Economic Analysis of the Use of Twinkies® For Insulation

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1.0 Executive Summary

An analysis was performed to determine if shelf life expired Twinkies® could be a cost effective and efficient material to be used as building ceiling insulation. After the collapse of the Hostess brand parent company in 2012, warehouses full of Twinkies® went unused and remained past their recommended freshness shelf life. This report details the investigation of the possibility of these leftover snack cakes use as an economically feasible insulating material.

The owner of several warehouses full of expired Twinkies® has been offering the surplus for sale at a price of $35/ 100# to recoup the investment. Research for alternative uses of the snack cake found that they possessed excellent properties of insulation. Stacking the product in a single layer was found to produce an R-40 insulation value. The use of such a Twinkie® insulation system could result in an associated savings in energy over a 1000 ft² ceiling of $29.66 annually. When analyzing the costs and benefits compared to 6.5’ of R-19 fiberglass batt insulation, the following results were obtained.

Present Worth of Costs Analysis

PW (Costs) Fiberglass = $1372.63

PW (Costs) Twinkies® = $1473.02

Payback Period

12.8 Years to recover the investment of a Twinkie® insulation system over a fiberglass system.

Rate of Return

Incremental ROR over traditional fiberglass yields a Rate of Return of approximately 6.704%. This value does not exceed the standard company MARR =10%.

Recommendation

Based on the multiple economic analysis methods, the use of Twinkies® as a substitute for fiberglass insulation is not economically justified due to the higher costs in addition to possible problems associated with their use.
2.0 Introduction

In 2012 Hostess Brands, Incorporated (makers of Twinkies®, Ho Hos® and Suzy-Q’s®) ceased operations due to labor union problems and the subsequent bankruptcy and liquidation of the corporation. This liquidation led to the purchase of many of the assets of the Hostess company including large-scale commercial baking facilities as well as remaining product stock that was left unsold at the time of the liquidation. Brokers had hoped to capitalize on the opportunity of selling the highly desired snack treats at a premium due to the future scarcity of the popular product. Unfortunately, this strategy did not pan out for many of the buyers of the unused product and they were stuck with warehouses full of snack cakes, most notably 30 million individually wrapped Twinkies® in several warehouses purchased by the Ace Zypp Investment Company of Walla Walla, Washington. The snack cakes ultimately surpassed their recommended freshness date and no retail distributors could be found to resell the inventory.

In an effort to make up for the loss of selling the Twinkies® at a premium, the Ace Zypp Company engaged the services of several testing labs to explore the physical properties of the snack cakes. In particular, the testing labs were attempting to find an undiscovered attribute that might allow the large volume of snack cakes to be used for something other than a tasty treat. The labs found that Twinkies® consisted of nearly 70% air voids, kept their basic pliability and did not gain moisture over time. Additionally it was found that as the cakes aged past their expiration date, they became not only flame but insect and rodent resistant due to the unique chemical combination of the preservatives found in the golden sponge cake. Most importantly, it was determined that the thermal resistance of a single layer of Twinkies® resulted in an R-40 rating.

Attempting to use Twinkies as building insulation could be an advantageous option compared to allowing the millions of unused cakes to be sent to a landfill. It would also lower the amount of fiberglass insulation that is used which possesses some evidence as an irritant to humans during construction. Twinkies® pose no such problem. The individual cellophane wrapped cakes would also act as a vapor barrier if packed tightly enough in the cavity space to be insulated. The R-40 value would also be a significant increase over the standard 6” of fiberglass insulation that normally carries an R-19 value which also requires a larger volume within the cavity to do so.

Numerous challenges would nonetheless complicate the use of the expired cakes as insulation. The product would not lend itself to wall insulation due to the individual nature of the cakes which could slide downward in the wall cavity leaving upper areas empty and un-insulated. A ceiling installation would be much easier to accomplish. Possible problems in properly stacking the cakes in the ceiling space would cause a productivity issue above that of normal fiberglass batt insulation to which it will be compared. Some savings in the elimination of a vapor barrier
installation may be realized however. The weight of the cakes in the ceiling may also cause an
overload of the supporting medium. Cutting individual cakes to fit into odd space sizes may
also cause some problems as a breach of the cellophane wrapper may set off additional
unwanted problems. Finally, hungry workers might also be tempted to take a cake or two for a
quick snack despite the product’s age.

3.0 Estimates of Cost and Savings

A comparison between a base fiberglass system and the proposed Twinkie® system was
performed over a standard 1000 square feet of ceiling area. The cost of each option along with
the cost of heat loss was determined for each system.

