/annum***

(Source: http://www.emsd.gov.hk/emsd/e_download/pee/esab.pdf)

第 10, 30, 50, 70 和 90 百分位數基準數據值（千瓦小時/平方米/年）：				
10th	30th	50th	70th	90th
53.3	84.0	112.5	133.5	160.6

計算方法	**z (kWh/m /annum)** **= 每年每平方米辦公室能源消耗 = x/y** 當中 x (kWh) = 過去連續12個月所有工廠內的辦公室的能源消耗 y (m^2) = 辦公室的總面積	
表現評級	**等級** 0 1 2 3 4 5	**範圍** >210 >180 & ≤ 210 >140 & ≤ 180 >100& ≤ 140 > 60 & ≤ 100 ≤ 60

類別 2 - 噪音污染

此類別用以評估塑料袋製造廠所發出的噪音有沒有影響四周的環境。

KPI-4 噪音水平 (dB)

— 這指標參考GB 12349-90《工業企業廠界噪聲測量方法》及GB 12348-90《工業企業廠界噪聲標準》以評估整個工廠範圍的噪音水平是否符合標準。

範圍

評估 ***整個工廠範圍*** 的噪音。

評級參考

— 噪音量度方法參考了GB 12349-90《工業企業廠界噪聲測量方法》，而表現評級設定則參考了GB 12348-90《工業企業廠界噪聲標準》，並已考慮各工廠的所在區域。

計算方法	於離廠房四周1米及離地1.2米量度平均噪音水平(dB)，並作背景噪音調整。	
表現評級	**等級**	**範圍**
	0	>70
	1	>65 & ≤ 70
	2	>60 & ≤ 65
	3	>55 & ≤ 60
	4	> 50 & ≤ 55
	5	≤ 50

類別 3 - 管理系統

此類別用以檢視機構的環境改善措施和管理系統，在這方面，一些業內規範已經形成。

KPI-5 環境管理系統標準

— 這指標將量度機構在環境管理標準方面的應用程度。機構採用國際認可管理標準，已被視為量度公司環境管治水平的獨立及客觀方法。

範圍

評估過去連續12個月 ***整個工廠*** 的管理系統。

評級參考

— 評審委員會討論後，認為如機構獲得國際認可的ISO14000環境管理系統認證，則其環境管理已達到一定的水平，而未獲ISO14000環境管理系統認證的機構，如已定立及執行 “綠色採購政策” 、“環境改善計劃及項目”等，其努力亦會獲得適當的肯定。

計算方法	根據以下條件作程度評估	
表現評級	**等級**	**範圍**
	0	沒有應用任何管理系統工具
	1	有訂立及執行 “綠色採購政策”
	2	有定立及執行 “綠色採購政策” + 有定立及執行 “環境改善計劃及項目”
	3	正執行ISO-14000環境管理系統但未獲認證
	4	已獲ISO-14000環境管理系統認證
	5	已獲ISO-14000環境管理系統認證及已執行及獲其他環境管理系統認證 (如執行ISO 14062 或獲QC080000 認證)

類別 4 - 產品設計

此類別用以評估機構在產品設計，包括物料選用以至產品生命週期方面的環境考慮是否做得足夠。

KPI-6 塑料

— 塑料是塑料袋的主要物料，其影響深遠。此指標將評估機構於選擇塑料時是否有顧及環保。

— 以下為選擇塑料最主要的環保考慮點：

- RoHS 認證 或 同等認受
- 再生物料 (如 PHA, PLA)
- 可降解 (生物-/光-/水-/氧-降解)

範圍

只評估過去連續12個月 ***PP及PE塑料袋*** 生產有關的塑料。

評級參考

— 評審委員會討論後，認為物料獲得RoHS（危害性物質限制指令）或同等的認證已是必需的條件，以確保以下六種有害化學物質的含量不會超出標準：

- 鉛 (Pb) (1000ppm)
- 汞 (Hg) (1000ppm)
- 鎘 (Cd) 最大允許含量為0.01% (100ppm)
- 六價鉻 (Cr^{6+}) (1000ppm)
- 聚溴二苯（PBB） (1000ppm)
- 聚溴二苯醚（PBDE），最大允許含量為0.1% (1000ppm)

— 另外，評審委員會亦鼓勵生產商多生產再生物料及可降解物料產品以減少固體垃圾，支持環保。

計算方法	根據以下條件作程度評估	
表現評級	等級	範圍
	0	沒有使用RoHS 認證 或 同等認受之物料； 沒有使用再生物料 及 沒有使用可降解物料
	1	使用 >60% RoHS 認證 或 同等認受之物料； 沒有使用再生物料 及 沒有使用可降解物料
	2	使用 ≥ 70% RoHS 認證 或 同等認受之物料； 沒有使用再生物料 及 沒有使用可降解物料
	3	使用 ≥ 80% RoHS 認證 或 同等認受之物料； 使用 >0% 再生物料 或 使用 ≥ 5% 可降解物料 (以減去再生物料後餘下的塑料計算)
	4	使用 100% RoHS 認證 或 同等認受之物料； 使用 ≥ 15% 再生物料 或 使用 ≥ 50% 可降解物料 (以減去再生物料後餘下的塑料計算)
	5	使用100% RoHS 認證 或 同等認受之物料； 使用 ≥ 50% 再生物料 或 使用 ≥ 75% 可降解物料 (以減去再生物料後餘下的塑料計算)

KPI-7a 印刷油墨及溶劑 — RoHS 認證

— 印刷油墨及溶劑也是塑料袋生產中的重要污染源。

— 以下為選擇印刷油墨及溶劑最主要的環保考慮點：

- RoHS 認證 或 同等認受

範圍

只評估過去連續12個月 ***PP及PE塑料袋*** 生產有關的印刷油墨及溶劑。

評級參考

— 評審委員會討論後，認為油墨及溶劑獲得RoHS (危害性物質限制指令)或同等的認證已是必需的條件，以確保以下六種有害化學物質的含量不會超出標準：

- 鉛 (Pb) (1000ppm)
- 汞 (Hg) (1000ppm)
- 鎘 (Cd) 最大允許含量為0.01% (100ppm)
- 六價鉻 (Cr^{6+}) (1000ppm)
- 聚溴二苯（PBB） (1000ppm)
- 聚溴二苯醚（PBDE），最大允許含量為0.1% (1000ppm)

計算方法	根據以下條件作程度評估	
表現評級	等級	範圍
	0	沒有使用 RoHS 認證 或 同等認受之印刷油墨及溶劑
	1	使用 ≥ 60% RoHS 認證 或 同等認受之印刷油墨及溶劑
	2	使用 ≥ 70% RoHS 認證 或 同等認受之印刷油墨及溶劑
	3	使用 ≥ 80% RoHS 認證 或 同等認受之印刷油墨及溶劑
	4	使用 ≥ 90% RoHS 認證 或 同等認受之印刷油墨及溶劑
	5	使用100% RoHS 認證 或 同等認受之印刷油墨及溶劑

