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Center for Sustainable Business

OWENS CORNING®

The Business Case for Zero Waste to Landfill by 2030

Working with Owens Corning's Fiberglass Insulation Business

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Introduction

Owens Corning is a Fortune 500 company that develops, manufactures and markets insulation, roofing, and fiberglass composites. They pride themselves on developing solutions that help save energy and improve comfort in commercial and residential buildings.

Currently, Owens Corning is working towards reducing the amount of waste generated and increasing recycling opportunities. They are aspiring towards becoming more circular with their products by using more waste in their products and processes (e.g., by using recycled glass to make fiberglass). Their near-term goal of Zero Waste to Landfill by 2030 comes at a time when customers are demanding lower embodied carbon products. A survey by Dodge Construction Network found that over 94% of engineers and contractors have client requests to reduce project embodied carbon. 27% report that this happens on 50% or more of projects.[1]

AttiCat® PINK® Blown-In Insulation installed in an attic.

SOFTR® Duct Wrap FRK fiberglass blanket being installed.

European regulators are also in the process of increasing demands around recycled content and waste management. For example, many countries throughout Europe are already reducing their landfill use. Between 2017 and 2020, Croatia, Poland, Slovakia, Cyprus, Greece, Malta, and Romania all reduced their landfill uses 20-31 percentage points.[2] In the US, the EPA is reevaluating landfill emissions calculation methodology which may be understating emissions

[1] Dodge Construction Network: Building Sustainability - The Drive to Reduce Embodied Carbon in Concrete Construction, 2022. [NOTE: link does not work]
[2] European Parliament: Waste management in the EU: infographic with facts and figures, June 2023.

by as much as 25%,[3] and in some regions, it has become more challenging to open landfills with pushback from community members.

NYU Stern CSB engaged with their fiberglass insulation business to understand the tangible and intangible benefits of achieving their Zero Waste to Landfill goal by 2030. A plant in the Owens Corning' network located in the Midwest, United States, was used to pilot the application of the ROSI methodology. This analysis could be modified to address waste reduction goals at other plants in the network and for other product categories.

The project evaluated the Return on Sustainable Investment (ROSI™) of the following key actions over a 7-year period:

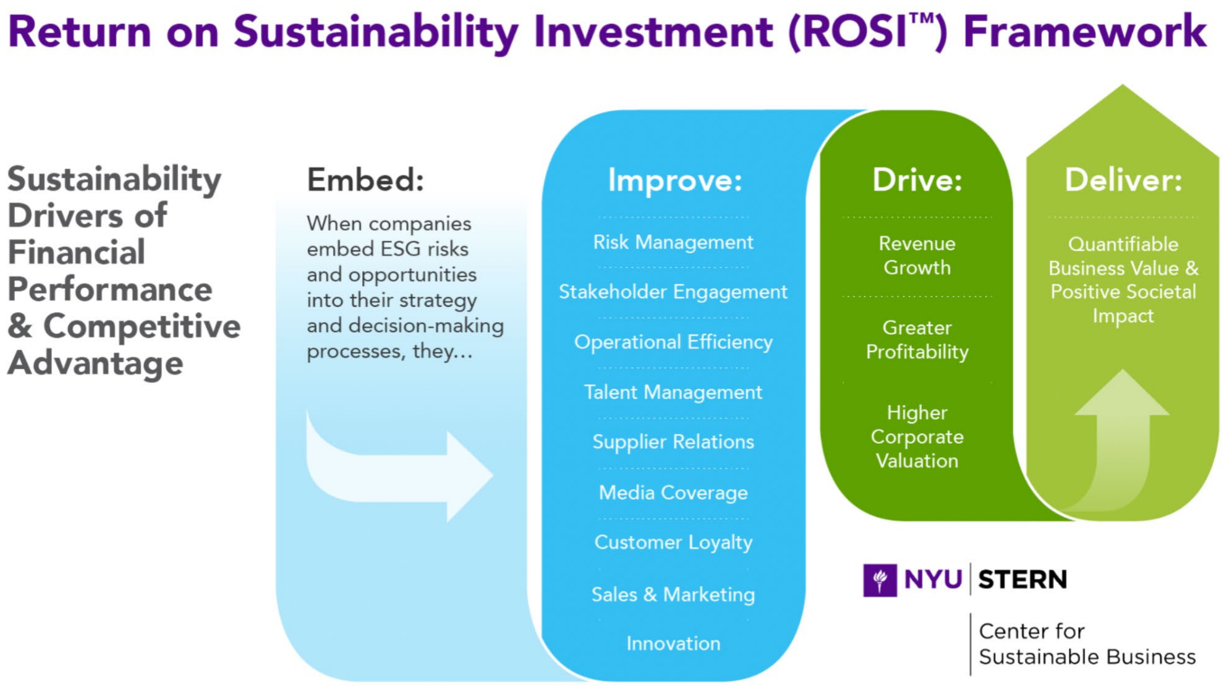
- Shift away from landfill by diverting to a variety of in-house recycling innovations and external recycling outlets.
- Deploy solutions that allow Owens Corning to increase product recycled content.
- Reduce scrap generation in the production process.

