IMPACTS OF PACKAGING ON CURBSIDE RECYCLING COLLECTION AND RECYCLING SYSTEM

Document Intended for Fact Sheet Users

27 April 2011

Introduction

In a continuing effort to improve the efficiency and effectiveness of curbside recycling, ÉEQ developed a new best practices tool in 2011 – Fact Sheets – for the benefit of its contributing companies. Fact Sheets establish a diagnosis and offer recommendations on the impacts and consequences of certain packaging on Quebec's curbside recycling collection and recycling streams.

Some packages cause problems for the curbside recycling collection and recycling system that may be due to the materials used, the colour or shape of the packaging or the lack of sufficiently effective equipment to sort or recycle them. The Fact Sheets address the situation to provide companies with guidance in making informed choices on the packaging they market.

Caveat

The Fact Sheets have been developed in accordance with current collection, sorting and recycling practices as well as equipment used in Quebec. ÉEQ's recommendations are based on available information and practices most representative of Quebec's industry. Because the situation evolves with time, publication dates and updates, as appropriate, are specified on each Fact Sheet.

ÉEQ is fully aware that other factors must also be considered, including safety, product preservation, technical possibilities and the environmental footprint of the packaging. Please keep in mind that the information provided in these Fact Sheets is limited to the impact of packaging on curbside recycling collection and recycling system in Quebec.

Objectives

- Provide a reference tool to ÉEQ contributing companies
- Fulfill a need expressed by companies wishing to adopt packaging that is more compatible with Quebec's current recycling streams
- Inform, raise awareness and educate all concerned audiences regarding the impacts and consequences of certain packaging on curbside recycling collection and recycling system
- Contribute to reducing the net costs of curbside recycling collection by helping companies choose packaging that is more easily recyclable

Intended Public

- ÉEQ contributing companies, particularly executive management, packaging managers and environmental issues managers
- Sorting centres and recyclers
- Other concerned groups involved in packaging and curbside recycling collection and recycling system issues such as packaging manufacturers, municipalities, governments and associations

Methodology and Sources of Information

Sources of Information

Fact Sheets are developed using the following sources of information:

- **[External studies]** Technical reports and articles on curbside recycling collection and recycling produced in Quebec and elsewhere in the world
- **[External opinion]** Technical opinions formulated as a result of projects similar to ÉEQ's and carried out outside Quebec (e.g. projects carried out by Recoup, APR and COTREP)
- **[Expert opinion]** Communications with Quebec and North-American experts knowledgeable about sorting centre and recycling facility operations or about packaging and materials

The Fact Sheets are based on current practices in Quebec. Expert opinions are gathered before each Fact Sheet is developed to ensure that they accurately reflect Quebec's curbside recycling collection and recycling context.

Information Analysis

ÉEQ's Technical Services collect all documentation relevant to the Fact Sheets. The physical properties of packaging materials are analyzed and validated, including density and processing temperature, as well as handling equipment and operational processes available in sorting centres and recycling facilities. For example, the following questions are researched:

- Is the packaging easily sorted using equipment normally available in sorting centres?
- Can its component materials be sorted by sink/float tank separation to take advantage of density differences?
- If packaging component materials are recycled together, are they compatible? Is there a risk of contaminating one material with another?

Once the analysis is complete, ÉEQ issues a recommendation for the intended public.

Validation

The first Fact Sheet was revised by independent consultant Centre de Transfert Technologique en Écologie Industrielle (CTTÉI). CTTÉI developed an analysis grid to evaluate each Fact Sheet produced by ÉEQ according to criteria relating to the information consulted (variety, quantity and quality of sources) and the relevance of its content.

How to Use Fact Sheets

Each Fact Sheet is made up of five sections:

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1) **Introduction:** description of the subject studied
2) **Summary Table:** presentation of the impacts and consequences of the packaging studied on curbside recycling collection and recycling system
3) **Recommendation:** support for contributing companies in making informed decisions regarding their packaging choices

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4) **Additional Information:** greater technical detail on the impacts and consequences mentioned in the summary table
5) **Main references:** for doing further research on the subject

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FACT SHEET
IMPACT OF PACKAGING ON CURBSIDE RECYCLING COLLECTION AND RECYCLING SYSTEM

PET BOTTLE with PVC sleeve-label

Introduction

The recovery and recycling stream for polyethylene terephtalate (PET) plastic bottles is well established in Quebec. Rates of recovery through curbside recycling collection are high, sorting the material is relatively easy for sorting centres, sorted material is worth several hundred dollars per tonne and there are business opportunities for its sale to recyclers.