KPI-7b 印刷油墨及溶劑 — 揮發性有機物(VOC)含量

— 印刷油墨及溶劑也是塑料袋生產中的重要污染源。

— 以下為選擇印刷油墨及溶劑最主要的環保考慮點：

- 揮發性有機物 (VOC) 含量

範圍

只評估過去連續12個月 ***PP及PE塑料袋*** 生產有關的印刷油墨及溶劑最。

評級參考

— 由於國際社會日益關注揮發性有機化合物(VOC)的排放問題，紛紛推出法例控制油墨及溶劑的VOC含量，香港政府亦已制定了《空氣污染管制(揮發性有機化合物)規例》並於二零零七年四月一日正式生效，以管制建築漆料/塗料、印墨、指定消費品、及某些印刷機所排放的揮發性有機化合物。相信不久將來，中國大陸亦會定立有關法規。受香港政府制定的《空氣污染管制(揮發性有機化合物)規例》規管印墨的揮發性有機化合物含量的限值 (為處於即用狀態以每公升印墨所含有多少克揮發性有機化合物計算)及其生效日期已表列如下。

	受規管印墨	發性有機化合物含量的最高限值及其生效日期	
		二零零七年四月一日	二零零九年一月一日
1	柔性版螢光印墨	300	-
2	用於不透氣承印物的柔性版印墨	300	-
3	用於透氣承印物的柔性版印墨	225	-
4	凸版印墨	300	-
5	平版印墨(熱固印墨除外)	300	-
6	凹版印墨	-	300
7	絲網印刷印墨	-	400

— 故評審委員會在設定評級時亦考慮有關規例，如沒有安裝VOC去除系統，則印刷油墨及溶劑的VOC最大平均含量設定為400g/L。
(Source:http://www.epd.gov.hk/epd/english/environmentinhk/air/prob_solutions/files/Notification_letter.pdf)

計算方法	根據以下條件作程度評估	
表現評級	**等級**	**範圍**
	0	印刷油墨、稀釋劑及洗滌劑之揮發性有機物 (VOC) 含量> 400g/L
	1	印刷油墨、稀釋劑及洗滌劑之揮發性有機物 (VOC) 含量 ≤ 400g/L
	2	印刷油墨、稀釋劑及洗滌劑之揮發性有機物 (VOC) 含量 ≤ 300g/L
	3	印刷油墨、稀釋劑及洗滌劑之揮發性有機物 (VOC) 含量 ≤ 200g/L
	4	印刷油墨、稀釋劑及洗滌劑之揮發性有機物 (VOC) 含量 ≤ 100g/L
	5	印刷油墨、稀釋劑及洗滌劑之揮發性有機物 (VOC) 含量 ≤ 1g/L

KPI-8 塑料減用

— 當設計一個環保膠袋時，如能套入3R概念（減少/重用/再造），有助減少物料的使用。這指標量度機構在設定塑料配方時有否考慮能減用塑料的方法。

— 以下為最主要的原料減用方法：

- 應用循環再造塑料
- 應用碳酸鈣($CaCO_3$)作為充填劑
- 應用茂金屬催化劑(Metallocene catalyst) 以增加膠袋的強度

◆ *範圍*

只評估過去連續12個月 ***PP及PE塑料袋*** 生產有關的使用。

◆ *評級參考*

— 評審委員會討論後，認為應用循環再造物料對保護環境最有幫助，而碳酸鈣($CaCO_3$)則廣為業界所用，故在設定評級時對其應用比例要求相對較高。

計算方法	根據以下條件作程度評估	
表現評級	**等級**	**範圍**
	0	產品沒有應用循環再造物料; 產品沒有應用碳酸鈣($CaCO_3$)作為充填劑; 及 產品沒有應用茂金屬催化劑
	1	≥ 10% 產品應用循環再造物料 及 >0% 產品應用碳酸鈣($CaCO_3$)作為充填劑 或 >0% 產品應用茂金屬催化劑
	2	應用≥ 20% 循環再造物料 及 應用≥ 10% 碳酸鈣($CaCO_3$)作為充填劑 或 應用≥ 10% 茂金屬催化劑
	3	應用≥ 50% 循環再造物料 及 應用≥ 20% 碳酸鈣($CaCO_3$)作為充填劑 或 應用≥ 20% 茂金屬催化劑
	4	應用≥ 70% 循環再造物料 及 應用≥ 30% 碳酸鈣($CaCO_3$)作為充填劑 或 應用≥ 30% 茂金屬催化劑
	5	應用≥ 90% 循環再造物料 及 應用≥ 40% 碳酸鈣($CaCO_3$)作為充填劑 或 應用≥ 40% 茂金屬催化劑

KPI-9 設計方法 (ODM 及 OBM 產品)

— 在設計產品時，如能應用一些環保設計工具或根據一些綠色認證標準，可協助設計者更有系統及更全面地考慮各環保因素。

— 以下為最主要考慮點：

- 應用環保設計工具(Ecodesign tools)，如:
  - — 環保設計清單
  - — Philips Fast Five Checklist
  - — ABC 分析等
- 獲取綠色認證/可生物降解標籤/堆肥標籤，如:
  - — 通過國際認可的降解能力或堆肥能力測試，如ASTM D6400/ EN13432 / DIN V 54900等
  - — 香港環保標籤計劃 - 可降解非食物或飲料容器及袋 (GL-005-006)
  - — 香港環保標籤計劃 - 非食品用塑膠袋 (GL-002-003)

◆ *範圍*

評估過去連續12個月所有 ***ODM (原設計製造) 及 OBM (原品牌製造) 的PP及PE塑料袋產品***。

◆ *評級參考*

— 評審委員會討論後，認為應用環保設計工具的概念對於塑料袋業界仍是比較新穎的，而環顧全球獲得綠色認證/可生物降解標籤/堆肥標籤的亦不普遍，故在設定評級時對其要求亦比較低。但仍希望透過此項評分，鼓勵業界在綠色產品的設計上不斷進步，成為行業先驅。

計算方法	根據以下條件作程度評估	
表現評級	**等級**	**範圍**
	0	沒有應用環保設計工具(Ecodesign tools); 及 沒有獲取綠色認證/可生物降解標籤/堆肥標籤
	1	>0% 產品應用了環保設計工具(Ecodesign tools); 及 沒有產品獲取綠色認證/可生物降解標籤/堆肥標籤
	2	≥ 25% 產品應用了環保設計工具(Ecodesign tools);或 ≥ 0% 產品獲取綠色認證/可生物降解標籤/堆肥標籤
	3	≥ 50% 產品應用了環保設計工具(Ecodesign tools);或 ≥ 5% 產品獲取綠色認證/可生物降解標籤/堆肥標籤
	4	≥ 75% 產品應用了環保設計工具(Ecodesign tools);或 ≥ 10% 產品獲取綠色認證/可生物降解標籤/堆肥標籤
	5	100% 產品應用了環保設計工具(Ecodesign tools);或 ≥ 20%產品獲取綠色認證/可生物降解標籤/堆肥標籤