Note: This analysis did not include non-hazardous liquid waste, hazardous waste, or plant trash.

ROSI™ Benefits

The ROSI™ process began with a benefits assessment, which identified the tangible and intangible benefits of one of Owens Corning's manufacturing plants achieving zero waste to landfill by 2030. These benefits were identified through desk research and interviews across business functions such as sustainability, marketing, procurement, finance, environmental legal, as well as several plant leaders.

[3] Environmental Integrity Project: EPA Underestimates Greenhouse Gas Emissions from U.S. Landfills by at Least 25 Percent, 2021.



For this analysis, NYU Stern CSB identified the following benefits:

1. **Avoided Risk of Sales Loss:** The emergence of new alternative sustainable insulation products presents competition. A sustainable product alternative will help mitigate loss of market share.
2. **Sales Opportunity:** Products with high recycled content and internally recycled materials may present a sales opportunity.
3. **WTL Diversion Mix:** Sending waste to landfill can be cheaper particularly in the U.S. than diverting to other outlets, but diverting away from landfill enables value to be realized in other metrics.
4. **Raw Material Procurement Mix:** Increasing the volume of waste that is diverted using internal recycling capabilities saves cost on procuring raw materials.
5. **Production Line Efficiency:** Improvements to production efficiency of the line, reduces scrap generation.
6. **Carbon Efficiency:** Diverting waste from landfill reduces carbon emissions, which can help OC meet its carbon reduction goals.
7. **Employee Engagement:** waste reduction would enable reallocation of employee time currently spent managing and moving waste, resulting in reduction of waste-related injuries. Additionally, less waste and waste reduction actions also can increase retention among employees who joined Owens Corning in part due to its sustainability profile.
8. **Risk Management:** Owens Corning can reduce costs by avoiding compliance penalties, lawsuits, and negative media/community pushback related to waste.
9. **Media Impacts:** Unpaid media benefits from media coverage of meeting the zero waste to landfill goals.

10. **Investors:** Ability to attract and retain investors.

Due to the limited scope of the project and availability of data, only the top 7 benefits were monetized.

Methodology: Applying ROSI™

The NYU Stern CSB team worked with Owens Corning to develop financial metrics for estimating the ROSI™ for 7 of the benefits that were previously identified. Read on to learn more about each benefit's methodology and results.

Benefit 1: Avoided Sales Loss

By investing in internal recycling capabilities at the plant-level to support insulation products with a higher recycled content, Owens Corning reduces its potential of losing Key Customers.

Customers are increasingly demanding sustainable solutions for their buildings. Owens Corning can meet this demand by increasing their recycled content to better compete with emerging sustainable alternatives. By investing in waste to landfill (WTL) reduction strategies, Owens Corning can build its sustainability-first reputation.

Methodology

This metric compares a Business as Usual (BAU) scenario where share of sales to key customers stays the same to an Alternative Scenario where share of sales to key customers declines gradually over the analysis time.

Step 1: Estimate annual total sales for the Business by multiplying net sales by estimated revenue growth.

Step 2: Estimate the risk-adjusted share of Sales to Key Customer (%) by subtracting the market share at risk divided by the time for share to decline from the share of key I customers as a percent of total sales.

Step 3: Estimate Business as usual sales to Key Customer by multiplying the share of key customer as percent of total sales by the annual total sales.

Step 4: Estimate risk-adjusted sales to Key Customer by multiplying the risk-adjusted share of sales to key customer by annual total sales.

Step 5: Estimate Sales to Key Customer at Risk by subtracting risk-adjusted sales to key customer from business-as-usual sales to key customer.

Step 6**:** Estimate operating income at risk (avoided loss) by multiplying the sales to key customer at risk by the total operating margin (EBIT as a percentage of sales).

