TECHNICAL BULLETIN

Building Envelope LCC Analysis Procedure

This document is intended to outline an easy procedure to model an entire building envelope, using our LCC software, and an HVAC "rule of thumb". The method can be used on multi-stage filtration systems, as well as single stage filtration. In the end, you will be able to produce an entire facility LCC analysis in just a few minutes. In this discussion, we will show you two methods to do this.

Let's start with a review.

Air Flow = Velocity X Area

Velocity is the speed of the moving air. We measure this in feet per minute (ft. / min.) in the HVAC industry.

Area is the cross sectional area of the flow. In our case, that is the area of a filter bank, measured in square feet (sq. ft.). The cross sectional area of a 24" x 24" filter is 4 square feet. If we push air into that filter at 500 ft. / min., that results in air flow of 2000 cubic ft. / min., or cfm.

2000 cfm (cubic feet / min.) =

500 ft./min. x 4 sq. ft.

Method 1

This method is a "first cut". It's intended to get you a ball park estimate of how much we could save a client, in just a few minutes.

1. Get the square footage of the facility. Most facility managers know this figure. Here's our HVAC "rule of thumb". It is common practice to estimate 1 cfm / per 1 sq. ft. for commercial buildings (office buildings, universities, etc.). Hospitals typically run 1-1.4 cfm/sq. ft. We have been using 1.2 cfm/sq. ft. for many hospitals. Discuss this ratio with your client and let them know this is an estimate. They will likely agree with our "rule of thumb". This estimated total cfm should be entered on the "Running Conditions" screen of LCC.

2. A common range for airspeed is 350 ft./min. to 450 ft./min. for most facilities. Based upon those values the estimates considered herein will be conservative as we will use 400 feet/min, the most common design velocity for full load in most buildings. It is also consistent with base values air filters manufacturers use on their literature.

3. Now calculate the number of full size filters. Since you've estimated air flow (cfm) and air speed (ft.min), you can calculate cross sectional area. You know that each full-size filter is 4 sq. feet.

As an example:

1,000,000 cfm =

400 (ft./min.) x area (sq. ft.)

Area = 1,000,000 cfm divided by 400 ft./min. = 2500 sq. ft.

Divide that figure by 4 sq. ft. to get equivalent full size filters. In this case, 625 full size filters.

4. Enter the resulting full size filters on the "AHU Design" screen. Your air speed will also be displayed. Double check it. If you are dealing with a multi stage system, assume the same number of filters for both stages.

This information, along with the rest of the LCC inputs will allow you complete the Facility Envelope LCC.

Once that is done, you can even calculate savings per square foot / per year, since you know the square footage of the facility and duration of your LCC analysis.

For example, with the above information, let's assume our LCC revealed we could save the client $600,000 over a 3 year period. That's an average of $200,000 per year. Divide that by sq. footage of the facility, in this case 1,000,000 sq feet, and we get 20 cents per square foot in savings!

Many manufacturers make a case for low TCO for a given facility. They often report savings as a function of square footage - usually in cents per square foot. Now, Camfil Farr can too. !

Method 2

This method is highly accurate because the inputs are actual data from the facility. Of course, it requires more cooperation with the end user.

1. Get with your facility engineer or Building Management / Monitoring System (BMS) expert. Most BMS's can report real-time, total cfm for the facility. Some systems can even average this cfm over a period of time. The more modern the facility, the better chance you'll have of grabbing this important data. This total cfm should be entered on the "Running Conditions" screen of LCC.

2. Now obtain a total filter schedule. Get the actual filter schedule, for all AHUs, from the facility department. Enter this data "AHU Design" screen of LCC.

3. Double check the velocity as it appears on the "AHU Design" screen. This figure should be an accurate, average velocity for all AHU's.

Again, as before, you can calculate savings per square foot per year if you know the square footage of the facility and duration on the LCC analysis. Good Luck with the Building Envelope LCC Procedure !

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