第三章

主要表現指標計算方法

第三章

主要表現指標計算方法

參加計劃的公司須於實地評估前填寫“評審計算表”以便獨立評審委員作實地核証。

KPI-1關鍵工藝能源消耗 (kWh/kg)

請量度及填報所有用作生產塑料袋的擠出機資料。電流的量度方法，請參考以下指引。

擠出機	全年生產量 (Tones)	電壓 (V)	三相電流 (I)	功率 (kWh)	每小時生產量 (kg/hr)
1					
2					
3					
4					
5					
6					

三相電流的量度及功率的計算方法

第一步	— 先檢查擠出機的狀態，並確定所有電熱已“開”。
第二步	— 確認電箱裡的三相電線L1、 L2 及 L3
第三步	— 量度及記錄任何3部擠出機的L1 及 N, L2及N, L3及N之間的電壓，一般情況，三相供電的機械電壓值應為220V。 — 如果量度出的3組數皆為220V，可以假定所有擠出機Live 及 Neutral之間的電壓為220V，不需要再量度其他擠出機的電壓。
第四步	a) 如擠出機沒有安裝獨立的安培計 — 使用“rms clamp meter”1量度及記錄L1, L2 and L3的電流[1] — 使用以下算式計算能功率(千瓦): (L1 + L2 + L3) x 220V/1000 a) 如擠出機沒有安裝獨立的安培計 — 只須記下所有安培計的讀數和總和 — 使用以下算式計算功率(千瓦): (總電流 x 380V)/1000
第五步	*如擠出系統由超過一台擠出機組成* a) 如擠出機沒有安裝獨立的安培計 — 一般情況下，擠出機上的電箱數量等同擠出螺桿的數量。 — 使用“rms clamp meter”1量度及記錄每個電箱L1, L2 及 L3的電流1，擠出系統的總用電量相等於電箱用電量的總和，而L1*, L2* 及 L3*各自的總用電量則相等於每個電箱內的L1, L2 及 L3用電量的總和。 — 使用以下算式計算功率千瓦): (L1*+ L2* + L3*) x 220V/1000 b) 如擠出機有安裝獨立的安培計 — 只需記下所有安培計的讀數和總和 — 使用以下算式計算功率(千瓦): (總電流 x 380V)/1000

[1] *“rms clamp meter”的正確使用方法*

正確

不正確

“每小時生產量”的計算方法

記錄量度電流當天該擠出機的總生產量，擠出機的每小時生產量 = (當天總生產總量/總生產小時)

例子:

擠出機	全年生產量 (Tones)	電壓 (V)	三相電流 (I)	功率 (kWh)	每小時生產量 (kg/hr)	每生產量關鍵工藝能源消耗 (kWh/kg)
1	5000	220	16 18 16	11	50	0.22
2	8000	220	25 27 30	18.04	60	0.30
3	3000	220	20 24 22	14.52	50	0.29
4	6000	220	24 20 21	14.3	65	0.22
5	6000	220	22 26 24	15.84	45	0.35

每生產量關鍵工藝能源消耗 (kWh/kg)	= (0.22+0.30+0.29+0.22+0.35) /5 = 0.276

KPI-2工場能源消耗 (kWh/kg)

請填報過去十二個月所有與塑料袋生產相關的工場（不包括塑料薄膜擠壓）之用電資料。

過去12個月	
PP&PE 塑料袋總生產量 (公斤)	
其他塑料袋生產相關工場 (請例明)	**能源使用 (kWh)**

例子:

過去12個月	
PP&PE 塑料袋總生產量 (公斤)	**12000000**
其他塑料袋生產相關工場 (請例明)	**能源使用 (kWh)**
剪切工場	2,000,000
後加工工場	3,000,000
測試實驗室	1,000,000
印刷工場	6,000,000
包裝工場	1,000,000
循環再造工場	60,000,000
倉庫	500,000

PP&PE 塑料袋總生產量 (公斤)	12,000,000
總能源使用 (kWh)	73,500,000
平均每公斤生產工場特定能量消耗 (kWh/kg)	= 73,500,000 kWh/120,000,000 kg = 0.6125 kWh/kg

KPI-3 辦公室能源消耗 (kWh/m^2/annum)

請填報過去十二個月廠房內所有辦公室之用電資料。

過去12個月		
辦工室 (請例明)	能源使用 (kWh)	面積 (m^2)

例子:

過去12個月		
辦工室 (請例明)	能源使用 (kWh)	面積 (m^2)
1	20000	250
2	30000	300
3	50000	450

總能源使用 (kWh)	100,000
所有辦工室的總面積 (m^2)	1,000
每平方米平均辦公室能量消耗 (kWh/ m^2)	= 100,000 kWh/1,000 m^2 = 100 kWh/ m^2

KPI-4 噪音水平 (dB)

公司須於實地審查前提供生產廠房的平面圖，讓審查員預先設定廠房周界的測音點。於實地審查當天，審查員會即場量度測音點的噪音值並記錄於下表中。噪音的量度方法，請參考以下指引。

噪音量度表格

評審員：_____

日期：_____

時間：_____

公司名稱:		**所在位置區域:** (請圈出)以居住、文教機關主的區域/於居住、商業、工業混雜區及商業中心區/工業區/于交通幹線道路兩側區域		
備註:				
測量編號	**時期**	**主要聲源**	**測量值 (dB)**	**背景雜音 (dB)**
測音點 A				
測音點 B				
測音點 C				
測音點 D				

噪音水平的量度及計算方法

i. 根據生產廠房的平面圖於離每邊邊界1米位置設定一測音點。

ii. 同時於離測音點2米位置設定背景雜訊測音點。

iii. 於每個測音點位置的離地1.2米每隔5秒量度並記錄噪音水平8次。

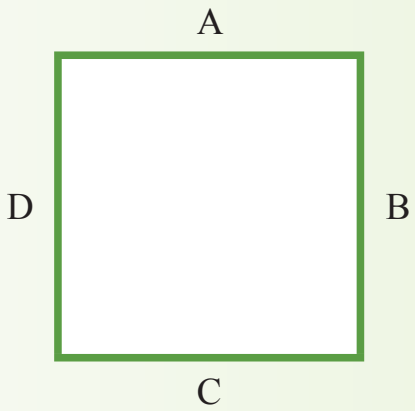
iv. 刪除最高及最低的測量值。

v. 計算每測音點的平均測量值(分貝)，並計算總平均噪音水平(分貝) 。

vi. 背聲調整: 背景噪音應該相等或比測音點測量值少最少10分貝，否則，應根據下表作出調整:

