

Summer 2021 Carbon Reduction Challenge

***A carbon-conscious method of
bubble wrap procurement for
packaging disposable bioreactors
in ABEC Fermoy, Ireland***



BIPHARMACEUTICAL
Redefined

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Integrated
solutions
and services for
biopharmaceutical
manufacturing



abec.com

MAIN RECOMMENDATIONS

- Replace Vendor A specialty bubble wrap used to ship finished Disposable Container bags from ABEC's Fermoy, Ireland site
- Current wrap is procured in the U.S., handled at ABEC's Bethlehem, Pennsylvania warehouse, and air freighted to Fermoy
- Utilize Vendor B to send bubble wrap substitute to Fermoy via ocean freight



Carbon Reduction
Potential: **11,200 lbs CO₂**
annually

Cost Savings: **\$3,700**
annually

Confidentiality Notice: Due to the sensitive nature of vendor relations, note that exact vendor names will not be mentioned in this document in an effort to preserve current vendor agreements as well as honor the privacy of ABEC's customers who rightfully expect the highest level of commitment to abide by industry rules, regulations, and common practices. Also note that Vendor A is ABEC's current specialty bubble wrap vendor and Vendor B is the proposed new bubble wrap vendor who has international ocean freight capabilities.

Background and Motivation



ABEC, Inc. has a long history of manufacturing turn-key bioreactors, machines in which biochemically active substances are combined to create pharmaceutical drugs such as gene therapies, vaccines, and other injectable medications. A majority of the world's pharma and biotech companies are ABEC customers. Notable is ABEC's role in the manufacturing of COVID-19 vaccines across the globe.

- Minimal current sustainability initiatives
- New proposed procedure to divert CO₂ and introduce cost savings is to acquire identical specialty wrap from Vendor B who can utilize carbon-conscious ocean freight to send the product directly to Fermoy



FROM AIR FREIGHT
to
OCEAN FREIGHT



Carbon Reductions and Cost Savings



OLD

Step	Description	Applicable Weight/Mileage	CO2 Expenditure (in lbs.)	Monetary Cost of Material/Labor
Making the Bubble Wrap	Carbon emissions from LDPE production (low-density polyethylene)	14 lbs per roll x 18 rolls- 252 lbs	685.8 lbs¹	Cost of Material- \$1,674
Wooden Crate Manufacturing	Carbon emissions from manufacturing of plywood crates	84x48x48 ISPM-15 crate- 200 lbs	41.3 lbs²	Cost of Material- \$423
1	Truck emissions for travel between Vendor A warehouse and ABEC Bethlehem	452 lbs travelling 16 miles	1.0 lbs³	N/A (covered by Vendor A)
2	Receiving and handling at ABEC Bethlehem warehouse	N/A	N/A	Cost of Labor- \$250
3	Truck emissions for travel between ABEC Bethlehem and Philadelphia Airport	452 lbs travelling 76.6 miles	4.8 lbs³	N/A (covered by courier)
4	Air freight emission between Philadelphia (PHL) and Dublin (DUB)	452 lbs travelling 3,264.7 miles	2,857.5 lbs⁴	Cost of Air Freight- \$1500
5	Truck emissions for travel between Dublin (DUB) and ABEC Fermoy, Ireland	452 lbs travelling 146.6 miles	9.2 lbs³	N/A (covered by courier)
Totals			3,599.9 lbs	\$3,848
Annual Totals (assuming 4 shipments per year)			14399.6 lbs	15,392

Table 1

NEW

Step	Description	Applicable Weight/Mileage	CO2 Expenditure (in lbs.)	Monetary Cost of Material/Labor
Making the Bubble Wrap	Carbon emissions from LDPE production (low-density polyethylene)	14 lbs per roll x 18 rolls- 252 lbs	685.8 lbs¹	Cost of Material- \$2,079⁵
Wooden Crate Manufacturing	Carbon emissions from manufacturing of plywood crates	84x48x48 ISPM-15 crate- 200 lbs	41.3 lbs²	
1	Truck emissions for travel between Vendor B warehouse and Port Newark	452 lbs travelling 718 miles	45.0 lbs³	
2	Ocean freight emissions between Port Newark and CPT Cork Port	452 lbs travelling 3,230 miles	35.2 lbs⁴	
3	Truck emissions for travel between CPT Cork and ABEC Fermoy	450 lbs travelling 22 miles	1.4 lbs³	
Totals			808.7 lbs	\$2,921.79
Annual Totals (assuming 4 shipments per year)			3,234.8 lbs	\$11,687.16

