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EPS Handles The Environment With Care

2009 REPORT

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WHAT IS EPS?

EXPANDED POLYSTYRENE

Environmentally Friendly

Expanded Polystyrene in its broadest sense is a rigid cellular plastic which is found in a multitude of shapes and applications.

- EPS does not contain any CFCs or HCFCs
- EPS is made from completely inert gases, and has no chemical influence of the environment.

Measuring the Benefits

The excellent properties of EPS, providing economic and high performance products, are further enhanced by its environmentally friendly characteristics.

By most methods of measurement, EPS has a positive contribution to the environment at every stage of its life cycle.

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The facts

EPS AND THE ENVIRONMENT

Facts About EPS and the Environment

EPS is 98% air. Only 2% of a typical box is material, this makes EPS a uniquely resource-efficient packaging material with a small carbon footprint.

EPS is extremely lightweight; this helps to reduce fuel consumption, when goods are transported in EPS compared to other heavier packaging materials.

Thousands of tonnes of EPS are recycled every year in the UK. As a single polymer EPS is straightforward to recycle and is recycled into items such as replacement hardwood decking or garden furniture, coat hangers and disposable cameras.

EPS is HFC, CFC and HCFC free and Pentane is used as its blowing agent. Pentane has a Global Warming Potential* (GWP) of zero. (The EU does not register pentane as a substance hazardous to human health or the environment.)

Facts About EPS and the Environment

In combustion the amount of carbon monoxide and particulates given off by EPS is a small fraction of that emitted by wood or cardboard.

The protective performance of EPS helps to reduce wastage caused by goods that are broken or damaged in the supply chain. This saves resources of energy, materials and transportation.

Styrene, used in the manufacture of EPS, occurs naturally in many commonplace products including strawberries, beans, nuts, beer, wine, coffee beans and cinnamon.

EPS is inert and innocuous and provides stability in landfill because is does not biodegrade and leach chemicals into the water system or gases into air that could contribute to global warming.

Facts About EPS and the Environment

Computer-aided design ensures that the minimum amount of material is used to make an EPS pack that will reliably protect fragile products in transit. The manufacture of EPS is a **low pollution process**. Steam is the key ingredient and the water is re-used many times.

Only 0.1% of total oil consumption is used to manufacture EPS.

Global warming potential (GWP) is a means of measuring the strength of different 'greenhouse' gases in the atmosphere and can be used to define the impact greenhouses gases have on global warming over specified periods of time. As an example C02 has a GWP of 1 over 100 years. All other greenhouse gases HFC, CFC HCFC and methane are measured relative to CO2.

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Life Cycle Analyses

ECOBALANCES

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We are occasionally asked: “Does the manufacture of EPS products have any impact on the environment?”

All manufacturing processes cause and will cause some impact on the environment. Regardless of whether they be energy and resource usage, emissions into the atmosphere, water pollution or waste generation - some impact will always occur.

Environmentally conscious manufacturers will aspire to keep the environmental impact to a minimum. Some materials are marketed as "ecological" or "environmentally friendly", providing piecemeal information (about those aspects where they are positive) in relation to their environmental effects. **There is a technique for circumventing misleading information and for evaluating the environmental effects of materials.**

Life Cycle Analyses

Product life-cycle analyses were conceived taking into account all the stages involved in a product's life. In each of these stages the quantity of energy it consumes is ascertained as well as the quantity and type of atmospheric and water pollution it causes and the quantity of solid waste it generates. This new discipline is the most efficient method available for evaluating the environmental impact of materials. It enjoys growing acceptance from governmental authorities.

Frequently asked questions

How many steps are there in the Life Cycle Approach?

Four.

What are they?

Goal Definition and Scoping, Inventory, Impact Assessment, Evaluation, and Improvement Analysis.

Goal Definition and Scoping?

The unit (in this case 1 kg of EPS material) is defined, data gathering and validation procedures are determined, and the level of data-detail is established.

What do we mean by Inventory?

