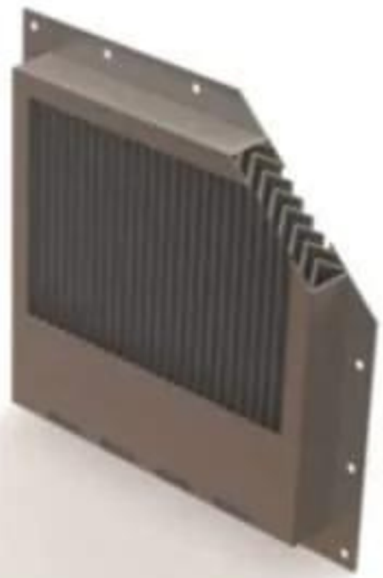
INERTIAL SEPARATORS IN GAS TURBINES



Both axial and reciprocating moving equipment can operate in a wide variety of unfavorable conditions, including in desert areas with high concentrations of dust, marine areas with large amounts of moisture and salts, and cities with excessive amounts of pollution.

Therefore, multi-stage filtration systems for inlet air are critical requirements to ensure both the operational efficiency and the lifespan of any gas turbine. In these hostile environments, one of the most powerful components of any multi-stage filtration system is the inertial separator.

After weather protection hoods and trash screens, an inertial separator is a vital stage of any multi-stage filtration system.

They play a crucial role in the beginning of the filtration process by removing moisture and particulate matter above 8-20 microns from an airstream, protecting the other filtration stages downstream from larger particulate matter.

How Inertial Separators Work

Inertial separators take advantage of several natural processes, including centrifugal force and impingement, to draw particulate matter and moisture into either pockets on a vane, where it then drains out, or into a tube or bleed region where particles and moisture are removed by a bleed fan or purge fan.

The paths that the particulate matter is forced into are carefully chosen to deal with the two primary types of particle trajectories--bounce-based and drag-based. These non-barrier systems are cost-effective for removing particulate matter because they operate passively. They lack moving parts and essentially work by disturbing the direction of the airflow, thus forcing particulate matter and moisture in one direction while the cleaner air continues in another.

The one drawback of inertial separators is that, because they’re bleeding inlet air, they reduce efficiency somewhat with a slight pressure loss (0.1 to 1.5 inH2O). However, inertial separators can be modified to achieve the precise cleaning efficiency required (within limits) while maintaining minimal pressure loss. Because the pressure drop is negligible, the benefits almost always outweigh the drawbacks.

Inertial separators come in several varieties, and while cyclone separators used to be more common, most modern gas turbines have moved to vertical vane separators.

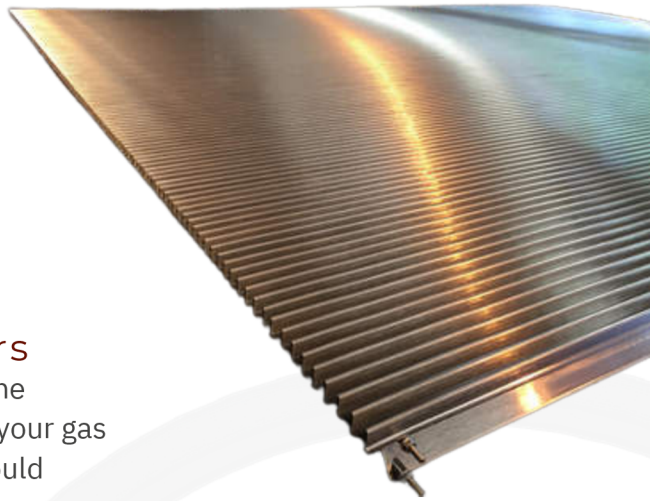
INERTIAL SEPARATORS IN GAS TURBINES

Vertical Vane Separators

A vertical vane separator uses a vane to change the direction of incoming air. As the air turns along the vane, moisture and particles impinge on the surface. The air continues to push the moisture and particles along the surface until they enter and are trapped in a hook. The moisture and particles then drain out of the hook. Vane separators have either a single-hook or a double-hook construction.

Vertical vane separators are superior because the vane is running vertically; therefore, droplet formation is practically eliminated, thus freezing is greatly reduced.

With the largest particles and a huge amount of moisture effectively removed from the air stream, the clean air can then move through the secondary and final-stage filters, which may include moisture coalescers, prefilters, and, finally, high-efficiency filters.



The Benefits of Using Inertial Separators

Inertial separators have two significant benefits: they extend the lifespan of the stages of filtration downstream, and they allow your gas turbine to operate at a high capacity for much longer than it would otherwise by reducing the frequency of shutdowns required for maintenance and cleaning of prefilters and high-efficiency filters.

Most inertial separators are self-cleaning, which reduces maintenance costs. They're also specifically designed to operate in abrasive, corrosive, and high-sunlight environments in temperatures ranging from -40°F to 200°F.

This ensures fewer shutdowns for the inertial separators' maintenance, repair, or replacement while simultaneously extending the lifespans of your other filtration stages. Given how much they reduce operation and maintenance costs, it's no wonder inertial separators are found on most gas turbines worldwide.

www.lotecinc.com
106 N. Denton Tap Rd, Suite #210-293, Coppell, TX 75019 | P: 972-462-7884 | F: 972-462-7179