The recent introduction of polyvinyl chloride (PVC) sleeves threatens this stream. As illustrated, the sleeves are used as a type of adhesive-free label that shrinks to the shape of containers. Keeping in mind Quebec's current system, the following table demonstrates the impact and consequences of using PVC sleeves on PET bottles. Consequences are both environmental and operational, therefore generating negative economic costs.

Summary Table

	STEPS	LEVEL OF IMPACT	IDENTIFIED IMPACTS	IDENTIFIED CONSEQUENCES
CURBSIDE RECYCLING COLLECTION	Collection and transportation	○	None	None
	Sorting centre operations	○	None	None
	Sorting			
	- manual	○	None	None
	- mechanical	○	None	None
	- optical	◑	• Increase in the percentage of bottles going into the wrong streams or being rejected due to equipment used	• Fewer PET bottles recycled • Contamination of other types of recyclable materials
CONDITIONING AND RECYCLING	Grinding and washing	○	None	None
	Additional sorting	◑	• Sorting by material density is ineffective for the sorting of PET bottle from PVC sleeve	• Requires special equipment
	Plastics processing	●	• Mechanical and chemical degradation of PET bottle due to low concentrations of PVC	• Lower quality resin produced by the recycling of PET bottles (black spots, discolouration)

LEGEND: ○ No impact ◑ Caution (uncertainty or complication) ● Problem

Recommendation

ÉEQ's research, available external studies and expert opinions all indicate that PVC sleeves have impacts on curbside recycling collection and recycling of PET bottles. The impacts identified in the summary table provide the basis for the following recommendation:

ÉEQ recommends avoiding the use of PVC sleeve-labels on PET bottles given the current state of Quebec's curbside recycling collection and recycling system.

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Introduction

Description of the packaging studied and its collection and recycling streams in Quebec

Summary Table

Impacts and consequences of the packaging studied at various stages of curbside recycling collection and recycling system

The level of impact the packaging has is classified according to the following:

○ **No impact:** The packaging is generally well handled by curbside recycling collection and recycling equipment in Quebec.

◑ **Caution:** The packaging presents certain problems (e.g. difficult sorting, lack of specialized equipment, premature equipment wear, very high handling costs) or, there is uncertainty regarding the material studied (e.g. new materials, lack of recycling stream).

● **Problematic:** In the current context, the packaging greatly disrupts curbside recycling collection or recycling system (e.g. major contamination of recycled materials).

Recommendation

ÉEQ's recommendation on the relevancy of using the packaging studied given the current state of Quebec's curbside recycling collection and recycling streams

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IMPACT OF PACKAGING ON CURBSIDE RECYCLING COLLECTION AND RECYCLING SYSTEM

Additional information

PET bottle with PVC sleeve-label

ÉEQ's directory of fact sheets is growing and will soon contain recommendations on other types of sleeve-labels. Other than PVC, there are types of plastics that may be used for sleeves, such as oriented polypropylene (OPP) or low-density polyethylene (LDPE).

Impacts shown on the summary table

OPTICAL SORTING
Optical sorting equipment is used by some Quebec sorting centres to separate plastic packaging according to component materials. Some equipment may not correctly identify bottles with sleeve-labels due to the presence of combined materials. For any type of optical sorting equipment, dealing with combined materials increases the risk of PET bottles going into the wrong streams or being rejected [Expert opinions]. It should be noted that when recyclable materials are compacted in the collection and transportation process, most sleeves detach from the bottles, therefore facilitating optical sorting [Expert opinions].

ADDITIONAL SORTING
Sink/float tank separation is a sorting technique used by recyclers to separate materials with a lower density than that of water (and therefore float) from those that have a higher density than water. As both the PET from bottles and PVC from sleeves are more dense than water, they cannot be sorted by sink/float tank separation [External studies]. Additional equipments are necessary to cope with this matter and, therefore increase the costs of additional sorting.