First, an inventory of relevant inputs and outputs to and from the environment are compiled. From this information, known as the Life Cycle Inventory (LCI), any potential environmental impacts are evaluated and interpreted. The study is a dynamic one, and can be updated as soon as new information relevant to EPS becomes available.
Considering the number of participating countries and producers, and the amount of data involved, the investigation had to be highly structured, detailed and standardised. This resulted in a clearly defined and reproducible working model. The parameters for the study are set at this stage. System boundaries and allocation procedures are determined, process flow charts are drawn up, and data sources are selected (in this LCA, the EUMEPS members and producers formed the data sources).

What's Impact Assessment?

Before we can determine any environmental effects, we must outline the categories under consideration: the Impact Categories. An example of an Impact Category used in the EPS study is its recyclability. Then, for each category, a number of characterisation factors are created (categories of recyclability) and a selection of normalisation factors included.

What's involved in the Evaluation process?

In this final stage of the study all the information gathered throughout the study is analysed. There are several considerations: sensitivity analysis, reliability analysis, qualitative and quantitative analysis, and finally, appraisal.

EPS Life Cycle Analysis

Study carried out by PRC-Bouwcentrum

1) **The authority of the Life Cycle Approach is supported by the <u>ISO 14040 series of standards</u>**, and follows in detail the life cycle stages of EPS manufacture, use, recycling and disposal

Environmental effect/aspect	Abbreviation	Unit	Characteristic scores	Normalisation scores
Environmental impact				
Abiotic depletion	ADP	-	0,83	1,04E-11
Global warming	GWP	kg	5,98	1,42E-12
Ozone depletion	ODP	kg	2,11E-06	3,75E-14
Human toxicity	HCT	kg	0,0357	9,06E-13
Aquatic ecotoxicity	ECA	m^3	101	2,29E-13
Smog	POCP	kg	0,0207	3,28E-12
Acidification	AP	kg	0,0278	8,19E-13
Nutrification	NP	kg	0,00241	2,81E-13
Land use	LU*t	$m^2.yr$	0,00274	
Environmental indicator				
Cumulative energy demand (excluding feedstock energy)	CED-	MJ (lhv)*	48,9	8,45E-13
Cumulative energy demand (including feedstock energy)	CED+	MJ (lhv)	93,1	1,61E-12
Not toxic final waste	W-NT	kg	0,0453	8,43E-14
Toxic final waste	W-T	kg	0,0124	3,09E-13