背景及測音點測量值差別 (dB)	3	4-6	7-9
測音點測量值調整(dB)	3	-2	-1

例子:



公司名稱:		**所在位置區域：**(請圈出)以居住、文教機關主的區域/於居住、商業、工業混雜區及商業中心區 / 工業區 / 于交通幹線道路兩側區域		
備註:				
測量編號	**時期**	**主要聲源**	**測量值 (dB)**	**背景雜音 (dB)**
測音點 A				
A1	10:40	-	50	52
A2		-	55	49
A3		-	54	52
A4		-	62	50
A5		-	53	53
A6		-	49.5	51
A7		-	52	51
A8		-	54	52

測音點 B				
B1		-	65	62
B2		-	60	62
B3		-	72	60
B4		-	64	64
B5		-	62	63
B6		-	57	58
B7		-	63	62
B8		-	64	61
測音點 C				
C1		-	60	60
C2		-	55	58
C3		-	67	56
C4		-	59	58
C5		-	57	58
C6		-	52	55
C7		-	58	57
C8		-	59	58
測音點 D				
D1		-	45	44
D2		-	40	45
D3		-	44	43
D4		-	52	41
D5		-	42	40
D6		-	37	43
D7		-	44	46
D8		-	43	47

噪音水平平均值 (dB)	背景噪音水平平均值 (dB)	噪音水平調整 (dB)	噪音水平平均值 (dB)
測音點 A			
53	51.3	-3	50
測音點 B			
63	61.7	-3	60
測音點 C			
58	57.6	-3	55
測音點 D			
43	43.7	-3	40
噪音水平總平均值 (dB)		= (50+60+55+40)/4 =52.5	

KPI-5 環境管理系統標準

請填報整間公司過去12個月內之環境管理系統執行情況。

過去12個月	
有否設定執行綠色採購政策? 如有，請舉例說明有關綠色採購政策。	
有否設定執行環境改善計劃? 如有，請舉例說明有關環境改善計劃。	
有否獲得ISO-14000環境管理系統認證 如獲得認證，認證日期及證書編號為:	
有否執行其他環境管理系統認證 (如 ISO 14062, QC080000 等) 如有執行，該環境管理系統為: 如獲得認證，認證日期及證書編號為:	

例子:

過去12個月	
有否設定執行綠色採購政策? 如有，請舉例說明有關綠色採購政策。	有 我們在公司各部門都組織了環境改善小組，小組每個月都會舉行環境改善會議，收集意見後，由負責人設定改善計劃並指導執行，每三個月由小組負責人於管理層會議中匯報進展及成果。
有否設定執行環境改善計劃? 如有，請舉例說明有關環境改善計劃。	有 我們早於2004年已定立一套綠色採購政策並定期更新，該政策涵蓋各部門。採購部門在採購時須按照政策進行評估，符合準則的才可進行採購。詳情請見附上之有關文件。
有否獲得ISO-14000環境管理系統認證 如獲得認證，認證日期及證書編號為:	未有 我們已了解ISO-14000環境管理系統之要求，現正跟顧問緊密合作以準備有關文件及培訓，預期明年三月可進行有關認證。
有否執行其他環境管理系統認證 (如 ISO 14062, QC080000 等) 如有執行，該環境管理系統為: 如獲得認證，認證日期及證書編號為:	沒有

KPI-6 塑料

請填報過去12個月內之有關於PP及PE塑料袋生產的塑料使用情況。

過去12個月				
塑料 (PP,PE 及 粟米料 e.g, PLA, PHA)	代號	重量 (Tones)	算式	結果 (%)
塑料總用量	**x**		-	
再生物料用量 (例如: PHA, PLA)	**a1**		**a1/x**	
減去再生物料 (e.g. PHA, PLA) 後餘下的塑料量	**y**		**x-a**	
獲得RoHS 認證 或 同等認受之塑料	**a2**		**a2/x**	
可降解塑料用量 (生物-/光-/水-/氧-降解) (以減去再生物料後餘下的塑料作基數計算)	**a3**		**a3/y**	

例子:

過去12個月				
塑料 (PP,PE 及 粟米料 e.g, PLA, PHA)	代號	重量 (Tones)	算式	結果 (%)
塑料總用量	**x**	10,000	-	-
再生物料用量 (例如: PHA, PLA)	**a1**	500	**a1/x**	5
減去再生物料 (e.g. PHA, PLA) 後餘下的塑料量	**y**	99,500	**x-a**	95
獲得RoHS 認證 或 同等認受之塑料	**a2**	10,000	**a2/x**	100
可降解塑料用量 (生物-/光-/水-/氧-降解) (以減去再生物料後餘下的塑料作基數計算)	**a3**	2,000	**a3/y**	21.05

KPI-7a 印刷油墨及溶劑 — RoHS認證

請填報過去12個月內之有關於PP及PE塑料袋生產的印刷油墨及溶劑使用情況。

過去12個月				
	代號	使用量	算式	結果
印刷油墨及溶劑總用量 (L)	x		-	
RoHS 認證 或 同等認受印刷油墨及溶劑總用量 (L)	b1		-	
RoHS 認證 或 同等認受印刷油墨及溶劑總用量的百份比(%)	-		b1/x	

例子:

過去12個月				
	代號	使用量	算式	結果
印刷油墨及溶劑總用量 (L)	x	10,000	-	-
RoHS 認證 或 同等認受印刷油墨及溶劑總用量 (L)	b1	3000	-	-
RoHS 認證 或 同等認受印刷油墨及溶劑總用量的百份比(%)	-		b1/x	30%

KPI-7b 印刷油墨及溶劑 — 揮發性有機物 (VOC)含量

請填報過去12個月內之有關於PP及PE塑料袋生產的印刷油墨及溶劑使用情況。

過去12個月				
	代號	使用量	算式	結果
印刷油墨及溶劑總用量 (L)	z		-	
揮發性有機物 (VOC) 總含量 (g)	b2		-	
揮發性有機物 (VOC) 去除/復元系統效率	b3		-	
揮發性有機物 (VOC) 含量 (g/L)	-		b2(1-b3)/z	

例子:

過去12個月				
	代號	使用量	算式	結果
印刷油墨及溶劑總用量 (L)	z	10,000	-	-
揮發性有機物 (VOC) 總含量 (g)	b2	8,000,000	-	-
揮發性有機物 (VOC) 去除/復元系統效率	b3	70%	-	-
揮發性有機物 (VOC) 含量 (g/L)	-	-	b2(1-b3)/z	240g/L

