TECHNICAL RESEARCH REPORT

# AFD

## Device of Many Functions

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The Adjustable Flow Device or AFD is an essential device in the function and performance of fabric duct. The internal fitting is zipped in to place and is invisible to occupants yet is critical to the system.

An AFD is constructed by combining a sleeve of highly permeable mesh with an adjustable drawstring. It acts as a mesh volume control damper and settling screen depending on the system insertion point. Clogging and performance over several years is unchanged due to the large center adjustable orifice and large free area of the mesh.

*Figure 1: Fully Open*

*Figure 2: 1/2 Open*

*Figure 3: Closed*

The AFD positions are described by the ratio of the open center orifice to the duct diameter as shown in Figures 1-3. The positions are preset at the factory and should not need adjustment in the field. However if adjustment is necessary, the AFD can be located by a small grey webbing at the zipper location.

From experience and for general design, DuctSox recommends the settings in the following chart as a starting point. The AFD is capable of providing a large pressure drop which is dependant on the cross sectional velocity.

| Velocity | AFD Position |
|---|---|
| 1,080-1,800 | 3/4 Open |
| 720-1,080 | 1/2 Open |
| 360-720 | 1/4 Open |
| 0-360 | Closed |

*Table 1: Recommended AFD Settings*

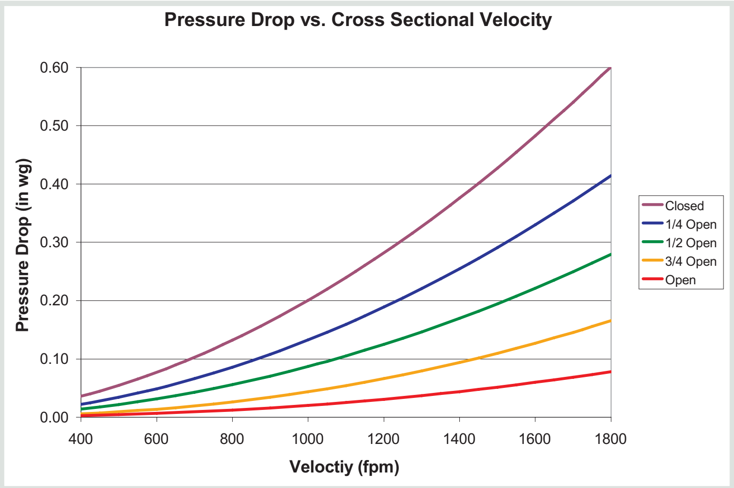


*Fig. 4: Pressure drop vs. velocity*

## STATIC PRESSURE REGAIN

In fabric ducts, the accumulation of static pressure regain is a common occurrence and aids in negating frictional losses. Unfortunately, the pressure along the length of duct is uneven and usually higher near the endcap. The AFD is used as an internal baffle and damper to adjust the static pressure and lessen the difference.

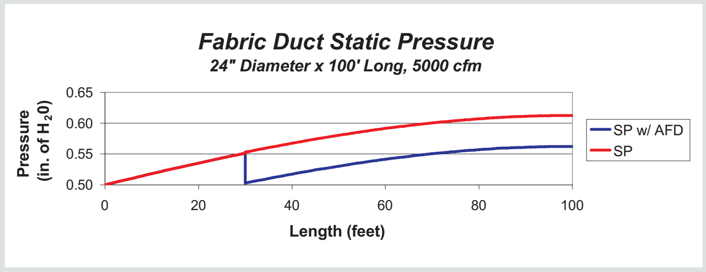


*Figure 5: Static Pressure Regain*

The airflow being dispersed is directly related to the static pressure at the outlet. Uneven static pressures result in uneven airflow to the space. With out an AFD, with some manufacturer's the airflows can commonly 10% to 20% from inlet to endcap of a straight system. With proper use of the AFD, the range of airflow is greatly reduced and is typically 3% to 6%. For example, Figure 5 shows an improvement in airflow from 11% to 5% by the insertion of an AFD at the 30' mark. For more information and discussion on fabric duct pressures, refer to the "Fabric Duct Pressure Explained" White Paper on www.ductsox.com.

## BALANCING MULTIPLE RUNS

AFDs can be used to balance separate branches whether connected to a metal or a fabric plenum. Note that if a metal manifold is connecting multiple fabric ducts, then metal dampers should be used at the metal/fabric connection to give maximum flexibility for pressure and airflow adjustments. In the example below, the air flows to the path of least resistance in the center two runs of fabric duct as shown by the static pressure readings. After the insertion and adjustment of AFDs, the pressures will be much more even.

