Technical Note

The Use of SKC Aluminum Cyclones

In hopes of achieving worldwide consensus, new size-selective exposure guidelines for particulates have been recently adopted by various agencies including:

- International Standards Organization (ISO)
- Comité Européen de Normalisation (CEN)
- American Conference of Governmental Industrial Hygienists (ACGIH)
- ASTM International

One of the most significant changes was the adoption by these agencies of a 50% (or median) cut-point for a respirable particulate matter sampler of 4 µm. The National Institute for Occupational Safety and Health (NIOSH) has now also adopted this same definition in their Method 7500 for Silica, Crystalline (15 January 1998 Issue) and Method 0600 Particulates not Otherwise Regulated, Respirable (15 January 1998 issue).

In light of these developments, SKC contracted with New York University and consulted with leading aerosol research scientists to validate the SKC Aluminum Cyclone to meet the new definition of respirable particulate matter. It was determined that a flow rate of 2.5 L/min results in a collection efficiency curve that best matches the new definition.[1] *See Figure 1.*

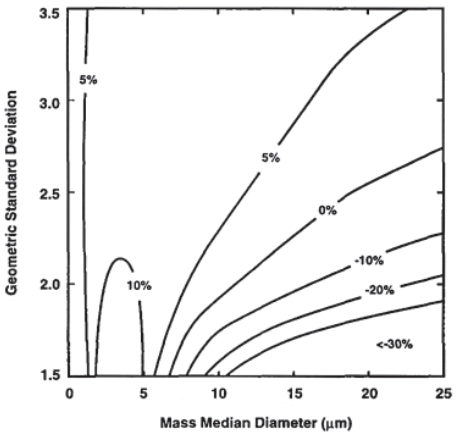

Figure 1.
Bias Map: SKC Aluminum Cyclone at 2.5 L/min[1]

Health and safety professionals in the United States, however, face a problem in that the Occupational Safety and Health Administration (OSHA) has not yet adopted the new particulate definitions. Like with the Permissible Exposure Limits (PELs), OSHA must continue to use particulate definitions and standards issued in the 1960s until updates make their way through the regulatory process.

Since OSHA compliance officers must use cyclones that meet the OSHA definition for respirable particulate matter still in effect, they cannot use the SKC Aluminum Cyclone or any other cyclone designed exclusively to meet the new definition. OSHA compliance officers are limited at this time to the use of the 10-mm nylon cyclone (Dorr-Oliver). Other health and safety professionals, however, face the choice of adopting the latest developments in science and technology or following the methods that would be used in case of an OSHA inspection.

Users must ultimately choose the sampling equipment most appropriate for an application. However, SKC would like to provide the following information for consideration:

1. The SKC Aluminum Cyclone at a flow rate of 2.5 L/min meets the ACGIH definition of a respirable dust sampler.[1, 6] This is an important consideration for companies that adopt ACGIH Threshold Limit Values® as in-house standards.
2. The literature has reported that the sampling efficiency of the 10-mm nylon (Dorr-Oliver) cyclone is affected by the airstream velocity and inlet orientation.[2] Studies have shown also that the 10-mm nylon cyclone can experience as much as a 20% reduction in mass collected when sampling at an angle toward the wind.[3]

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3. The literature suggests that the 10-mm nylon cyclone collects proportionately less dust (undersamples) with decreasing humidity than either the horizontal elutriator (as a reference instrument) or the SKC Aluminum Cyclone, as a result of electrostatic charges.[4]

OSHA silica experts feel, however, that results for crystalline silica obtained with cyclones based on the new definition may not be consistently higher than those obtained by OSHA inspectors since the OSHA PEL for compounds containing crystalline silica is based upon the percent silica content. OSHA believes that different particle classification devices collect different *distributions* of particles which would affect the percent silica content in the sample.[5]

In the years ahead, SKC hopes that all agencies involved in occupational health and safety issues will be in agreement on the definitions of particle size fractions and appropriate samplers. Until then, health and safety practitioners will need to decide how best to address this disparity in order to protect their employees from exposure to particulates.

References:

[1] *Harper, M., C.P. Fang, D.L. Bartley, B.S. Cohen, "Calibration of the SKC Inc. Aluminum Cyclone For Operation in Accordance with ISO/CEN/ACGIH Respirable Aerosol Sampling Criteria," J. Aerosol Sci. Vol. 29, pp. S347-S348, 1998*

[2] *Kar, K. and M. Gautam, "Orientation Bias of the Isolated 10-mm Nylon Cyclone at Low Stream Velocity," Am. Ind. Hyg. Assoc. J. 56:1090-1098, 1995*

[3] *Liden, G., "Evaluation of the SKC Personal Respirable Dust Sampling Cyclone," Appl. Occup. Envron. Hyg. 8(3):178-190, 1993*

[4] *Sass-Kortsak, A.M., C.R. O'Brien, P.R. Bozek, J.T. Purdham, "Comparison of the 10-mm Nylon Cyclone, Horizontal Elutriator, and Aluminum Cyclone for Silica and Wood Dust Measurements," Appl. Occup. Environ. Hyg. 8(1):31-37, 1993*

[5] *Edwards, S.L., "Crystalline Silica: Sampling and Analytical Issues," Synergist, Dec. 2000, pp. 11-13*

[6] *Trakumas, S., et. al., Performance Assessment of Personal Respirable Cyclone Samplers, AIHce Presentation 191, 2003*

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