Step 7: Calculate the Net Present Value (NPV) using the company's discount rate.

Benefit 2: Sales Opportunity

Owens Corning can capture new revenue streams by introducing new sustainable products that are tied to innovative waste reduction strategies.

This metric relies on an estimate of the sales opportunity for a new sustainable insulation product and/or the expansion of an existing product to broader markets. A proxy based on products currently sold that include scrap materials recycled into the final product at other facilities was used. In doing so, they could reach additional segments and increase revenue for the plant.

Methodology

This metric compares the BAU where Owens Corning does not introduce a new product to an Alternative Scenario where Owens Corning introduces a new product with high recycled content.

Step 1: Calculate estimated sales by multiplying the estimated sales opportunity for a new sustainable insulation product by the sales growth estimate, taking into consideration the deployment year.

Step 2: Calculate associated marketing cost by multiplying the estimated annual sales by the marketing costs (as a percentage of sales). This metric uses an industry standard of 5% of revenue.

Step 3: Calculate the net sales benefit by subtracting the annual marketing costs from the estimated annual sales.

Step 4: Calculate the NPV using the company's discount rate.

Benefit 3: Diversion Mix

By diverting waste away from landfill, Owens Corning can reduce costs.

This metric requires Owens Corning to compare their current diversion mix to an alternative scenario where they reduce waste to landfill by 2030 through internal recycling and external upcycling. The Alternative Scenario assumes the development of alternate diversion solutions to meet the goal of zero WTL at varied timing of implementation by 2030.

Methodology

Step 1: Estimate the volume of glass waste generated annually using the growth in sales as a proxy for growth in waste generation. Multiply the annual glass waste generated by the BAU percent per diversion outlet.

Step 2: Estimate the BAU cost of diversion by multiplying the volume of waste per diversion outlet by the cost per ton per diversion outlet.

Step 3: Set target percentages per diversion outlet for the Alternative Scenario. Repeat Steps 1 & 2 using these new percentages per diversion outlet.

Step 4: Calculate the difference between the BAU diversion cost and Alternative Scenario diversion cost to estimate the diversion mix shift cost savings.

Step 5: Calculate the NPV using the company's discount rate.

The diversion benefit is negative starting in year 4, when alternative diversion outlets are introduced, which are both more expensive than sending waste to landfill. In year 5, an additional diversion outlet is also introduced, which increases costs substantially, also much more expensive than sending waste to landfill.

This metric makes it clear that the benefits derived from recycling are far greater than just offsetting the cost of to landfill as reflected by the other metrics.

Benefit 4: Procurement Mix

By investing in internal recycling solutions, Owens Corning can reduce their costs for procuring virgin and externally procured recycled glass.

This metric compares the BAU fiberglass insulation glass mix to an Alternative Scenario. It relies on the assumption that the plant can only procure as much internally recycled cullet as is diverted through their internal recycling mechanisms. In the BAU, the current % of recycled content is used and in the alternative scenario, it is increased based on feedback from operations interviews. The analysis also considers constraints in maximum and minimum recycled content thresholds to ensure product formulation quality and qualify for recycled content certifications.

A decrease in virgin glass needed leads to a cost reduction because the price of virgin glass is much higher than recycled glass. There are also transportation savings associated with acquiring the glass, and the energy savings associated with processing recycled glass, as virgin glass uses more energy to process.

In the BAU Scenario, the plant is diverting more internally recycled cullet than they are able to use in their product formulations. In the Alternative Scenario, the plant increases its use of internally recycled materials. However, excess cullet can be sold to third parties or reused by Owens Corning.

Methodology

Step 1: Estimate the base case volume of glass needed from each source including virgin glass, externally procured cullet, and internal recycled glass. Start with internal recycled glass - pull the amount of internal recycled glass that is diverted from the diversion metric. Calculate the amount of externally procured recycled glass needed by multiplying the minimum percent needed by the volume of glass needed annually. Estimate the amount of virgin glass needed by subtracting the two sources of recycled glass from the total glass needed. The analysis included the minimum and maximum for recycled content required by the process formulations.

Step 2: Multiply each volume per source by their respective prices to calculate the base case total cost of glass. Included in the prices are inflation factors which may depend on supply availability and/or inflation.

Step 3: Estimate the new volumes of glass needed from each source based on increase in internal recycling capabilities (as depicted in the diversion metric) and minimum procured cullet necessary for meeting recycled content requirements.

