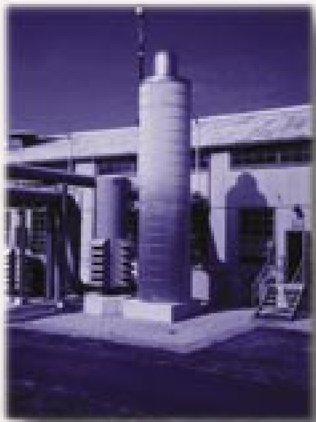

MED MODEL HPSC

Mueller Environmental Designs, Inc.

Air Filtration
Evaporative Cooling
Noise Control
Mist Elimination
Turnkey Projects

MED Model HPSC Design

APPLICATION

The Mueller Environmental Designs HPSC provides inlet air filtration for gas turbines, fans, compressors, reciprocating engines and other rotating machines requiring a high degree of inlet air filtration.

OPERATION

As dust laden air enters the filter system via the weather hoods, it is cleaned as it passes through the high efficiency extended surface area filter elements. The clean filtered air exits the filter elements into the clean air plenum to the turbine inlet.

VELOCITY PARAMETERS

PULSE TYPE SELF-CLEANING INTAKE FILTRATION SYSTEMS

GENERAL

The design criteria to define the three (3) critical velocities of, “Media Velocity”, “Updraft Velocity”, and “Between Cartridge Velocity”, has evolved over the past fifteen years from the combination of theoretical calculations, laboratory testing and, actual field experience resulting from many thousands of operating hours in widely diversified environments of the world.

The three velocity parameters are closely interrelated one with the other, and cannot be evaluated individually. It is obvious for instance that, for any given set of filter cartridge center line spacing, cartridge diameter and cartridge length, any increase in the velocity of the air passing through the filter media (media velocity), automatically means a corresponding increase in the updraft velocity of the incoming air stream and, an increase of the between cartridge velocity. In the same manner, any decrease in any one of the velocity parameters, also means a decrease in the other two velocity parameters.

MED Model HPSC-64

MEDIA VELOCITY

It has been well documented that, high efficiency barrier filter media operate on the principle of diffusion of the aerodynamic capture of particulates. This means that, the lower the gas velocity through the media, the better is the media ability to remove and retain sub-micron particulates. It is for this reason that HEPA filters that are used in open-heart surgery theatres and critical microchip manufacturing, operate with a media velocity not exceeding 6 FPM.

In order to be a self-cleaning device, the compressed air shock wave used to clean the filter cartridge must be able to overcome the intermolecular (Van Der Waals) forces between the particulates that are to be dislodged and the fibers of the filter media on which the particulates are retained. Furthermore, the pulse action must be capable of moving the particulates a sufficient distance from the surface of the filter media that it will not immediately be re-entrained back onto the media surface by the incoming air stream after the short (50-100 millisecond pulse duration period). By calculation this can be shown to be in the order of 4-5 FPM.

Indeed, some early pulse type intake systems were sized with media velocities in the region of 4-5 FPM. However, it was quickly established that a somewhat lower velocity was needed in order for the system to be able to maintain a stabilized operating pressure drop without unacceptably high pressure peak excursions during periods of high free moisture content in the ambient air. Optimum media velocity has since been defined, and accepted by the industry, as not to exceed 3 FPM.

Filter Element Holding Frame Mechanism

BETWEEN CARTRIDGE VELOCITY

In a conventional pulse type self-cleaning filter design, the particulates that are dislodged from the surface of the filter media by the action of the compressed air cleaning of the cartridges, are required to fall by gravity, and exit the system, against the force (velocity) of the incoming upward moving air stream. Depending upon the size of the free falling particulates and, their specific density, it has been shown by calculation, and verified by laboratory testing that, the incoming air velocity between adjacent filter cartridges should not exceed 550 FPM. This between cartridge velocity of 500-550 FPM has been endorsed by The Gas Turbine Manufacturer's Association

Reverse Pulse Header and Venturi Tube Assembly

UPDRAFT VELOCITY

To a certain extent, the updraft velocity is dictated by the filter cartridge diameter and, the aforementioned, between cartridge velocity. However, it also has to be recognized that, the dislodged particulates not only have to fall by gravity below the bottom of the filter cartridges, but that they also have to move tangentially across the width of the filter modules in order to exit back to atmosphere. Again, this tangential movement is against the force of the incoming dirty air stream. If the velocity of this air stream exceeds about 350 FPM the particulates will, depending upon the module width, and therefore the distance the particulates must travel, be re-entrained back toward the filter cartridges rather than exiting the system under the module skirt. An additional and important reason for the 300-350 FPM updraft velocity is to prevent the ingress of rain and or snow into the system.

The reverse pulse air cleaning cycle is controlled by a solid state sequence timer. The timer receives a start signal from a photohelic pressure differential switch. The timer starts blowers and energizes solenoid valves that in turn activate diaphragm air valves to create short sharp bursts of high energy compressed air through strategically placed orifices located in blowpipes positioned in the clean air plenum. This high energy air burst is in reverse flow to the normally flowing incoming dust laden air. This momentary pressurization and reversal of airflow, dislodges the accumulated dust particles, cleaning the filter elements, for continued machinery operation.

CONSTRUCTION

The Mueller Model HPSC System includes a housing with filter maintenance area and clean air plenum, extended surface barrier filters, filter element supports, and reverse air pulse mechanism. The housing is all welded, hot rolled carbon steel construction.

The extended surface barrier filter elements are made of uniformly pleated cellulose blend media packs. The media is formed into round shaped filter elements. The elements have galvanized cell top and bottom end plates. The filter element to clean air plenum connection is complete with closed cell neoprene gasket.

The reverse pulse mechanism is comprised of an external compressed air manifold with diaphragm air valves and 1 ½" NPT connection at each end. The manifold is externally bolted to clean air plenum subassembly roof. The timing circuit controls are factory installed and tested prior to shipment

PERFORMANCE

The high efficiency extended surface area filter elements achieve a 99.6% on AC fine test dust when tested in accordance with ASHRAE 52-76 test method.

Pulse Venturi Tube

Filter Holding Frame

Filter Holding Crank Arm

RSC-2 Filter

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