* lhv = lower heating value

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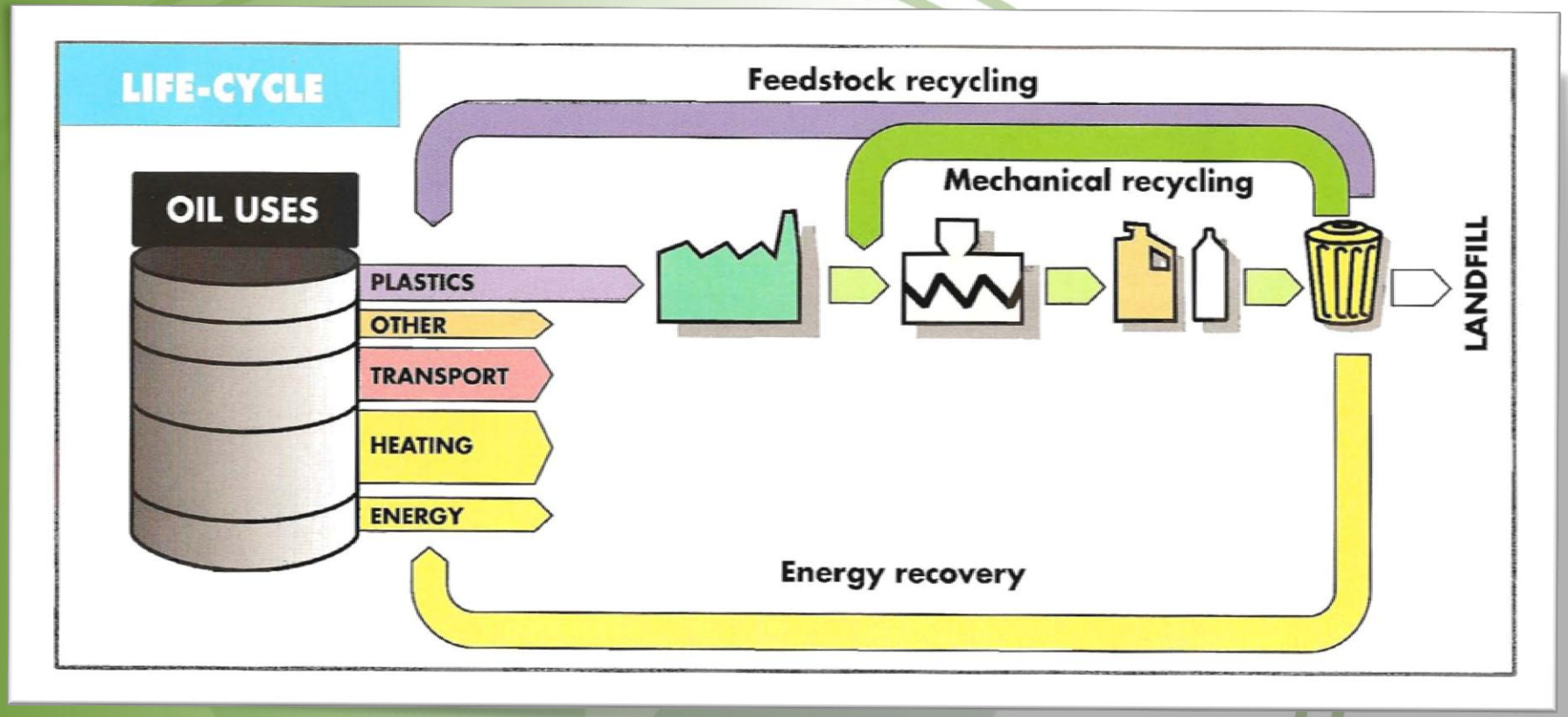
A Life Cycle Comparison

EPS VS. CARDBOARD

EPS Life Cycle Comparison



Life-cycle analyses have shown that Expanded Polystyrene packaging clearly has much less effect on the environment than other competitive materials for the same use.

