INTRODUCTION

In this study, we conduct a lifecycle analysis of window frames made out of Polyvinyl Chloride (PVC). The window frames that we examine start their life as PVC in the Oxy Vinyls Canada Manufacturing plant in Thorold, Ontario; are assembled out of that PVC at the Harvey Building Resources Manufacturing Plant in Manchester, New Hampshire; and are distributed to homeowners through Boston Building Resources in Boston, Massachusetts. However, the manufacturing and distribution of these window frames bring with it a slew of environmental externalities throughout the frames lifecycle. During production, PVC emits a carcinogenic gas that can have disastrous human health and environmental implications. During transportation, a huge amount of greenhouse gases are produced. In disposal, many PVC windows end up in landfills. PVC is 100% recyclable, so we investigate to what degree these windows are being recycled. We also investigate what the industry is doing at all points of the process in order to make the product more sustainable and how customers feel about vinyl windows as opposed to the more traditional wooden alternative.

METHODS

We conducted our investigation using three research tools. We went on a tour of the Harvey Manufacturing Plant to assess post-industrial PVC recycling and conduct employee interviews. Additionally, we surveyed Harvey customers to determine the homeowners’ window preferences and window disposal practices. Finally, we used scientific databases to further our understanding of the PVC life cycle and its externalities.

HOMEOWNERS’ DISPOSAL PRACTICES

![Figure 1. Responses to Survey Question 7: What do you do with your old vinyl windows?](image)

![Figure 2. Responses to Survey Question 6: Did you have to replace your vinyl windows?](image)

RESULTS

- There were no recorded incidents or complaints of damage to human health through the operations of Oxy Vinyls Canada.
- In addition, they have been diligent and successful at keeping their emissions at levels well below those that would cause harm to the environment.
- At the Harvey Plant, post-industrial waste is sent to a recycling facility to be recycled into chips and re-used in the production of other PVC products.
- There was an overwhelming preference for vinyl windows over wood windows as evidenced by the homeowner survey, and the disposal of old windows is split between being sent to a landfill and being removed by Grant Disposal Company, separated into salvageable PVC parts, and recycled.

CONCLUSION

With increasing concern over the sustainability of the PVC life cycle, the recycling of this material by each company involved in the process becomes ever more important in regards to the impacts on the environment and human health. Oxy Vinyls Canada, Harvey Building Products and BBR all state that sustainability is central to their mission, and their current efforts reflect this promise. However, the disconnectedness among stakeholders and the huge input of greenhouse gases from transport and production necessitate a more integrated to PVC window production and recycling.

SOLUTIONS

1) Develop a collection system in which consumers return their used window frames and receive a deposit paid at the time of purchase. This incentivizes consumers to keep their old window frames out of landfills.
2) Implement alternative energy sources for production plants and alternative fuels for transport of PVC material

DOCUMENTATION

[Links to various sources and references related to PVC lifecycle, environmental concerns, recycling, and sustainable practices]