Air leakage through door seals is a major cause of hangar energy consumption. Infiltration can be reduced with the installation of nylon brush seals.

**FEASIBILITY REQUIREMENTS**

**SURVEY DATA NEEDS:**
- Hangar door size (H)
- Number of door panels
- Heating degree days
- Heating season average wind speed (mph)
- Heating plant efficiency (HEFF)
- Average winter wind speed (mph)

**SOURCE OF DATA:**
- Site specific
- Map 1, Supporting data

**BENEFITS/DETRIMENTS**

Reduced infiltration with little effect on normal operations. Advantages include no significant maintenance problems, no special tools required for installation, and the brush seal is flexible and can conform to changes and discontinuities in surface contours unlike rubber which gaps.

**PROCEDURE**

1. Determine the hangar door size (width, height) and number of hangar door panels.

2. Determine the panel size as follows:

   \[ W_{\text{panel}} = \frac{\text{Hangar door width}}{\text{Number of panels}} \]

   \[ H_{\text{panel}} = \text{Hangar door height} \]

3. Determine the perimeter footage (Sp) of nylon brush door seal required. Note that all four sides of each panel should have nylon brush seals installed.

   Fuel Savings (MBtu/heating season) =

   \[ \frac{Sp(\text{ft}) \times 0.007DW_{s}^{1.1215}}{100 \times HEFF} \]

   where:

   - \[ Sp = \text{Total Perimeter Footage of Nylon Brush Seal} \]
   - \[ D = \text{Number of Heating Degree Days Per Heating Season} \]
   - \[ W_{s} = \text{Heating Season Average Wind Speed (MPH)} \]
   - \[ HEFF = \text{Heating Plant Efficiency} \]

**GENERAL INFORMATION**

- Sizes available: N/A
- Startup cost: $15 to $25 per foot installed
- Replacement cost: Same as startup cost
- Equipment life: 15 years
- Skill level of personnel required: Mechanical contractor/PWC personnel
- Level of development:
Basic research underway
Prototype being tested
Operational test and evaluation underway
Approved for service
Available on market

NATIONAL ENERGY SAVINGS (NES) (in Btu/yr)

\[ \text{NES} = \text{Hydrocarbon Fuel Savings} \left( \frac{\text{Btu}}{\text{yr}} \right) + \left( \text{Electrical Energy Savings} \left( \frac{\text{kWh}}{\text{yr}} \right) \times 11,600 \frac{\text{Btu}}{\text{kWh}} \right) \]

ECONOMIC ANALYSIS EQUATION

\[ \text{SIR} = \frac{\Delta \text{E(DERF)} + \Delta \text{O&M(PYDF)}}{C(\text{PIF})} \]

SAMPLE CALCULATION

Assumptions
- Heating plant efficiency (HEFF) 75%
- Startup cost $23,400
- Two hangar doors 150 ft W x 40 ft H each
- Six panels per door
- Heating degree days 4,000
- Average wind speed 10 MPH
- Change in O&M None
- Fuel saved No. 2 fuel oil
- Energy cost $5.12/MBtu
- Escalation rate 8%
- Annual discount rate (R) 10%

Calculation follow from the procedure section:

Using the equation in procedure step 2, determine the panel size:

\[ W_{\text{panel}} = \frac{\text{Hangar door width}}{\text{Number of panels}} \]

\[ = \frac{150 \text{ft}}{6} = 25 \text{ft} \]

\[ H_{\text{panel}} = \text{Hangar door height} \]

\[ = 40 \text{ft} \]

Using the equation in procedure step 3, determine the perimeter footage (Sp):

\[ Sp = \left( \frac{\text{Number of Panels / Door}}{2} \right) \times \left( \frac{W_{\text{panel}} + 2H_{\text{panel}}}{} \right) \]

\[ = (6)(2 \times 25 + 2 \times 40) \]

\[ = 780 \text{ ft} \]

\[ \text{FUEL SAVINGS} \left( \frac{\text{MBtu}}{\text{yr}} \right) = \]

\[ = \frac{780 \times (0.007)(10)^{1.1215} (4,000)}{100} \times 0.70 \]

\[ = 4,127.2 \text{ MBtu/yr - door} \]

\[ \text{NES (MBtu/yr)} = \]

\[ = 4,127.2 \frac{\text{MBtu}}{\text{yr - door}} \times 2 \text{doors} \]

\[ = 8,254.4 \text{ MBtu/yr} \]
FUEL COST SAVINGS ($/YR) = 

\[
\left( \frac{8,254.4 \text{ MBtu}}{\text{yr}} \right) \left( \frac{\$5.12}{\text{MBtu}} \right)
\]

= $42,262.50 / yr

SIR = 

\[
\frac{\$42,262.50(20.050) + 0}{\$23,400(1.251)}
\]

= 29

Need more information?

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