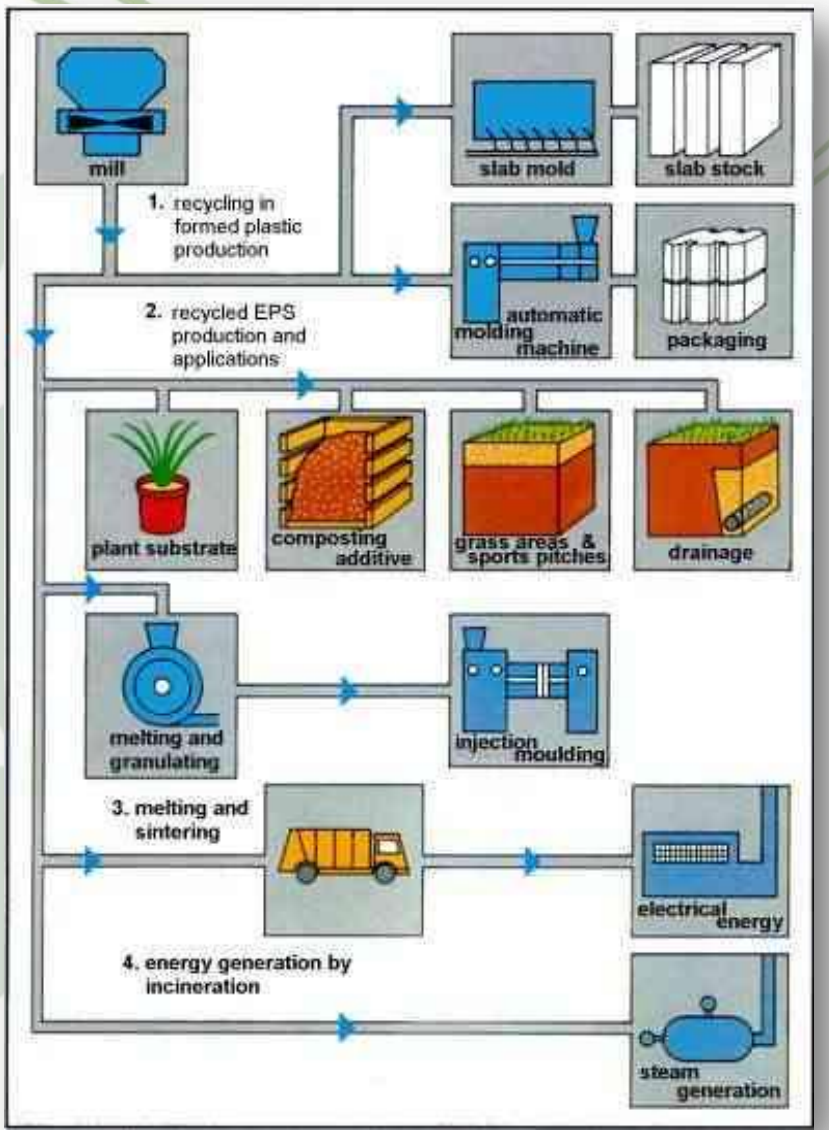
Life Cycle Comparison

Compared with EPS cups of the same size, **paper cups consume:**

170 times as much process water
30 per cent more cooling water
15 times more chemicals
13 times more electricity
6 times as much steam

Because of its light weight, on an equal volume basis EPS is only one-sixth of the weight of cardboard.

Compared to EPS, other packaging materials such as wood, corrugated cardboard and paper weigh on average six and a half times as much, require twice as much energy to produce and result in two-thirds more waste by volume.



Life Cycle Analysis Conclusion

Life-cycle analyses have shown that Expanded Polystyrene packaging clearly has much less effect on the environment than other competitive materials for the same use.

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Weighing The Benefits

CRITICAL FACTORS

EPS Vs Cardboard

Expanded Polystyrene packaging has a significantly lower impact on the environment during production then cardboard products. This is especially so in terms of atmospheric pollution, energy consumption, water pollution and global warming potential.

Environmental Load Index

PACKAGING STUDIED	ENVIRONMENTAL-LOAD INDEX	
VENDING MACHINES CUPS (1)	**EPS CUPS**	**PAPER CUPS**
		EPS=1
CHEMICALS	1	15
ELECTRICITY	1	13
COOLING WATER	1	1,3
PROCESS WATER	1	170
STEAM	1	6
CRUDE PETROLEUM	1	0,6
SHAPED/MOLDED PACKAGING (2)	**EPS**	**PULP AND FIBREBOARD**
ENERGY CONSUMPTION	1	2,3 - 3,8
AIR POLLUTION	1	3,1 - 4,1
WATER POLLUTION	1	2,3 - 2,8
GLOBAL WARMING POTENTIAL	1	4,0 - 4,4
VOLUME OF SOLID WASTE	1	0,69 - 0,79
PACKAGING MATERIALS (3)	**EPS**	**WOOD, PAPER, ETC**
COST	1	1,3
WEIGHT	1	6,4
ENERGY CONSUMPTION	1	2,0
VOLUME OF SOLID WASTE	1	1,2

Sources:

1) University of Victoria, BC - "Polyfoam vs paper cups...". http://www.springerlink.com/content/b55256333584v60n/
2) InFo Kunststoff, Berlin - "EPS and corrugated cardbord, a life cycle study". http://library.epfl.ch/en/periodicals/?recId=12836431
3) Study of GVM, Wiesbaden.

