TECHNICAL ARTICLE

"COALESCING"

. . . Removing Water and Other Condensables From Compressed Breathing Air . . .

Rendering . . .
compressed air "breathable" involves the removal of numerous contaminants. There are several approaches to this but the most common commercial process involves some combination of gas cooling (Compressor Aftercooler), condensable separation (Interstage Separators), coalescing (Coalescors), vapor adsorption/catalysis (Cartridges), and particle trapping (Microfilters)- a 5-stage process. Of the five stages, COALESCORS perform one of the most important functions - preparing the compressed air before entering the adsorption phase. Unless this is accomplished efficiently, the adsorption cartridges will be forced to make up for any deficiencies. A costly sacrafice

Water . . .
gets into compressed air as humidity which is borne naturally within the ambient air. This water takes the form of droplets and vapors called Aerosol Condensables. Also, lubricant carryover from the compressor is usually present in the condensable mix. Condensables are the most prominent contaminant and therefore require the bulk of apparatus to remove it. At least 80% of the purification process takes place where the condensables are squeezed from the airstream. Since other contaminants such as Carbon Dioxide (CO_2) bond in limited amount to the water molecules, these are removed as well. The adsorption stage of the process will be much more economical if the Aerosol Condensables are efficiently removed. Maintaining this efficiency translates into considerable savings at the next stage adsorbent cartridges. A Good COALESCOR is key to removing water.

Efficiency . . .
like any filtration medium, coalescors are available in a range of performance ratings. These ratings are usually in the form of micron sizing. " Since all things work to some degree" - a product rated at 20 micron will work but to a far lesser degree than a ½ micron product. To judge performance level you must ask the manufacturer about the efficiency of their elements. This information is typically expressed as % efficiency (i.e. 99% efficient). You can surely conclude that the lack of efficiency at the COALESCOR will place additional burden on the apparatus downstream. In other words the adsorbent cartridges will have to take up the slack.

The Difference . . .
between separation and coalescing is rarely recognized. Many technicians commonly confuse separation devices (such as turbulence inducers and marble beds) with coalescors. There is a world of difference between them and the efficiency levels are vastly wide as well. The immediate saving in capital expense for these inferior devices does not compensate for the long-term sacrifice in efficiency. In other words, the filter cartridges will have to take up the slack.

Helpful Hints . . .

To successful COALESCING:

1.) Cool the air as much as possible prior to Coalescing.

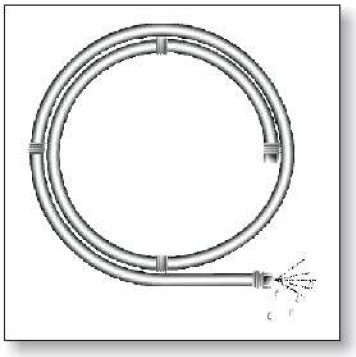
2.) Drain condensate from the Coalescor as frequently as possible (L-Factor offers automatic condensate drain systems).

3.) Use the most efficient Coalescing Element available (L-Factor offers "Hop Up" kits for many brands of coalescors on the market).

4.) Change the Coalescing Element periodically-with every other adsorbent cartridge change or at least twice annually. (L-Factor offers high grade replacement elements to fit most brands of Coalescors on the market).

See back for more -->

SEPARATION, STAGE 1



CONDENSING:
Condensing happens anywhere that the compressed air has a chance to cool below it's dew point. As the air leaves the compressor, it is by nature hot and containing high levels of condensibles. The heat is drawn out by directing the air through an aftercooler which acts similarly to a radiator. At this point the condensibles cool and drop out like rain drops. This process can be enhanced by chilling the aftercooler with forced air or a water jacket.

WATER TRAP SEPARATION: (Up to 80% Efficient)
Once the compressed air has been cooled, more of the aerosol liquid and solid contaminants can be forced out of suspension by abruptly changing the velocity and direction of the gas stream. Centrifugal force "flings" the larger solids and droplets from the air/gas into a sump, where they can collect for later disposal. Typical efficiency of these devises range down to 20-30 micron (approx. 80%) and designs span from crude marble beds to high porosity sintered screens.

COALESCING, STAGE 2

STANDARD: (Up to 95% Efficient)
After the aerosol liquids have been sufficiently removed from the air/gas; it is then ready for processing further by means of coalescing. This procedure can remove up to 95% of condensable aerosols and particles depending on the design efficiency of the device. Efficient coalescing occurs on two principles; A) Interception and B) Inertial Impaction. Simply- as the air/gas passes through the layers of the efficient coalescing element it first encounters a layer of filter media which block the passage of particles larger than it's porous surface. As the air/gas moves to the next layer turbulence is induced and the aerosols are forced into larger droplets where they accumulate within the porous labyrinth of the structure and then trickle downwards into the sump.

HIGH EFFICIENCY: (Up to 99.9 Efficient)
Built on the same principles of standard coalescing-this more highly efficient process incorporates a third step known as Diffusion or Molecular Brownian Movement. Any condensable aerosols, which are remaining after the impaction stage, collide with a fibrous layer causing them to coalesce with the fibers and any other droplets already collected on the fibers. These droplets then migrate to the nearest crossing point of the fibers where they form into larger droplets. Pressure differential across the element then forces these droplets to fall off into the sump. Determined by the micronic sizing of the element-this type of coalescing can produce results as efficient as 99.9%.

LAWRENCE FACTOR®
Others Make Air & Gas - We Ensure That It's PURE!™

4790 NW 157th Street. Miami Lakes, FL 33014 / PhL (305) 430-0550 - Fax: (305) 430-0864 / www.Lawrence-Factor.com