KPI-8塑料減用

請填報過去12個月內之有關於PP及PE塑料袋產品的資料。

過去12個月				
	代號	重量 (Tones)	算式	結果 (%)
PP及PE塑料袋生產總重量	x		-	-
有應用循環再造物料的PP及PE塑料袋	c1		c1/x	
有應用碳酸鈣($CaCO_3$)作為充填劑的PP及PE塑料袋	c2		c2/x	
有應用茂金屬催化劑(Metallocene catalyst)的PP及PE塑料袋	c3		c3/x	

例子:

過去12個月				
	代號	重量 (Tones)	算式	結果 (%)
PP及PE塑料袋生產總重量	x	80,000	-	-
有應用循環再造物料的PP及PE塑料袋	c1	50,000	c1/x	63
有應用碳酸鈣($CaCO_3$)作為充填劑的PP及PE塑料袋	c2	40,000	c2/x	50
有應用茂金屬催化劑(Metallocene catalyst)的PP及PE塑料袋	c3	20,000	c3/x	25

KPI-9 設計方法 (ODM 及 OBM 產品)

如有製造ODM 及 OBM 產品，請填報過去12個月內之有關於ODM 及 OBM PP及PE塑料袋產品設計及開發的資料。

過去12個月				
	代號	量 (型號數量)	算式	結果 (%)
ODM/OBM PP及PE塑料袋產品	x		-	-
有應用環保設計工具(Ecodesign Tools)之ODM/OBM 的PP及PE塑料袋產品	d1		c1/x	
獲取綠色認證/可生物降解標籤/堆肥標籤之ODM/OBM 的PP及PE塑料袋產品	d2		c2/x	

例子:

過去12個月				
	代號	量 (型號數量)	算式	結果 (%)
ODM/OBM PP及PE塑料袋產品	x	1000	-	-
有應用環保設計工具(Ecodesign Tools)之ODM/OBM 的PP及PE塑料袋產品	d1	30	c1/x	3
獲取綠色認證/可生物降解標籤/堆肥標籤之ODM/OBM 的PP及PE塑料袋產品	d2	10	c2/x	1

第四章

現場評核清單

第四章

現場評核清單

第一節　概括指引

— 除有特別指示外，所有數據都應取自剛過去的連續12個月。
— 除有特別指示外，所有數據都應規範於PP及PE塑料袋生產相關的項目。
— 交付的數據應該由負責人批核及可追溯的。

第二節　特定指引

主要表現指標	檢查
■ **類別 1 - 能源管理**	
(kWh/kg)	
— 只評估用作生產PP及PE 塑料薄膜的擠出機。	
— 實地評估將審核用電紀錄或電費單及生產紀錄。	
— 實地評估將揀選3台全年最高生產量的擠出機，量度它們的電壓(V)、電流(A)及每小時生產量(kg/hr)。詳細的量度及計算方法，請見第五章。	
KPI-2 工場能源消耗 (kWh/kg)	
— 只評估PP及PE塑料袋生產相關的工場用電量，即不包括塑料薄膜擠壓工場。例如：剪切工場、後加工工場、測試實驗室、印刷工場、包裝工場、循環再造工場、倉庫等。	
— 實地評估將審核用電紀錄或電費單及生產紀錄。	
KPI-3 辦公室能源消耗 (kWh/m^2/annum)	
— 評估生產廠房內的所有辦工室用電量	
— 實地評估將審核用電紀錄或電費單及辦公室面積。	
■ **類別 2 - 噪音污染**	
KPI-4 噪音水平 (dB)	
— 只評估該公司的生產廠房範圍，如部分區域已出租予其他公司，則該部分不會計算在內。	
— 公司須於實地審查前提供生產廠房最新的平面圖，讓審查預先設定廠房周界的測音點。	
— 如因地理環境的關係不能抵達廠房外圍，則以內圍牆位置量度背景噪音，再往內2米處量度測音點噪音並記錄有關情況，如有需要的話，作噪音調整討論資料。詳細的量度及計算方法，請見第五章。	

■　類別 3 - 管理系統	
KPI-5 環境系統標準	
綠色採購政策 — 有關負責人應對填寫的綠色採購政策提供清晰的描述。 — 並提供有關綠色採購政策的支持文件如綠色採購指引、發給供應商的綠色指引、供應商審查表、認可供應商列表等。	
環境改善計劃 — 有關負責人應對填寫的環境改善計劃提供清晰的描述。 — 並提供有關環境改善計劃的支持文件如內部員工通告、會議紀錄、改善計劃報告等。 — 審查員將實地查察有關改善項目的進展或成果。	
環境管理系統 — 如有關環境管理系統未獲認證，則需提供有關環境管理系統的支持文件如操作手冊或程序、工作指引及紀錄以証明有關系統在執行中。 — 如有關環境管理系統已獲認證，則需提供由獨立認證機構所發的有關環境管理系統証書。	
■　類別 4 - 產品設計	
KPI-6塑料	
— 應提供PP 及 PE塑料總使用量有關的支持文件。	
RoHS 認證或同等認受 — 塑料如獲RoHS 認證 或 同等認受(如EN71、重金屬含量証明等)，應提供有關支持文件如證書、供應商聲明、物料安全資料表等。	
再生物料 (例如: PHA, PLA) 的應用 — 產品如有應用再生物料(例如: PHA, PLA)，應提供支持文件如採購、使用、生產紀錄等。	
可降解塑料 (生物-/光-/水-/氧化-降解) 的應用 — 產品如有應用可降解塑料 (生物-/光-/水-/氧-降解)，應提供支持文件如採購、使用、生產紀錄等。 — 如未能提供有關紀錄: ● 則應提供降解添加劑的使用紀錄(a) ● 並提供產品中降解添加劑的平均百分比資料(b%) ● 使用算式估計出可降解產品的重量: a/b%	
KPI-7a 印刷油墨及溶劑 — RoHS 認證	
RoHS 認證 或 同等認受 — 印刷油墨及溶劑如獲RoHS 認證 或 同等認受(如EN71、重金屬含量証明等)，應提供有關支持文件如證書、供應商聲明、物料安全資料表等。	