Versatile EPS

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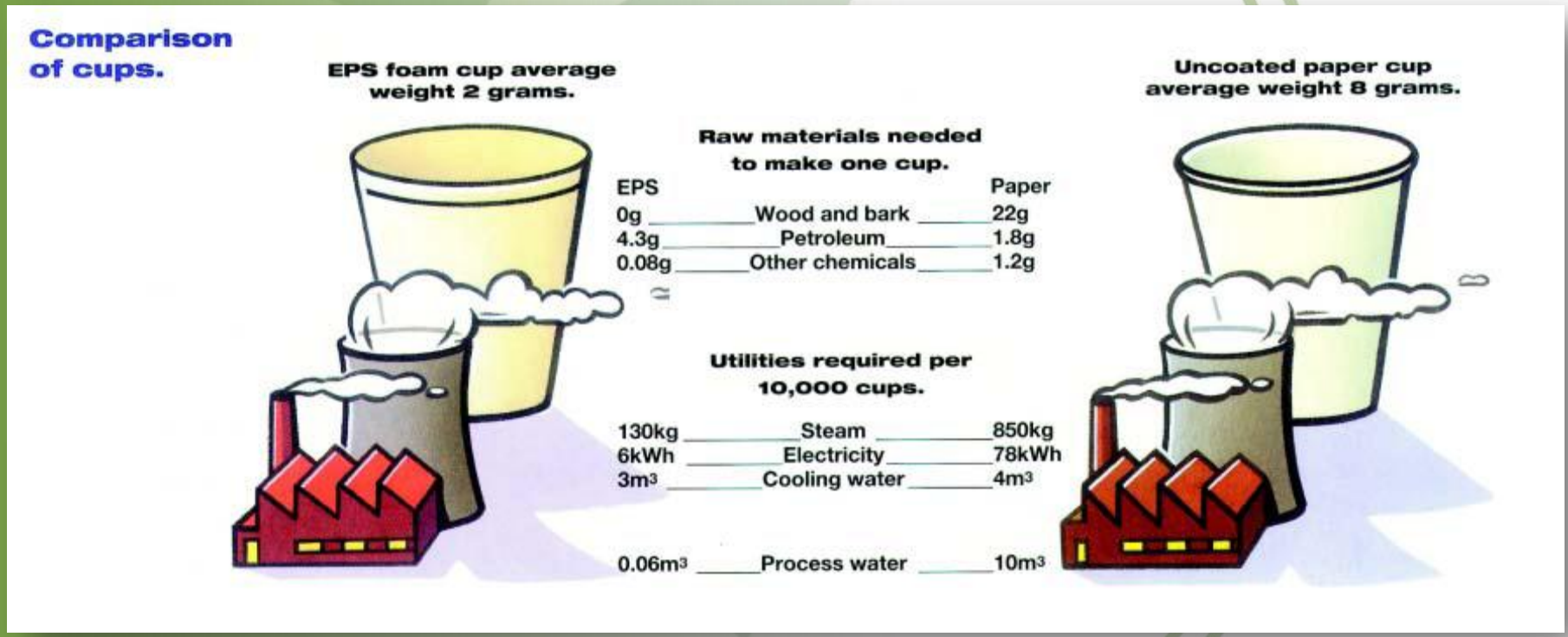

