The Airflow Update®

AIRFLOW SCIENCES CORPORATION

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Flow Separation in Industrial Applications

Flow separation occurs when a bend or expansion is too severe to allow the flow to follow the contour of the duct. This causes a wake to form, resulting in an effective reduction in the the duct's cross sectional area (known as the vena contracta). This area reduction results in a pressure loss which can be significant. At times, flow separation creates pulsations throughout a system. These pulsations have been known to cause flow induced vibrations which may damage ductwork and/or fan bearings. Separated flow also typically results in highly non-uniform gas velocity profiles. This can degrade efficiency of downstream heat exchangers, particle collectors, mixers, instrumentation, etc.

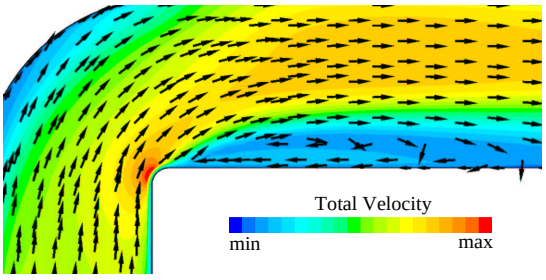


Figure 1: With no vanes, a turbulent, recirculating flow region exists.

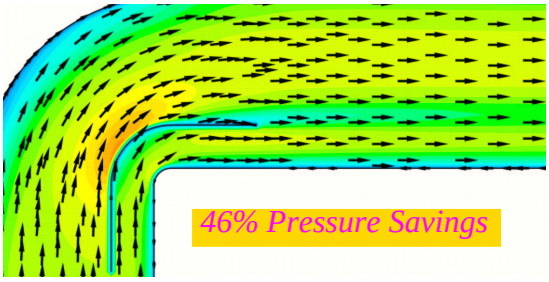


Figure 2: Optimized turning vanes result in a smooth, low turbulence attached flow regime.

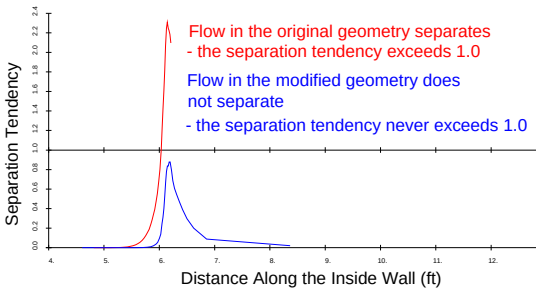


Figure 3: Separation Tendency Plots

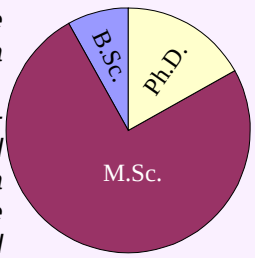
Flow separation can usually be eliminated or controlled through the addition of optimally designed turning vanes or by altering duct geometry. Figure 1 shows a baseline duct with a turbulent, recirculating flow region downstream of the corner. By implementing properly designed vanes, the flow exiting the corner exhibits smooth, low turbulence, attached flow as seen in Figure 2. The baseline and final design separation tendency plots, based on the application of the Stratford Separation Criteria, are presented in Figure 3 where it can clearly be seen that the flow through the design model remains attached.

Airflow Sciences Corporation has over 25 years of experience developing cost-effective solutions to these flow problems. Our custom flow modeling software accurately predicts separation and is used to design duct systems which minimize or eliminate separation.

For further information on ASC's Computational Fluid Dynamic (CFD) modeling, visit our website at **www.airflowsciences.com**

From the Editor

We're growing again! The baby-boom at Airflow does not appear to be abating. Many of our staff are either expecting or have had a child in the past year. Now might be a good time to buy stock in chocolate cigar companies.



On the business side, we've been filling our newly expanded office and laboratory with highly qualified people. We'd like to extend a whole-hearted "Welcome Aboard" to all of our new family members. As we enter our 27th year, we feel that our staff's education and experience make us a world leader in flow modeling, field testing, and lab testing. Did you know that 90% of our engineering staff has a Master's degree or higher? Some may claim that our staff has more degrees than a thermometer but we believe in hiring the brightest and the best engineers available.

