Estimating M compressor Shaft Seal leakage rates

Shaft seal oil leakage is necessary to ensure that the rotating faces are both cooled and lubricated. Multistage compressor shaft seal flow rates are determined by multiple criteria which may vary with application. Those criteria that govern the seals' performance are compressor shaft speed, compressor oil reservoir pressure, and compressor coupling size.

These variables are defined for the specific application during the initial design, therefore the seal leakage must be evaluated based on the parameters for each case. The larger the coupling, faster the operating speed, or higher the oil reservoir pressure the more that the seal will be estimated to overfeed.

The rate may seem higher on certain applications than others, but the criteria may differ resulting in a higher requirement to keep the seal life as designed. As an example, an M526 operating at 12,000 rpm with a 1-1/2 inch coupling and an oil reservoir pressure of 55 psig is predicted to pass oil at a rate of 11-12 drops/min.

Because there are tolerances in the installation of the assembly a seal may actually perform at a rate of 0.8 to 1.25 times the estimated performance, or in this example 9 drops/ minute minimum to 15drops/minute as a maximum for a new seal.

A newly installed seal should be operated for several hours before evaluating its' performance. Since the process gas is typically soluble in the lubricating oil, it may be that a trace will be detected when "sniffing" the seal area. The coupling guard may also serve to collect process gas that escapes from the oil as the fluid passes into the atmospheric portion of the assembly and the process gas is released from solution.

A seal should not be replaced (with intent to improve leakage rate) until the actual measured performance rate exceeds the maximum estimated performance by 2X, or in this example 30dpm (2 X 15 = 30). A seal that is operated with reduced overfeed flow (by increasing nose pressure/ spring tension) will likely have a very short operating life cycle. The correct installation height is given on the compressor drawing for the particular application.