Designation: E 799 – 03

Standard Practice for Determining Data Criteria and Processing for Liquid Drop Size Analysis[1]

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1. Scope

1.1 This practice gives procedures for determining appropriate sample size, size class widths, characteristic drop sizes, and dispersion measure of drop size distribution. The accuracy of and correction procedures for measurements of drops using particular equipment are not part of this practice. Attention is drawn to the types of sampling (spatial, flux-sensitive, or neither) with a note on conversion required (methods not specified). The data are assumed to be counts by drop size. The drop size is assumed to be the diameter of a sphere of equivalent volume.

1.2 The analysis applies to all liquid drop distributions except where specific restrictions are stated.

2. Referenced Documents

2.1 *ASTM Standards: ASTM Standard:*

E 1296 Terminology Relating to Liquid Particle Statistics[2]

2.2 *ISO Standards:*

13320–1 Particle Size Analysis-Laser Diffraction Methods[3]

9276–1 Representation of Results of Particle Size Analysis-Graphical Representation[3]

9272–2 Calculation of Average Particle Sizes/ Diameters and Moments from Particle Size Distribution[3]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *spatial*, *adj*—describes the observation or measurement of drops contained in a volume of space during such short intervals of time that the contents of the volume observed do not change during any single observation. Examples of spatial sampling are single flash photography or laser holography. Any sum of such photographs would also constitute spatial sampling. A spatial set of data is proportional to concentration: number per unit volume.

3.1.2 *flux-sensitive*, *adj*—describes the observation of measurement of the traffic of drops through a fixed area during intervals of time. Examples of flux-sensitive sampling are the collection for a period of time on a stationary slide or in a sampling cell, or the measurement of drops passing through a plane (gate) with a shadowing on photodiodes or by using capacitance changes. An example that may be characterized as neither flux-sensitive nor spatial is a collection on a slide moving so that there is measurable settling of drops on the slide in addition to the collection by the motion of the slide through the swept volume. Optical scattering devices sensing continuously may be difficult to identify as flux-sensitive, spatial, or neither due to instantaneous sampling of the sensors and the measurable accumulation and relaxation time of the sensors. For widely spaced particles sampling may resemble temporal and for closely spaced particles it may resemble spatial. A flux-sensitive set of data is proportional to flux density: number per (unit area × unit time).

3.1.3 *representative*, *adj*—indicates that sufficient data have been obtained to make the effect of random fluctuations acceptably small. For temporal observations this requires sufficient time duration or sufficient total of time durations. For spatial observations this requires a sufficient number of observations. A spatial sample of one flash photograph is usually not representative since the drop population distribution fluctuates with time. 1000 such photographs exhibiting no correlation with the fluctuations would most probably be representative. A temporal sample observed over a total of periods of time that is long compared to the time lapse between extreme fluctuations would most probably be representative.

3.1.4 *local*, *adj*—indicates observations of a very small part (volume or area) of a larger region of concern.

3.2 *Symbols:Symbols—Representative Diameters:*

3.2.1 ($\bar{D}_{pq}$) is defined to be such that:[4]

$$\bar{D}_{pq}{}^{(p-q)} = \frac{\Sigma_i D_i^p}{\Sigma_i D_i^q} \tag{1}$$

where:

$\bar{D}$	=	the overbar in $\bar{D}$ designates an averaging process,
$(p - q)$ $p > q$	=	the algebraic power of $\bar{D}_{pq}$,
p and q	=	the integers 1, 2, 3 or 4,

[1] This practice is under the jurisdiction of ASTM Committee E29 on Particle Size Measurement and is the direct responsibility of Subcommittee E29.04 on Liquid Particle Measurement.

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[2] *Annual Book of ASTM Standards*, Vol 14.02.

[3] Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

[4] This notation follows: Mugele, R.A. and Evans, H.D., "Droplet Size Distribution in Sprays," *Ind. Engnrg. Chem.* Vol 43, No. 6 (1951), pp. 1317-1324.

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