KPI-7b 印刷油墨及溶劑 — 揮發性有機物 (VOC) 含量	
揮發性有機物 (VOC)含量 — 應提供有關支持文件如供應商聲明、物料安全資料表等以証明印刷油墨及溶劑的VOC含量。 — 如未能提供有關VOC含量紀錄，則以下數據將會被假定: ● 印刷油墨 VOC = 800g/L ● 溶劑 VOC = 900/L ● 印刷油墨密度 = 1.14kg/L ● 溶劑密度 = 0.9kg/L	
KPI-8塑料減用	
循環再造物料的應用 — 產品如有應用循環再造物料，應提供支持文件如採購、使用、生產紀錄等。 — 如未能提供有關生產紀錄: ● 則應提供循環再造物料的使用紀錄(a) ● 並提供產品中循環再造物料的平均百分比資料(b%) ● 使用算式估計出有應用循環再造物料的產品重量: a/b%	
碳酸鈣的應用 — 產品如有應用碳酸鈣，應提供支持文件如採購、使用、生產紀錄等。 — 如未能提供有關生產紀錄: ● 則應提供碳酸鈣的使用紀錄(a) ● 並提供產品中碳酸鈣的平均百分比資料(b%) ● 使用算式估計出有應用碳酸鈣的產品重量: a/b%	
茂金屬催化劑的應用 — 產品如有應用茂金屬催化劑，應提供支持文件如採購、使用、生產紀錄等。 — 如未能提供有關生產紀錄: ● 則應提供茂金屬催化劑的使用紀錄(a) ● 並提供產品中茂金屬催化劑的平均百分比資料(b%) ● 使用算式估計出有應用茂金屬催化劑的產品重量: a/b%	
KPI-9 設計方法 (ODM 及 OBM 產品)	
— **ODM:原設計生產** – 涉及設計一個產品，而產品最後將印上另一間公司的品牌出售。(塑膠袋產品的物料配方設計亦視為產品設計的一部分) — **OBM:原品牌生產** – 涉及設計一個產品，而產品最後將印上公司本身的品牌出售。(塑膠袋產品的物料配方設計亦視為產品設計的一部分)	
環保設計工具應用 — 應提供應用環保設計工具如環保設計清單、Philips Fast Five清單、ABC分析的支持文件。	
獲取綠色認證/可生物降解標籤/堆肥標籤 — 應提供相關認證或標籤的支持文件。 — 應提供產品樣板作參考。	

第五章

表現評核表

表現評核表

塑料袋業之綠色生產評估計劃

評核者：_____

評核日期：_____

類別	主要表現指標	表現評級					
		0	1	2	3	4	5
類別 1 – 能源管理	KPI-1關鍵工藝能源消耗 (kWh/kg)						
	KPI-2工場能源消耗 (kWh/kg)						
	KPI-3辦公室能源消耗 ($kWh/m^2/annum$)						
類別 2 – 噪音污染	KPI-4 噪音水平 (dB)						
類別 3 – 管理系統	KPI-5 環境管理系統標準						
類別 4 – 產品設計	KPI-6塑料						
	KPI-7a印刷油墨及溶劑 – RoHS 認證						
	KPI-7b印刷油墨及溶劑 – 揮發性有機物(VOC)含量						
	KPI-8塑料減用						
	KPI-9 設計方法 (ODM 及 OBM 產品)						

第六章

評估報告範本

表現評核表

Hong Kong Productivity Council
香港生產力促進局

絕對保密
STRICTLY CONFIDENTIAL

評估報告

XXX公司

Hong Kong Productivity Council
香港生產力促進局

DD.MM.YEAR

Manufacturing Technology Division

目錄

I)　簡介

塑膠袋業之綠色生評估計劃的背景和目的

II)　評估方法

典範借鑑和主要表現指標的背景

圖2.1 塑料袋業之
綠色生產典範借鑑模式的九個主要表現指標

類別1 - 能源管理
- KPI-1關鍵工藝能源消耗 (kWh/kg)
- KPI-2工場能源消耗 (kWh/kg)
- KPI-3辦公室能源消耗 (kWh/m^2/annum)

類別 2 - 噪音污染
- KPI-4 噪音水平 (dB)

類別 3 - 管理系統
- KPI-5 環境管理系統標準

類別 4 - 產品設計
- KPI-6 塑料
- KPI-7a 印刷油墨及溶劑 — RoHS 認證
- KPI-7b 印刷油墨及溶劑 — 揮發性有機物(VOC)含量
- KPI-8 塑料減用
- KPI-9 設計方法 (ODM 及 OBM 產品)

表現評級

表 2.2 綠色生產典範借鑑模式：表現評級

主要表現指標	等級	
KPI-1 關鍵工藝能源消耗 (kWh/kg) z (kWh/kg) = 每公斤生產平均薄膜擠壓能源消耗 (M-SEC) = x/y 當中 x (kWh) = 擠壓機的功率 y (kg) = 擠壓機每小時PP/PE薄膜的生產量	5	≤ 0.20
	4	>0.20 & ≤ 0.76
	3	>0.76 & ≤ 1.33
	2	>1.33 & ≤ 1.89
	1	>1.89 & ≤ 2.45
	0	>2.45
KPI-2 工場能源消耗(kWh/kg) z (kWh/kg) =每生產量工場能源消耗 (W-SEC) = x/y 當中 x (kWh) = 過去連續12個月PP及PE塑膠袋生產相關的工場能源消耗 y (kg) = 過去連續12個月PP及PE塑膠袋的總產量	5	≤ 0.8
	4	>0.8 & ≤ 1.2
	3	>1.2 & ≤ 1.6
	2	>1.6 & ≤ 2.0
	1	>2.0 & ≤ 2.4
	0	>2.4
KPI-3 辦公室能源消耗 (kWh/m²/annum) z (kWh/m²/annum) = 每年每平方米辦公室能源消耗 = x/y 當中 x (kWh) = 過去連續12個月所有工廠內的辦公室的能源消耗 y (m²) = 辦公室的總面積	5	≤ 60
	4	>60 & ≤ 100
	3	>100 & ≤ 140
	2	>140 & ≤ 180
	1	>180 & ≤ 210
	0	>210
KPI-4 噪音水平 (dB) 於離廠房四周1米及離地1.2米量度平均噪音水平(dB)，並作背景噪音調整 平均噪音水平 (dB) = (z1+z2+…zN)/N	5	≤ 50
	4	>50 & ≤ 55
	3	>55 & ≤ 60
	2	>60 & ≤ 65
	1	>65 & ≤ 70
	0	>70
KPI-5 環境管理系統標準 根據右列條件作程度評估.	5	已獲ISO-14000環境管理系統認證及已執行及獲其他環境管理系統認證 (如 執行ISO 14062 或獲QC080000 認證)
	4	已獲ISO-14000環境管理系統認證
	3	正執行ISO-14000環境管理系統但未獲認證
	2	有定立及執行 “綠色採購政策” + 有定立及執行 “環境改善計劃及項目”
	1	有訂立及執行 “綠色採購政策”
	0	沒有應用任何管理系統工具