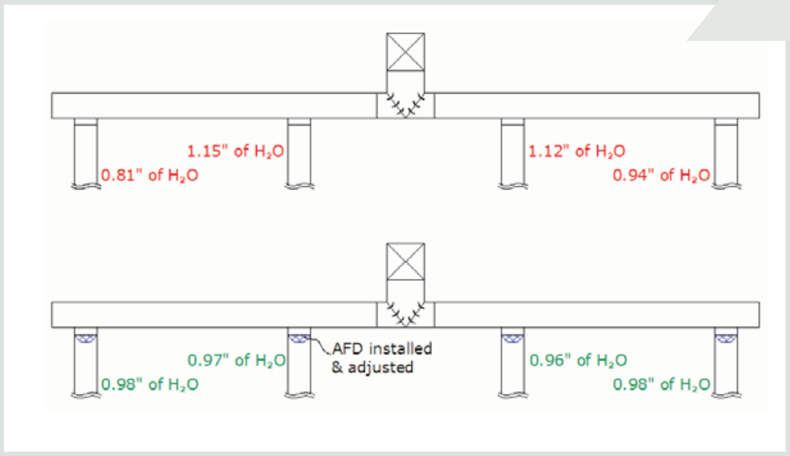


*Figure 6: Balanced pressure for multiple runs.*

## REDUCE TURBULENCE

An AFD can be utilized to reduce the turbulence near an inlet or fitting where the fabric duct wall is fluttering. The open center orifice relocates the higher velocities towards the center of the duct. Air entering the fabric duct inlet should be relatively smooth and not highly turbulent for best results.

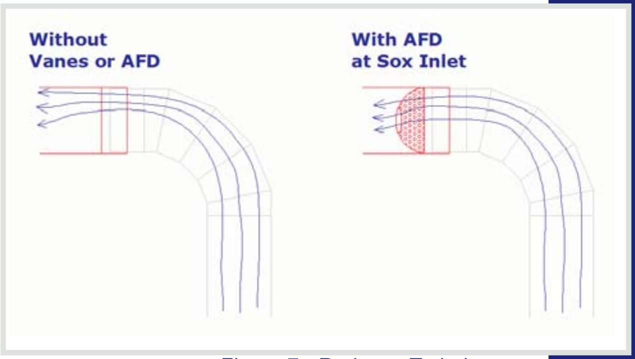


*Figure 7: Reduces Turbulence*

## REDUCE INFLATION DYNAMICS

When the fans shut off, fabric duct systems deflate. Depending on suspension method, deflation varies from 17% to near 100%. Upon equipment start up, systems that are fully deflated have no airflow resistance thus resulting in a large air mass traveling down the length of duct with little or no resistance. The momentum can cause excess noise due to fabric movement and inflation pop.

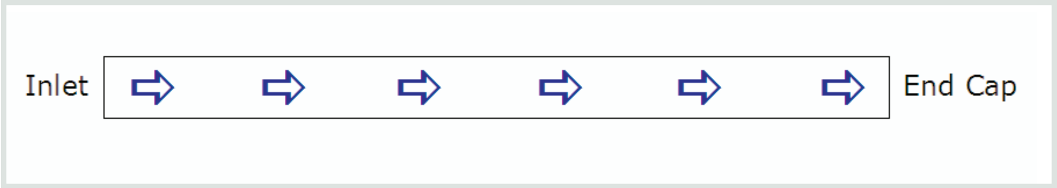


*Fig. 8: Systems without AFD's offer little resistance to inflation airflow.*

Adding an AFD, whether one or two locations along the length, will stage the inflation and reduce the noise and fabric movement. As the air flows towards the AFD, the added resistance creates a pressure that stages inflation. Since some of the initial air mass is already dispersed, a lesser amount of air makes it to the endcap. The last sections of fabric duct are then pressurized and start dispersing air.

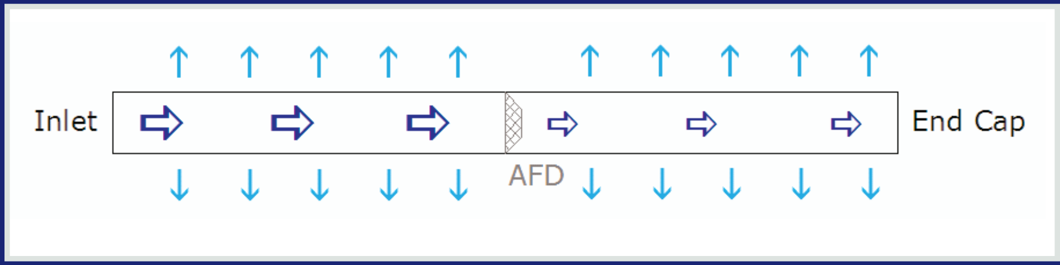


*Fig. 9: AFD resists inflation velocity, resulting in smoother start-ups.*

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