3.1 Base Component – R-19 Fiberglass Batt Insulation

The base component consisted of 6.5” thick R-19 Fiberglass batt insulation fronted by a 6 mil
polyethylene vapor barrier. Standard fiberglass batt insulation can be obtained in several
thicknesses and in many packaging configurations in each thickness. A typical depth of
fiberglass insulation is the 6.5” depth that matches the 2x8 ceiling joists typical of wood framed
construction. This depth provides an R-19 thermal resistance and will act as the base system
for the economic comparison.

Investigation using multiple construction supply websites regarding the cost of R-19 fiberglass
batt insulation resulted in an average material cost of $0.52/SF. Polyethylene sheeting (6 mil)
for use as a vapor barrier costs on average $0.04/SF. Installation costs were calculated from
productivity factors obtained from Walker’s Building Estimators Guide with labor costs from the
Ohio Department of Labor Prevailing Wage Rates.

Summary of R-19 Fiberglass Cost

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of material (R-19 Fiberglass Batts)</td>
<td>$0.52/SF</td>
</tr>
<tr>
<td>Cost of material (6 mil Polyethylene Sheeting)</td>
<td>$0.04/SF</td>
</tr>
<tr>
<td>Cost of Fiberglas Installation Labor: 0.45 Hours/100SF x 10 CSF x $33/HR ÷ 1000 SF</td>
<td>$0.15/SF</td>
</tr>
<tr>
<td>Cost of Vapor Barrier Installation Labor: 0.40 Hours/100SF x 10 CSF x $33/HR ÷ 1000 SF</td>
<td>$0.13/SF</td>
</tr>
<tr>
<td>Total Fiberglas Cost Installed</td>
<td>$0.84/SF</td>
</tr>
<tr>
<td>Total Cost per 1000 SF</td>
<td>$840</td>
</tr>
</tbody>
</table>
3.2 Proposed Component – R-40 Single Layer Twinkies®

The proposed component consisted of a single layer of individually wrapped Twinkies® which by a testing report available from the Ace Zypp Investment Company claim to yield an R-40 insulation value. The report details that the Twinkies® were laid tightly end to end and side to side in an annular cavity space and tested in accordance with ASTM C-518. Twinkies® have a dimension of 4” in length by 1.5” in width and height according to many Twinkie® fan websites and weigh anywhere between 38.5 and 42.5 grams per cake. Due to the tapered vertical profile of the cakes, the testing lab alternated adjacent cakes vertical orientation for the test, with no cake longitudinally adjacent to another cake sitting in the same orientation. This afforded a more tightly packed system with no air gaps between cakes.

Ace Zyp advertised cakes for sale in bulk for at $35 per 100 pounds of product. This price resulted in an average of eleven (11) cakes per pound and $0.032 per cake. The resultant Twinkie® coverage per square foot was found by dividing the standard cake footprint of 4” by 1.5” (6 square inches) into the 144 square inches in a square foot. The resultant coverage required was found to be 24 cakes per square foot. Thus, Twinkie® material costs were calculated to be $0.77 per square foot.

Installation costs of Twinkie® insulation proved to be a difficult value to ascertain. Due to the stacking and arranging of cakes into the space to be insulated, it was estimated that the production rate would be three times that of fiberglass insulation installation in an unheated attic space. No vapor barrier costs for material or installation were included for the Twinkie® system since the cellophane wrapping is assumed to act as the vapor barrier.

Summary of R-40 Twinkie® Cost

Cost of material (R-40 Single Layer of Twinkies®) = $0.77/SF

Cost of Twinkie® Installation Labor: 3 x 0.45 Hours/100SF x 10 CSF x $33/HR ÷ 1000 SF = $0.45/SF

Total Twinkie® Cost Installed = $1.22/SF

Total Cost per 1000 SF = $1220
3.3 Heat Loss Calculations

Using the standard heat transfer through a solid medium equation, the benefit of using Twinkies® as insulation in place of fiberglass can be calculated.

\[
\text{Heat Loss (BTU's/Year)} = \text{Area (SF)} \times \Delta t(\text{°F/ Hour}) \times \frac{1}{R} \times \text{Heating Degree Days/Year} \times 24 \text{ Hours/Day} \times \frac{1}{\% \text{ Heating Efficiency}}
\]

The following assumptions were used to facilitate the calculation:

- Heating Degree Days = 6600 for Toledo, Ohio (Climatezone.com).
- Heating efficiency on average = 90%.
- 1000 SF study area.
- Unheated attic space above ceiling.
- 1° of temperature differential for base calculation.