KPI-6 塑料 根據右列條件作程度評估	5	使用100% RoHS 認證 或 同等認受之物料; 使用 ≥ 50% 再生物料 或 使用 ≥ 75% 可降解物料 (以減去再生物料後餘下的塑料計算)
	4	使用 100% RoHS 認證 或 同等認受之物料; 使用 ≥ 15% 再生物料 或 使用 ≥ 50% 可降解物料 (以減去再生物料後餘下的塑料計算)
	3	使用 ≥ 80% RoHS 認證 或 同等認受之物料; 使用 >0% 再生物料 或 使用 ≥ 5% 可降解物料 (以減去再生物料後餘下的塑料計算)
	2	使用 ≥ 70% RoHS 認證 或 同等認受之物料; 沒有使用再生物料 及 沒有使用可降解物料
	1	使用 >60% RoHS 認證 或 同等認受之物料; 沒有使用再生物料 及 沒有使用可降解物料
	0	沒有使用RoHS 認證 或 同等認受之物料; 沒有使用再生物料 及 沒有使用可降解物料
KPI-7a 印刷油墨及溶劑 — RoHS 認證 根據右列條件作程度評估	5	使用100% RoHS 認證 或 同等認受之印刷油墨及溶劑
	4	使用 ≥ 90% RoHS 認證 或 同等認受之印刷油墨及溶劑
	3	使用 ≥ 80% RoHS 認證 或 同等認受之印刷油墨及溶劑
	2	使用 ≥ 70% RoHS 認證 或 同等認受之印刷油墨及溶劑
	1	使用 ≥ 60% RoHS 認證 或 同等認受之印刷油墨及溶劑
	0	沒有使用 RoHS 認證 或 同等認受之印刷油墨及溶劑
KPI-7b 印刷油墨及溶劑 — 揮發性有機物(VOC)含量 根據右列條件作程度評估	5	≤ 1
	4	≤ 100
	3	≤ 200
	2	≤ 300
	1	≤ 400
	0	>400
KPI-8 塑料減用 根據右列條件作程度評估	5	應用≥ 90% 循環再造物料 及 應用≥ 40% 碳酸鈣($CaCO_3$)作為充填劑 或 應用≥ 40% 茂金屬催化劑
	4	應用≥ 70% 循環再造物料 及 應用≥ 30% 碳酸鈣($CaCO_3$)作為充填劑 或 應用≥ 30% 茂金屬催化劑
	3	應用≥ 50% 循環再造物料 及 應用≥ 20% 碳酸鈣($CaCO_3$)作為充填劑 或 應用≥ 20% 茂金屬催化劑
	2	應用≥ 20% 循環再造物料 及 應用≥ 10% 碳酸鈣($CaCO_3$)作為充填劑 或 應用≥ 10% 茂金屬催化劑
	1	≥ 10% 產品應用循環再造物料 及 >0% 產品應用碳酸鈣($CaCO_3$)作為充填劑 或 >0% 產品應用茂金屬催化劑
	0	產品沒有應用循環再造物料; 產品沒有應用碳酸鈣($CaCO_3$)作為充填劑; 及 產品沒有應用茂金屬催化劑

KPI-9設計方法 (ODM 及 OBM 產品) 根據右列條件作程度評估	5	100% 產品應用了環保設計工具(Ecodesign tools);或 ≥ 20%產品獲取綠色認證/可生物降解標籤/堆肥標籤
	4	≥ 75% 產品應用了環保設計工具(Ecodesign tools);或≥ 10%產品獲取綠色認證/可生物降解標籤/堆肥標籤
	3	≥ 50% 產品應用了環保設計工具(Ecodesign tools);或 ≥ 5% 產品獲取綠色認證/可生物降解標籤/堆肥標籤
	2	≥ 25% 產品應用了環保設計工具(Ecodesign tools);或≥ 0% 產品獲取綠色認證/可生物降解標籤/堆肥標籤
	1	>0% 產品應用了環保設計工具(Ecodesign tools); 及 沒有產品獲取綠色認證/可生物降解標籤/堆肥標籤
	0	沒有應用環保設計工具(Ecodesign tools); 及 沒有獲取綠色認證/可生物降解標籤/堆肥標籤

評估步驟

現場評核的背景和詳細評估步驟

III) 典範借鑑結果和建議

現場評核過程

評核組員： [評審員名稱]

DD/MM/YY	評審員 A	評審員 B	評審員 C
10:00 – 10:30	**預備會議** — 由評核組員簡單介紹評核 範圍、目的和時間表 — 所有部門主管參加會議以瞭解計劃目的和過程		
10:30 – 12:00	**KPI-5 環境管理系統標準** — 調查結果和意見 **KPI-6 塑料** — 調查結果和意見	**KPI-4 噪音水平 (dB)** — 調查結果和意見	**KPI-1 關鍵工藝能源消耗 (kWh/kg)** — 調查結果和意見
12:00 – 13:30	Lunch		
13:30 – 14:30	**KPI-7a 印刷油墨及溶劑 — RoHS 認證** — 調查結果和意見 **KPI-7b 印刷油墨及溶劑 — 揮發性有機物(VOC)含量** — 調查結果和意見 **KPI-8 塑料減用** — 調查結果和意見		**KPI-3 辦公室能源消耗 (kWh/m^2/annum)** — 調查結果和意見
14:30 – 15:30	**KPI-9設計方法 (ODM 及 OBM 產品)** — 調查結果和意見		**KPI-2 工場能源消耗 (kWh/kg)** — 調查結果和意見
15:30 – 16:00	**參觀廠房**		
16:00 – 16:30	**總結會議**		

類別1 - 能源管理

主要表現指標	等級		受評公司評分	業界評分
KPI-1 關鍵工藝能源消耗 (kWh/kg) z (kWh/kg) = 每公斤生產平均薄膜擠壓能源消耗 (M-SEC) = x/y 當中 x (kWh) = 擠壓機的功率 y (kg) = 擠壓機每小時PP/PE薄膜的生產量	5	≤ 0.20		
	4	>0.20 & ≤ 0.76		最好
	3	>0.76 & ≤ 1.33		平均
	2	>1.33 & ≤ 1.89		
	1	>1.89 & ≤ 2.45		
	0	>2.45		
KPI-2 工場能源消耗(kWh/kg) z (kWh/kg) =每生產量工場能源消耗 (W-SEC) = x/y 當中 x (kWh) = 過去連續12個月PP及PE 塑膠袋生產相關的工場能源消耗 y (kg) = 過去連續12個月PP及PE 塑膠袋的總產量	5	≤ 0.8		最好
	4	>0.8 & ≤ 1.2		平均
	3	>1.2 & ≤ 1.6		
	2	>1.6 & ≤ 2.0		
	1	>2.0 & ≤ 2.4		
	0	>2.4		
KPI-3 辦公室能源消耗 (kWh/m^2/annum) z (kWh/m^2/annum) = 每年每平方米辦公室能源消耗 = x/y 當中 x (kWh) = 過去連續12個月所有工廠內的辦公室的能源消耗 y (m) = 辦公室的總面積	5	≤ 60		
	4	>60 & ≤ 100		
	3	>100 & ≤ 140		最好
	2	>140 & ≤ 180		
	1	>180 & ≤ 210		平均
	0	>210		

建議和改善空間

[針對評核結果的意見和建議改善空間]

