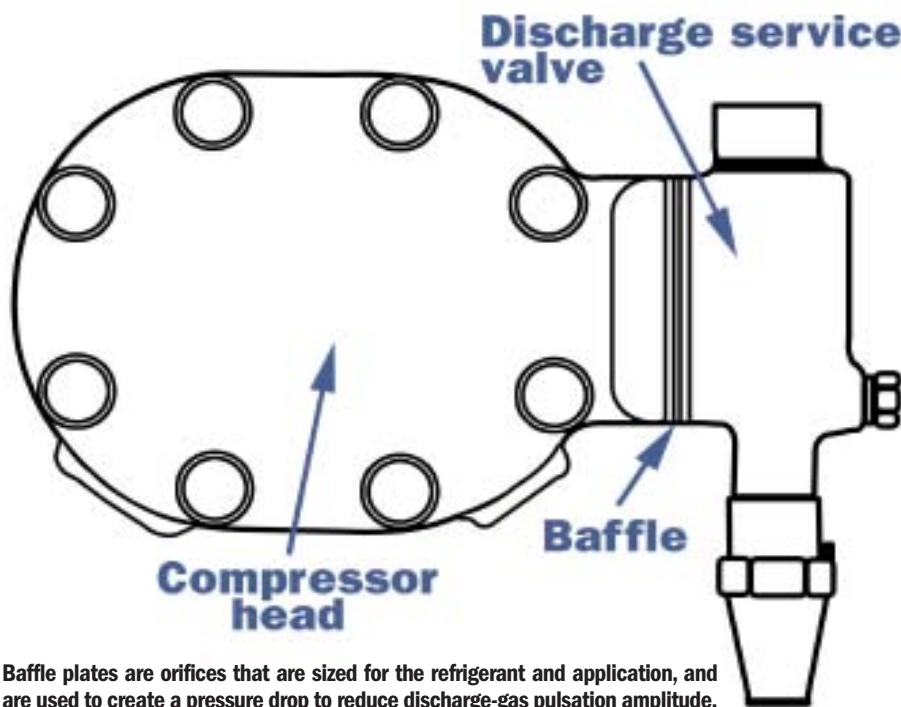


A Baffling Issue

Baffle plates are an easy, effective way to reduce gas pulsation in refrigeration systems, but they have limitations too

BY WES TAYLOR, CMS



Baffle plates are orifices that are sized for the refrigerant and application, and are used to create a pressure drop to reduce discharge-gas pulsation amplitude.

a certain range of operating conditions. It is generally recommended to have 6 psi to 10 psi pressure drop to obtain effective discharge pulsation reductions. This requires different baffle plate sizes for different compressor displacements.

➤ The least expensive method of reducing gas pulsation.

Here are some baffle plate limitations:

➤ Baffle plates are effective within certain operating envelopes. Changes in refrigerant can dramatically change refrigerant mass flow and pressure drop. Manufacturers have published application recommendations for low-, medium- and high-temperature applications. These should be followed to avoid excessive pressure drops.

➤ Baffle plates are typically sized for the refrigerant and application at full design load conditions. When the compressor is unloaded and operated at part load, the mass flow through the compressor is reduced by one-third, one-half or two-thirds.

➤ The reduction in flow reduces the pressure drop through the baffle plate and its effectiveness in reducing discharge gas pulsation. Mufflers and good piping practices should be considered on compressors with unloaders.

➤ Conversely, system changes that increase the mass flow of the compressor will increase the pressure drop

Discharge-line vibrations have amazed and confused technicians since the introduction of the reciprocating compressor. Baffle plates have been used for many years in refrigeration applications to help reduce gas pulsation in discharge-line assemblies and to minimize the potential for line failures and refrigerant loss.

Baffle plates are orifices that are sized for the refrigerant and application, and are used to create a pressure drop to reduce discharge-gas pulsation amplitude. Baffle plates are typically installed between the discharge service valve and the compressor mounting location. They can be effective at the low-pulsation frequencies most common to reciprocating compressors now being produced.

Mufflers are typically more effective

at higher frequencies but have very low pressure drops. The lower pressure drops result in slightly lower compressor discharge temperatures and slightly higher operating efficiencies.

Compressor manufacturers have noted several issues recently with refrigeration compressors when applied with baffle plates and the newer HFC refrigerants and polyolester (POE) lubricants. Based on those application issues, this article will review some of the advantages and limitations in applying baffle plates.

Pros and cons of baffle plates

Here are some baffle plate advantages:

➤ Easy to apply on compressor or system, especially easy on retrofits of existing system that exhibit piping vibration concerns.

➤ Effectively reduces pulsation at

through the baffle plates. Dramatically increasing the suction pressure (in many refrigeration systems, that occurs at the termination of defrost cycles) will result in a large increase of mass flow.

➤ This results in very high pressure drops and values as high as 40 psi to 50 psi have been reported. It is not a problem unless the compressor motor protection limit is reached. In that rare case, the maximum suction pressure at which the compressor is allowed to operate must be limited.

Another operating condition that significantly increases the mass flow is a dramatic decrease in the compressor's discharge pressure, which can occur on systems with floating head pressures.

In the winter, the discharge pressure may be half or less than what it would be during hot periods in the summer. With reciprocating compressors, this dramatic reduction in discharge pressure increases the volumetric (or pumping) efficiency of the compressor, while lowering the dis-

charge temperature of the refrigerant.

The combination can result in the same large pressure drops previously noted. If that occurs, you may have to limit the minimum allowable discharge pressure or use a baffle plate with more holes. That would avoid the high pressure drops, but compromises the reduction in pressure pulsation during summer conditions.

Finally, compressor startup on a single compressor system also can result in even higher discharge pressure drops across the baffle plate. At startup the combination of high suction pressures and low discharge pressures occur. That results in pressure drops of over 100 psi at startup until the suction pressure drops to design conditions and the discharge pressure rises.

Conclusions and recommendations

Baffle plates are an easy, effective way to reduce gas pulsation, but they have several limitations. They can result in too large a pressure drop when the suction pressure is too far above design or

the discharge pressure is too far below the design condition. Manufacturers, therefore, recommend applying baffle plates in a manner that avoids the high pressure drops.

The best advice would be to only use baffle plates as a service tool on installations where piping vibration has been a problem and it is difficult to correct using mufflers and line clamping. (Mufflers should be the first choice in oem design phase.)

Also, baffle plates are best applied in systems already running. In this environment, the application-operating envelope is better understood and you can more easily apply the correct baffle plate.

Editor's note: Future issues of *RSES Journal* will publish articles on the discharge muffler and vibration application issues. Please retain this issue of *RSES Journal* for reference.◆

Wes Taylor, CMS, is training manager, Carlyle Compressor Co., and is a frequent and popular speaker at RSES educational sessions.