If you have any flow, heat transfer, or mass transfer issues you're dealing with, feel free to give us a call at (734) 464-8900.

Edited by Kevin Linfield

Plant Air Monitoring Done Right

Many facilities are required to continuously monitor atmospheric conditions. Whether it is to ensure clean-room standards, maintain ventilation requirements, or to meet health and safety codes, air monitoring is often a necessary part of doing business. A typical food processing facility (Figure 4) requires internal air to travel from "clean" to "dirty" areas. Flow in the reverse direction is unacceptable, because the plant requires food handling areas to be contaminant-free. Internal air flows from the packaging department through both the processing and shipping areas. A high pressure zone is maintained in packaging and a low pressure zone is kept in both the shipping and receiving areas.

This arrangement helps ensure the cleanliness of the food processing system and aids in conforming to health codes. In order to determine the stability of this positive-pressure environment, long term air monitoring is often required.

Airflow Sciences Corporation has considerable experience in developing customized data acquisition tools. A typical system would consist of numerous pressure sampling points. These would be at locations determined to provide a most representative measurement while minimizing installation costs and product line interference.

Coupled with external atmospheric measurements such as temperature, wind speed, wind direction and pressure, an all-encompassing, real-time automated data retrieval system can be developed and implemented. Once this information is obtained, a control system can be developed to promote environmental quality.

Does your facility require atmospheric monitoring? Give us a call and we'd be glad to help you analyze your situation.

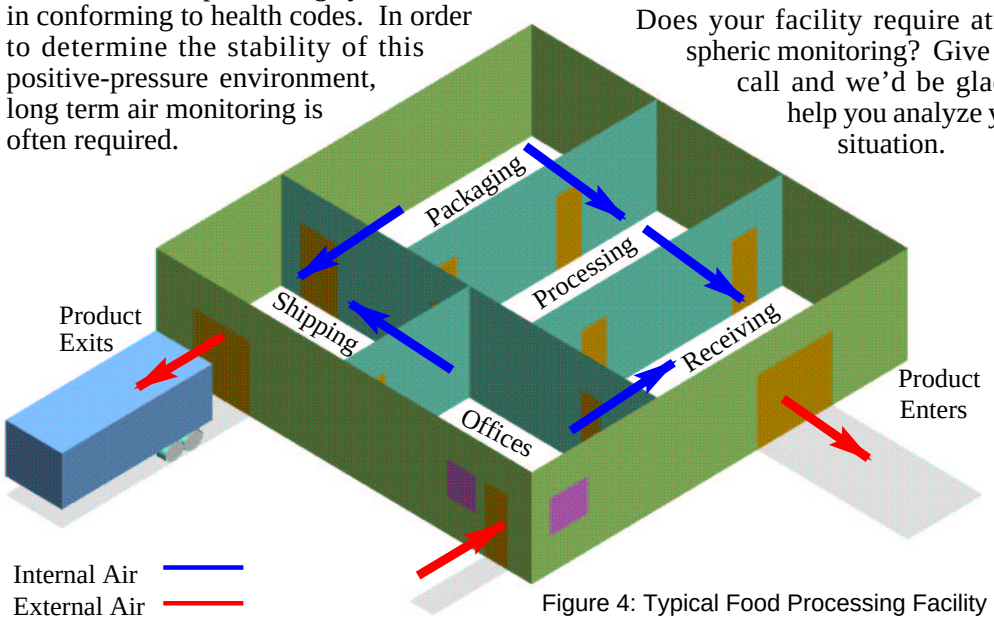


Figure 4: Typical Food Processing Facility

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Airflow Events

Keeping in tune with our industry clientele we've participated at the following conferences and trade shows in the past year: POWER-GEN 2000, International Conference on Electrostatic Precipitation (ICESP 2001), and Particulate Control Users Group (ESP/FF 2001).

We presented a paper at ICESP comparing results of field testing, CFD modeling, and physical modeling of Electrostatic Precipitators. If you'd like a copy, you can download one in electronic format from our website, or feel free to give us a call and we'll send you a hard copy by mail.

Be sure to visit our booth at POWER-GEN 2001 in Las Vegas this December, and say Hi! to Brian, Mike and Jim.

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