UNDERLYING ASSUMPTIONS

- A medium tractor trailer emits **142 grams of CO₂** per ton-mile
- Producing 1kg of LDPE produces **6kg of CO₂**
- For every 61 lbs of plywood manufactured, **12.6 lbs of CO₂** are created
- **\$0** upfront investment and no associated payback period

Gross Annual Savings: (extrapolated from Table 1 and Table 2)

14,399.6 - 3,234.8 = **11,164.8 lbs of CO₂ diverted annually***

Equivalent to CO₂
released from about
616,000 iPhone charges

EPA Greenhouse Gas Calculator

\$15,392 - \$11,687.16 = **\$3,704.84**
annual saving

Co-Benefits & NPV

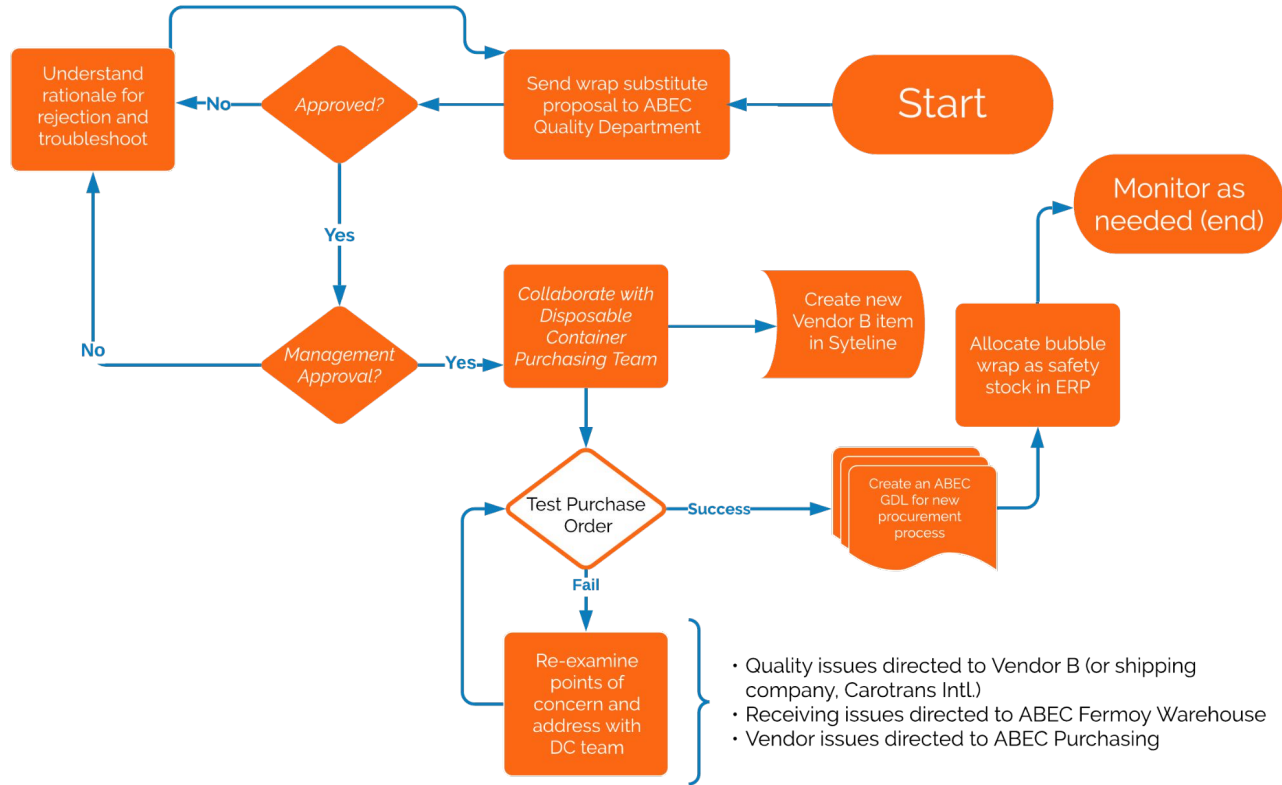


- Addressing carbon-conscious business practices in a niche industry like biopharmaceutical manufacturing
- Increasing/beginning ABEC's corporate social responsibility beyond stellar customer relations
- Decreased congestion in transfer areas of ABEC Bethlehem warehouse
- Upper management awareness of excess carbon expenditures previously ignored

Calculating NPV in Excel: $-\text{PV}(3\%;5;3,704.84)-250 \times 4 = \$15,967.08$

Assuming 5 years of new vendor B relations, 3% interest rate, annual labor investment of \$1000

Next Steps



- Potential commitment to minimize packaging
- Reusable pallets, cloth bioreactor covers, recyclable crates
- Commitment to ocean freight for non-essential international transport
- Future big-ticket projects may impede with implementation schedule