Natural gas heating is assumed to be the prevalent method of heating in the Toledo area to offset the heat loss through the envelope into the environment. Natural gas costs for small commercial customers from the Columbia Gas customer website were found to be $0.63/CCF. There are 103,000 BTU per CCF. Thus, the resultant cost of natural gas per BTU supplied is $0.0000061/BTU.

Summary of Heat Loss Calculations

<table>
<thead>
<tr>
<th>Insulation Type</th>
<th>R-Value</th>
<th>Heat Loss (BTU’s/Year)</th>
<th>Heating Cost/Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiberglass Batts</td>
<td>R-19</td>
<td>9,263,157</td>
<td>$56.50</td>
</tr>
<tr>
<td>Twinkies®</td>
<td>R-40</td>
<td>4,400,000</td>
<td>$26.84</td>
</tr>
</tbody>
</table>

4.0 Economic Analysis

The economical viability of using Twinkies® for insulation was analyzed using three standard engineering economics procedures.

- Present Worth
- Payback Period
- Rate of Return

The following criteria were established for use when needed for the analyses:

- MARR=10%
- Life Span = 30 Years
Summary of Component Costs

<table>
<thead>
<tr>
<th>Option</th>
<th>Installation Cost</th>
<th>Heating Cost/Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiberglass Batts R-19</td>
<td>$840</td>
<td>$56.50 /Year</td>
</tr>
<tr>
<td>Twinkies® R-40</td>
<td>$1220</td>
<td>$26.84 /Year</td>
</tr>
</tbody>
</table>

4.1 Present Worth (PW) Analysis

On their own, each option possesses only costs (installation and heat loss costs). Thus, assuming that there is no “Do Nothing” option (some type of insulation will be used), determining the lowest PW of costs will indicate which option is more economically feasible.

\[
P W = \text{Installation First Cost} + \text{PW(Annual Heating Cost)}
\]

PW Cost (Fiberglass) = $840 + $56.50 (P/A, 10%, 30) = $840 + $56.50(9.427) = $1372.63

PW Cost (Twinkies®) = $1220 + $26.84 (P/A, 10%, 30) = $1220 + $26.84(9.427) = $1473.02

4.2 Payback Period (PBP) Analysis

The payback period assumed that at least fiberglass insulation will be installed and thus a “Do Nothing” option was not available against which to be analyzed. The time to recover the incremental costs of using the alternate Twinkies® option was calculated. Since no corporate policy exists with which to determine the adequacy of an option’s recovery of costs, this method was used as an advisory measure and not as a standalone decision statistic.

\[
PBP = \frac{\text{Incremental Installation Cost}}{\text{Incremental Heat Savings per Year}}
\]

PBP (Twinkies®–Fiberglass) = Incremental Installation Cost / Incremental Heat Savings per Year

PBP = ($1220 - $840) / ($56.50 – $26.84) = 12.8 Years

4.3 Rate of Return (ROR) Analysis

Again since there is no “Do Nothing” option, an incremental approach was used, with fiberglass being the base component. The resultant ROR was compared to the MARR=10% for economic feasibility.

\[
P W (\text{Benefits}) – P W (\text{Costs}) = 0
\]

($56.50 - $26.84) (P/A, i*, 30) – ($1220 - $840) = 0

$29.66 (P/A, i*, 30) – 380 = 0

(P/A, i*, 30) = 380/29.66 = 12.81 \quad i^* = 6.704\%
5.0 Conclusion and Recommendations

Each economic analysis result revealed that the use of Twinkies® was not economically feasible. The Present Worth of Costs for each option revealed that the fiberglass option was a lower cost. The Rate of Return was calculated to be lower than the MARR=10% and thus not economically feasible. The calculated Payback Period of nearly 13 years, while not having a threshold value, appeared to be extremely long in duration for such a small incremental cost.

The analysis was based on solid cost information except for the cost of installation of the Twinkie® system. It would take an estimated cost of installation of the Twinkies® of no more than twice that of fiberglass batt insulation for the options to be viewed as economically equal. While the Twinkie® installation cost was estimated, a productivity rate of only double that of batts seemed unlikely due to the labor intensive nature of installing the cakes in the spaces to be insulated.

It is the recommendation that without a clear cut economic advantage of the Twinkies® in any of the economic measures, the use of Twinkies® as a substitute insulation medium should be rejected.