類別2 - 噪音污染

主要表現指標	等級		受評公司評分	業界評分
KPI-4 噪音水平 (dB) 於離廠房四周1米及離地1.2米量度平均噪音水平(dB)，並作背景噪音調整 平均噪音水平 (dB) = (z1+z2+⋯zN)/N	5	≤ 50		
	4	>50 & ≤ 55		最好
	3	>55 & ≤ 60		平均
	2	>60 & ≤ 65		
	1	>65 & ≤ 70		
	0	>70		

建議和改善空間

[針對評核結果的意見和建議改善空間]

類別3 - 管理系統

主要表現指標	等級		受評公司評分	業界評分
KPI-5 環境管理系統標準 根據右列條件作程度評估	5	已獲ISO-14000環境管理系統認證及已執行及獲其他環境管理系統認證 (如 執行ISO 14062 或獲QC080000 認證)		
	4	已獲ISO-14000環境管理系統認證		最好 已獲ISO-14000環境管理系統認證
	3	正執行ISO-14000環境管理系統但未獲認證		
	2	有定立及執行“綠色採購政策” + 有定立及執行“環境改善計劃及項目”		
	1	有訂立及執行“綠色採購政策”		平均 “綠色採購政策”
	0	沒有應用任何管理系統工具		

建議和改善空間

[針對評核結果的意見和建議改善空間]

類別4 - 產品設計

主要表現指標	等級		受評公司評分	業界評分	
KPI-6 塑料 根據右列條件作程度評估	5	使用100% RoHS 認證 或 同等認受之物料; 使用 ≥ 50% 再生物料 或 使用 ≥ 75% 可降解物料 (以減去再生物料後餘下的塑料計算)			
	4	使用 100% RoHS 認證 或 同等認受之物料; 使用 ≥ 15% 再生物料 或 使用 ≥ 50% 可降解物料 (以減去再生物料後餘下的塑料計算)			
	3	使用 ≥ 80% RoHS 認證 或 同等認受之物料; 使用 >0% 再生物料 或 使用 ≥ 5% 可降解物料 (以減去再生物料後餘下的塑料計算)		最好	平均
	2	使用 ≥ 70% RoHS 認證 或 同等認受之物料; 沒有使用再生物料 及 沒有使用可降解物料			
	1	使用 >60% RoHS 認證 或 同等認受之物料; 沒有使用再生物料 及 沒有使用可降解物料			
	0	沒有使用RoHS 認證 或 同等認受之物料; 沒有使用再生物料 及 沒有使用可降解物料			

KPI-7a 印刷油墨及溶劑 — RoHS 認證 根據右列條件作程度評估	5	使用100% RoHS 認證 或 同等認受之印刷油墨及溶劑		最好 平均
	4	使用 ≥ 90% RoHS 認證 或 同等認受之印刷油墨及溶劑		
	3	使用 ≥ 80% RoHS 認證 或 同等認受之印刷油墨及溶劑		
	2	使用 ≥ 70% RoHS 認證 或 同等認受之印刷油墨及溶劑		
	1	使用 ≥ 60% RoHS 認證 或 同等認受之印刷油墨及溶劑		
	0	沒有使用 RoHS 認證 或 同等認受之印刷油墨及溶劑		
KPI-7b 印刷油墨及溶劑 — 揮發性有機物 (VOC)含量 根據右列條件作程度評估	5	≤ 1		
	4	≤ 100		
	3	≤ 200		
	2	≤ 300		
	1	≤ 400		
	0	>400		最好 平均
KPI-8 塑料減用 根據右列條件作程度評估	5	應用≥ 90% 循環再造物料 及 應用≥ 40% 碳酸鈣($CaCO_3$)作為充填劑 或 應用≥ 40% 茂金屬催化劑		最好
	4	應用≥ 70% 循環再造物料 及 應用≥ 30% 碳酸鈣($CaCO_3$)作為充填劑 或 應用≥ 30% 茂金屬催化劑		
	3	應用≥ 50% 循環再造物料 及 應用≥ 20% 碳酸鈣($CaCO_3$)作為充填劑 或 應用≥ 20% 茂金屬催化劑		平均
	2	應用≥ 20% 循環再造物料 及 應用≥ 10% 碳酸鈣($CaCO_3$)作為充填劑 或 應用≥ 10% 茂金屬催化劑		
	1	≥ 10% 產品應用循環再造物料 及 >0% 產品應用碳酸鈣($CaCO_3$)作為充填劑 或 >0% 產品應用茂金屬催化劑		
	0	產品沒有應用循環再造物料; 產品沒有應用碳酸鈣($CaCO_3$)作為充填劑; 及 產品沒有應用茂金屬催化劑		

KPI-9設計方法 (ODM 及 OBM 產品) 根據右列條件作程度評估	5	100% 產品應用了環保設計工具(Ecodesign tools);或 ≥ 20%產品獲取綠色認證/可生物降解標籤/堆肥標籤		
	4	≥ 75% 產品應用了環保設計工具(Ecodesign tools);或≥ 10%產品獲取綠色認證/可生物降解標籤/堆肥標籤		
	3	≥ 50% 產品應用了環保設計工具(Ecodesign tools);或 ≥ 5% 產品獲取綠色認證/可生物降解標籤/堆肥標籤		最好
	2	≥ 25% 產品應用了環保設計工具(Ecodesign tools);或≥ 0% 產品獲取綠色認證/可生物降解標籤/堆肥標籤		平均
	1	>0% 產品應用了環保設計工具(Ecodesign tools); 及 沒有產品獲取綠色認證/可生物降解標籤/堆肥標籤		
	0	沒有應用環保設計工具(Ecodesign tools); 及 沒有獲取綠色認證/可生物降解標籤/堆肥標籤		

建議和改善空間

[針對評核結果的意見和建議改善空間]

III) 整體分析[範例]

與本地業界比較的整體結果[1]

業界最佳表現　　**受評公司評分**　　**業界平均表現**

類別	主要表現指標	比較圖表
類別 1 – 能源管理	KPI-1 關鍵工藝能源消耗 (kWh/kg)	4 3 3
	KPI-2 工場能源消耗(kWh/kg)	5 3 4
	KPI-3 辦公室能源消耗 (kWh/m^2/annum)	3 3 1
類別 2 – 噪音污染	KPI-4 噪音水平 (dB)	4 3 2
類別3 – 管理系統	KPI-5 環境管理系統標準	4 3 1

類別4 – 產品設計	KPI-6　塑料	3				
		3				
		3				
	KPI-7a　印刷油墨及溶劑 — RoHS 認證	5				
		3				
		5				
	KPI-7b　印刷油墨及溶劑 — 揮發性有機物(VOC)含量	0				
		0				
		0				
	KPI-8　塑料減用	5				
		3				
		3				
	KPI-9　設計方法 (ODM 及 OBM 產品)	3				
		3				
		2				

強項和弱點

[總結整體強項和弱點]

[5] 業界平均表現根據2008年5月至7月期間五間參與綠色生產評估計劃的先導公司的評核結果計算出來。

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