Step 4: Multiply each new volume per source by their respective prices to calculate the base case total cost of glass. Included in the prices are inflation factors which may depend on supply availability and/or inflation.

Step 5: Estimate energy cost savings associated with the glass procurement mix shift, given that recycled glass typically takes less energy to process. Do this by comparing the cost of energy needed before and after the glass mix shift. Be sure to factor in an inflation factor for the price of electricity. Note: carbon reduction benefits associated with reduction in energy use are captured in the carbon efficiency metric.

Step 6: Calculate the additional operational benefits related to the procurement shift including furnace life increase, throughput increase, reduced cullet upsets, and reduced need for oxidizer.

Step 7: To calculate the total operational savings related to the procurement mix shift, add together the procurement cost savings, energy cost savings, and additional operational benefits. Note: The cost of increasing internal recycling capabilities are captured in the diversion metric.

Step 8: Calculate the NPV using the company's discount rate.

Benefit 5: Production Line Efficiency

Owens Corning can reduce waste generation by improving line efficiency to reduce the volume of scrap produced at origin.

This type of production efficiency relies on employees' enhanced management of the process, maintenance of equipment, scheduling of product runs etc. This metric compares BAU where scrap reduction remains where it is today to an alternative scenario where it increases over a 7-year period. Both scenarios factor in a projected production growth which accounts for market growth, throughput increase, and conversion and spinner efficiency.

Methodology

Step 1: Calculate the BAU total product produced for the production lines by multiplying actual pack per line (volume) by 1 plus the projected production line growth.

Step 2: Calculate the BAU percent scrap produced per line by subtracting the weighted average PJE per line from 1.

Step 3: Calculate the BAU volume of scrap produced for the production lines by multiplying the annual product produced per line by the percent scrap produced per line.

Step 4: Calculate the BAU percent annual reduction in scrap for the production lines by subtracting the BAU percent scrap reduction from the percent scrap produced per line.

Step 5: Calculate the BAU volume of scrap produced for the production lines with BAU reduction by multiplying the BAU percent annual scrap reduction per line by the percent scrap produced per line.

Step 6: Calculate the BAU incremental volume of scrap produced for the production lines with BAU reduction by subtracting the BAU scrap produced per line with BAU reduction from the BAU annual scrap produced per line.

Step 7: Calculate the BAU scrap cost savings for the production lines by multiplying the BAU incremental scrap reduction per line by the weighted average PJE savings per pound.

Step 8: Repeat steps 4-7 for the Alternative Scenario using a more progressive scrap reduction percentage.

Step 9: Calculate total scrap reduction savings per line by subtracting the alternative scenario scrap reduction savings per line from the BAU scrap reduction cost savings per line.

Step 10: Calculate the NPV using the company's discount rate.

Benefit 6: Carbon Efficiency

Owens Corning can reduce costs associated with having to purchase carbon offsets in the future at higher prices to meet their carbon reduction goals by increasing their internal recycling capabilities.

This metric calculates carbon emissions avoidance based on the difference between BAU and the Alternative Scenario for procurement mix shift and diversion mix shift.

- For procurement mix shift, carbon emissions depend on the amount of virgin versus recycled glass that is bought, transported, and processed, given that processing virgin glass uses more energy, and thus emits more carbon. Additionally, carbon emissions vary based on whether an electric or gas furnace is used to process it.
- Carbon emissions also vary based on the diversion outlet used. In the metric we have developed, we calculate the carbon emissions avoided from diverting away from landfill. The metric provides input options for calculating the carbon emissions that are accrued by diverting to the other diversion outlets.

It is worth noting that the social cost of carbon was not included in this metric but could provide further economic support for to diverting waste from landfill. Additionally, operational efficiencies related to increasing throughput efficiency could lead to further carbon reductions.

Methodology

Step 1: Calculate the BAU scenario for procurement mix by multiplying estimates for carbon emissions associated with upstream processing and sourcing of virgin and procured recycled glass.

Step 2: Calculate the BAU scenario for processing glass on-site by multiplying estimates for carbon emissions per ton of 100% virgin batch versus one with a higher recycled content) multiplied by their respective volumes pulled from the procurement mix metric. Repeat for the Alternative Scenario and find the difference to estimate carbon emissions savings from procurement mix shift.