PLASTICS PROCESSING
"Black spots" show up in PET that is contaminated with PVC, and the mechanical and chemical properties of the material are changed, even in the presence of low PVC concentrations. Quebec recyclers have informed ÉEQ that maximum concentration of PVC in PET is 50 ppm [Experts opinions]. A study conducted by Paci et al. (1999) showed that 100 ppm of PVC in recycled PET bales may increase its degradation and discolouration (Naït-Ali, 2008) [External studies].

Main references

Association of Postconsumer Plastic Recyclers (2009) *Design for Recyclability Guidelines*, viewed on July 28, 2010, http://www.plasticsrecycling.org/technical_resources/design_for_recyclability_guidelines/index.asp

Comité Technique de Recyclage des Emballages Plastiques (2004) *Avis généra l- Étiquettes et manchons PVC sur bouteille PET*, COTREP, viewed on December 16, 2010, http://www.cotrep.fr/fileadmin/contribution/mediatheque/avis-generaux/francais/etiquettes-et-manchons/FT08-etiquette-PVC-sur-bouteille-PET.pdf

NAÏT-ALI, Kako Linda (2008) *Le PET recyclé en emballages alimentaires : approche expérimentale et modélisation*, Doctorate thesis on the chemistry of materials, Université Montpellier II, viewed on November 16, 2010, 220 p. http://tel.archives-ouvertes.fr/docs/00/29/20/38/PDF/these_naitali_300408.pdf

PACI, M. and LA MANTIA, F.P. (1999) "Influence of small amounts of polyvinylchloride on the recycling of polyethyleneterephthalate", *Polymer Degradation and Stability*, vol. 63, n°1, p.11-14.

Recoup (2009) *Plastics Packaging - Recyclability by Design*, 2009 revised edition, viewed on September 24, 2010, http://www.recoup.org/design/docs/202July_09_APR_endorsement_RBD.pdf

www.ecoentreprises.qc.ca

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Additional Information

Detailed explanations on the impacts and consequences previously presented in the Summary Table

Main References

Presentation of the main sources of written information consulted for developing the Fact Sheet

Diagram on the Various Stages of Curbside Recycling Collection and Recycling System

Today, almost all Quebecers have access to municipal curbside recycling collection programs. In 2008, over 650,000 tonnes of recyclable materials were recovered and handled by Quebec sorting centres (RECYC-QUÉBEC, *Bilan 2008 de la gestion des matières résiduelles au Québec*, Montréal, 2009, p.3).

The following diagram illustrates the main stages of curbside recycling collection and recycling system, including conditioning, in the case of plastic packaging. It should be noted that these stages may vary because all Quebec sorting centres and recyclers do not have the same equipment or may not use the same operational methods.

Stages in Curbside Recycling Collection

Collection and Transportation

Residents place plastic packaging in recycling bins along with other recycled materials, which are then collected and transported. Collection and transportation result in materials compaction. Generally, recyclable materials are sent directly to sorting centres but, in some cases, they are first directed to a transfer station.

Sorting Centre Operations

All recyclable materials, including plastic packaging, are handled by sorting centres. They are unloaded, transported on conveyor belts, sorted mechanically, manually, and sometimes optically, before being baled and sent on to a recycler.

Mechanical Sorting

Mechanical sorting equipment separates fibres (paper and cardboard) from plastic, glass and metal packaging. Some types of mechanical sorting equipment perform better than others from an operational point of view.

Manual Sorting

Sorting centre employees separate plastic packaging from glass and metal. Plastic packaging is generally sorted into three categories: 1) PET bottles, 2) HDPE bottles, 3) other plastic packaging, called "mixed plastics."

Optical Sorting

Some sorting centres have optical sorting equipment. This equipment replaces part of manual sorting, i.e. that which separates plastic packaging according their materials.

Stages in Conditioning and Recycling

Grinding and Washing

In order to obtain recyclable material in the form of small, clean plastic pieces, commonly called flakes, plastic packaging from sorting centres is ground and washed. Such plastic packaging may come from PET bottles, HDPE bottles or mixed plastics.

Additional Sorting

Depending on how recyclers are set up, additional sorting is required before and after grinding and washing. This additional sorting is necessary to remove contaminants and sort plastic packaging according to recycler specifications ("recipes" that specify i.e. colour and/or quality of material). The additional sorting method most used is sink/float tank separation, which separates materials according to density.

Plastics Processing

Recyclers produce recycled plastic pellets or sheets that they sell or use to manufacture new products or packaging.

Acknowledgements

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