LIFE CYCLE INVENTORY OF PACKAGING OPTIONS FOR SHIPMENT

FINAL PEER-REVIEWED REPORT

Prepared For

OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ)
U.S. EPA ENVIRONMENTALLY PREFERABLE PURCHASING PROGRAM

By

FRANKLIN ASSOCIATES, A DIVISION OF ERG
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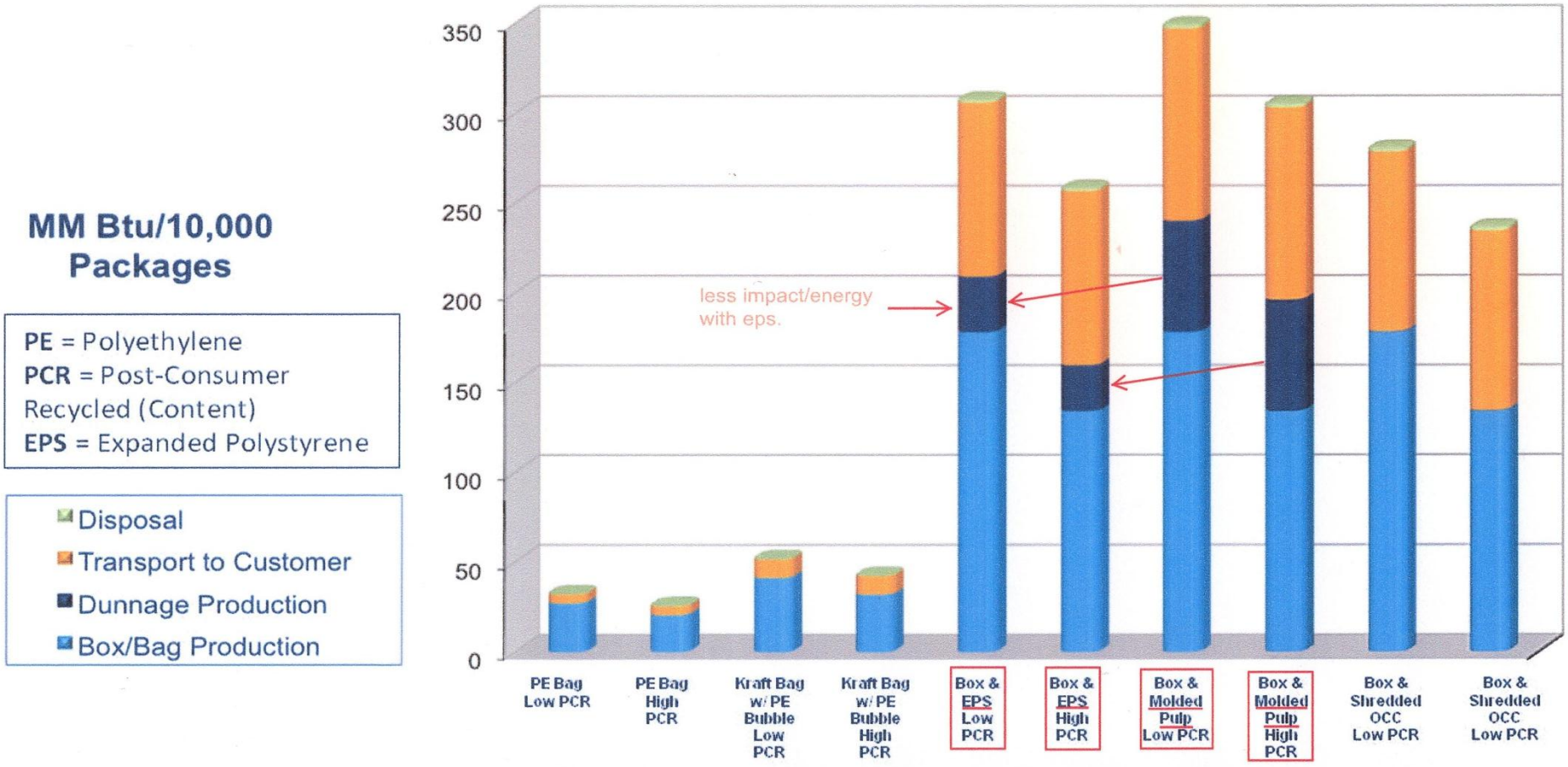

Energy & Environmental Results For Packaging Options For Shipment of Retail Mai-Order Soft Goods – Franklin Associates, 2003

OBSERVATIONS AND CONCLUSIONS

The Franklin Report

The main conclusion that can be drawn from this analysis regarding packaging options for shipping mail-order soft goods to residential customers is that the weight of the packaging is the most critical factor influencing the environmental burdens. Burdens for material production, transportation, and disposal all relate directly to the weight of material that is required. In this analysis, heavy packaging components with a relatively low environmental profile per pound have higher overall environmental burdens than packaging options that are made of materials with higher per-pound burdens but that have lower weights used in packaging.