Acoustic Building Design

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Introduction

The sources of compressor station noise are generally well understood. They include engine and compressor casing noise, engine air intake and exhaust, and cooler inlet and outlet noise.

Addressing noise generation at the design stage will clearly reduce the level of supplemental noise attenuation equipment yet, incredibly, the majority of compressor packagers continue to pound out compressors with conventional building designs, including acoustically transparent windows, translucent roof panels and ridge vents. Even when acoustic considerations are addressed in initial building design, much of the effort falls short of the mark, or introduces other operating complications.

Basic Acoustic Building Design

Conventional acoustic building design includes acoustic insulation and perforated liners. This approach is a good start and reduces internal noise for the operators as well as outside building noise. However, these buildings may still incorporate other elements that create noise sources.

High Elevation Noise Sources in Building Design

Ridge vents remain a common building component, even in acoustic building designs. Some operators measure acoustic building performance at a distance too close to the building to fully reflect noise emanating from the ridge vent, before it's reached the ground. As a result, that noise source may be more relevant further out from the building than the operator realizes.

Some operators understand the problems windows pose in noise transmission and will specify windowless buildings. However, they're sometimes offset with the use of roof mounted translucent panels building lighting. Unless properly selected, translucent panels can remain a significant noise source with the operator again falling prey to the same misleading conclusions about the level of long distance noise attenuation.

Acoustic Ventilation in Building Design

Where acoustic building ventilation is incorporated, it is tempting for operators to use fewer but larger capacity ventilation hoods and fans to reduce capital costs. There can be a couple of problems with this approach.

Concentrated, rather than evenly spaced ventilation can result in some portions of the building being improperly swept. A second, parallel problem has to do with gas detection. Gas detectors require a minimum retention time to work properly. In the event of gas leaks, improper building ventilation can render gas detectors ineffective or leave pockets or areas within the building improperly swept clean of leaking gases. As a result the operator may be unaware of explosive mixtures within the building and on sour sites H_2S can escape undetected into the building and surrounding environment

In extreme cases the airflow through the building can be so severe as to weaken the building's structural integrity or interfere with the safe operation of doors and undermining emergency exit safety considerations.

Another cost saving building ventilation technique is to steal some of the airflow from forced draft fan coolers and sweep that air through the building. One problem with this approach is the reduction in gas and engine cooling duty by 5 to 15%. Operators don't always consider the economics of the revenue loss arising from the lost gas production. Further, this ventilation provides some cooling around the engine but doesn't sweep the compressor end of the building. Finally, the static head on this air source is low raising the question of overall adequate building ventilation.

Process cooling and building ventilation requirements both need to be properly sized and then a deliberate assessment made as to whether it is more effective and economic to use a larger than necessary cooler fan to also accommodate building ventilation, or size the cooling fan to it's process requirements and size the building ventilation for its needs.

Figure 1 – Complete Acoustic Building Enclosure