FILTER 2000

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Cancels: FIRST EDITION

Air Solutions Group
Davidson, NC 28036

COMPRESSED AIR FILTERS
SERIES HE, GP, AC, DP AND NL MODULE
FUNDAMENTALS OF AIR FILTRATION (Continued)

Rotary screw compressors, unlike reciprocating compressors, operate by the action of a pair of helical rotors whose mating parts do not touch. To maintain a seal during compression, a large volume of oil is injected directly into the compressor chamber at all times, thus magnifying the contamination problem. Although oil separators can remove most of the larger particles, fine mists pass through to contaminate the system downstream, at the rate of 2 - 3 ppm after the aftercooler.

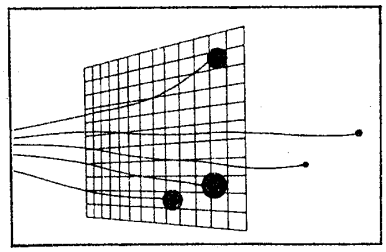
Must the oil be removed from the air? Some engineers reason that since many of their air end uses require lubrication, they might as well leave the compressor oil in the air rather than go to the trouble of removing it at one point and adding it back with a lubricator later. The error in this approach is that compressor lubricant is not necessarily a good air tool lubricant, and the compressor oil in the air is always accompanied by water, rust, and pipe scale, which certainly are not good tool lubricants.

TYPES OF FILTRATION

Technically speaking, filters use the mechanisms of interception, inertial impaction, and adsorption. Each is effective in removing certain contaminants and certain particle sizes. Ideally, for maximum effectiveness filters should combine all three mechanisms in precisely engineered proportions

INTERCEPTION:

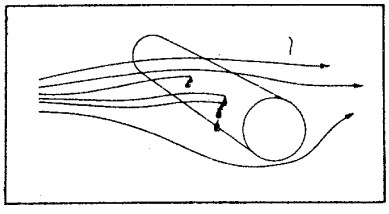
Interception or mechanical separation is the easiest filtration mechanism to envision. A moving particle is blocked when it encounters a passageway or hole smaller than itself. The larger the particle relative to the hole size, the greater the chance of interception.



Filters that operate through the interception mechanism may employ widely spaced or densely packed filter media, depending upon requirements. Coarser filters will intercept larger particles. More densely packed filters will intercept smaller particles, but will also restrict the airflow, posing the problem of high-pressure drop. Increasing the filter area can compensate for high-pressure drop, but a balance must be achieved between filter area and practical physical limitations.

INERTIAL IMPACTION:

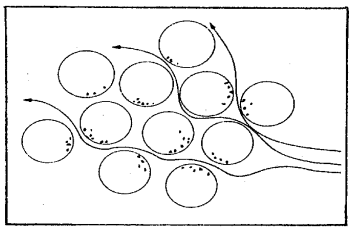
Inertial impaction occurs as the air stream passes through a random network of fibers. The compressed air stream, because of its relatively low density and inertia, changes direction and flows around the fibers. Entrained particles, however, because of their higher density and inertia, randomly collide with the fibers. Fine liquid droplets merge or coalesce into larger droplets, move downward along the fiber strands and are drained from the filter. Compressed air filters that use the inertial impaction principle are also known as coalescing filters.



ADSORPTION:

Adsorption, in contrast, is a process that involves the adhering of contaminant molecules to the surface of a solid adsorbent. A packed bed of porous materials with high surface-to-volume ratio performs effectively in this capacity. As contaminant molecules lodge in the small pores, cracks, voids and crevices of the adsorbent, no clogging occurs, and the effect on pressure drop is negligible.

Adsorption filters are effective in removing both oil and oil vapor.



FILTER DESIGN

Particle size, desired efficiency, allowable pressure drop and element life are the primary consideration in filter design and selection.

In terms of particle size, contaminants in a typical compressed air system range from 10 microns to 0.01 micron. A micron is one-millionth of a meter or approximately 0.00004-inch. To put this into perspective the typical human hair is 60 microns in diameter.