Step 3: Calculate BAU scenario for carbon emissions associated with the diversion mix shift by multiplying the estimates for carbon emissions per ton of waste funneled through each diversion channel by their respective volumes pulled from the diversion mix metric. Repeat for Alternative Scenario and find the difference to estimate carbon emissions savings from the diversion mix shift.

Step 4: Add together carbon emissions savings from procurement mix shift and diversion mix shift. Multiply by the incremental carbon price for offsets. This metric assumes that OC will pay less by offsetting emissions now as opposed to having to buy carbon credits in the future at higher prices.

Step 5: Calculate the NPV using the company's discount rate.

Benefit 7: Employee Engagement

By incentivizing employees to reduce waste generation, Owens Corning can reallocate employee time and associated employee injuries. Less waste and waste reduction actions can also increase retention among employees who joined Owens Corning in part due to its sustainability profile.

This metric calculates the employee engagement benefit for waste-related injury costs and retention-related cost.

- For waste-related injury costs, The National Safety Council estimates $42,000 per non-fatal work injury and $1,340,000 per fatal work injury. The metric uses historical data to estimate the costs.
- For retention costs, research from the Lewis Institute for Social Innovation and IO Sustainability suggests that sustainability can reduce employee turnover by 25-50%, but NYU used a conservative estimate given that waste reduction goals are one piece of OC's sustainability agenda and employees may leave for a host of reason.[4] Additionally, the metric uses HR survey data that indicated that a percent of employees joined OC in part due to its sustainability attributes. We use this as a proxy for the number of employees at risk of leaving for not meeting sustainability goals.

Captured in this metric is the ability for a location in the United States to compare the costs of their incentive payouts to employees for production efficiencies related to waste reduction to the avoided costs associated with reducing waste to landfill. An additional benefit that could be monetized is the headcount that could be freed up from managing waste and could be moved to more productive activities.

Methodology

Step 1: Estimate the waste-related injury costs. This model using an estimate of the cost per non-fatal work injury from the National Safety Council in 2023 and multiplies it by the average number of injuries. It then calculates the injury cost of waste to landfill per ton by dividing the annual average cost of managing injuries by the volume of waste generated annually. Cost savings related to reduction in employee-related injuries multiples the injury cost per waste to landfill ton by the annual reduction in waste.

Step 2**:** Estimate BAU annual retention costs by multiplying the median salary for employees by the cost of turnover as a percentage of salary by the number of employees at the plant that handle waste by the % of insulation business that indicated sustainability as a factor for joining OC by the average turnover rate Step #: Estimate the alternative scenario by repeating Step 2 except, using a reduced turnover rate estimated by subtracting the reduction in turnover rate due to sustainability attributes from the average turnover rate. Subtract the Alternative Scenario annual retention costs from the BAU annual retention costs and multiply by attribution factor. Note: Retention benefits are estimated to begin in year 4.

[4] SUMAS Sustainability Management School: Unpacking the Business Case for Sustainability, Accessed 6 March 2025.

Step 3: Estimate employee productivity incentive costs by multiplying the average annual costs for VIP payouts (cost of production efficiency improvements) by the attribution factor for costs related to waste reduced per employee.

Step 4: Calculate cost savings of WTLF for waste that is produced due to inefficient production processes (Piece Job Efficiency) by multiplying the maximum volume of waste produced per employee by the number of employees eligible for VIP payouts related to waste by the cost of WTLF.

Step 5: Subtract the result of Step 4 from Step 5.

Step 6: Add together the cost savings related to reduction in waste-related injuries, increasing retention, and employees improving production efficiency.

Step 7: Calculate the NPV using the company's discount rate.

Conclusion

Using the ROSI™ methodology to evaluate the financial impact of Owens Corning's Zero Waste to Landfill goal made it clear that diverting waste from landfill is not a value driver given how cheap it is. However, by diverting from landfill, Owens Corning can reap significant savings associated with procuring and processing less virgin glass, procuring less external recycled glass, and reducing their carbon emissions now instead of having to buy offsets in the future. They can also mitigate risk associated with managing waste, remaining in compliance with future waste regulations, and retaining employees. By increasing their recycled content, the company can also compete with new sustainable alternatives by introducing new products. ***These ROSI™ net benefits amount to a 7-year NPV of an equivalent of 15% of annual revenue of the plant in 2022 dollars.***

By investing in their waste reduction goals, Owens Corning can unlock opportunities to save money and capture additional value. In doing so, they will also work to secure their long-held spot as a market leader.