Designation: E829 – 16

Standard Practice for Preparing Refuse-Derived Fuel (RDF) Laboratory Samples for Analysis[1]

This standard is issued under the fixed designation E829; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers the preparation of RDF laboratory samples for analysis, the laboratory samples having been previously obtained from representative RDF samples.

1.2 The determination of the air-dry loss of the RDF is part of this preparation procedure and must be performed prior to the particle size reduction.

1.3 The practice given may also be used for other RDF types but additional sample preparation steps may be necessary prior to the application of this method.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. Specific hazard statements are given in Section 7.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D5681 Terminology for Waste and Waste Management

D6044 Guide for Representative Sampling for Management of Waste and Contaminated Media

E180 Practice for Determining the Precision of ASTM Methods for Analysis and Testing of Industrial and Specialty Chemicals (Withdrawn 2009)[3]

E790 Test Method for Residual Moisture in Refuse-Derived Fuel Analysis Samples

E791 Test Method for Calculating Refuse-Derived Fuel Analysis Data from As-Determined to Different Bases

3. Terminology

3.1 *Definitions*—For definitions of terms common to waste and waste management used in this practice, refer to Terminology D5681 and ASTM STP 832.[4]

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *air-drying*—a process of partially drying RDF to bring its moisture content to near equilibrium with the ambient atmosphere in which further reduction, division, and characterization of the sample are to take place. In order to bring about this equilibrium, the RDF is usually subjected to drying under controlled temperature conditions ranging from 30 to 40°C.

3.2.2 *analysis sample*—final subsample prepared from the air-dried laboratory sample but reduced by passing through a mill with a 0.5-mm (0.02-in.) size or smaller final screen.

3.2.3 *bias*—a constant or systematic error in the test results. The error is a persistent positive or negative deviation from the accepted reference value.

3.2.4 *gross sample*—a sample representing one lot and composed of a number of increments on which neither reduction nor division has been performed.

3.2.5 *laboratory sample*—a representative portion of the gross sample received by the laboratory for further analysis.

3.2.6 *lot*—a large designated quantity (greater than the quantity of the final sample) of RDF that can be represented by a properly selected gross sample.

3.2.7 *precision*—a term used to indicate the capability of a person, an instrument, or a method to obtain reproducible results; specifically, a measure of the random error as expressed by the variance, the standard error, or a multiple of the standard error.

3.2.8 *refuse-derived fuel*—solid forms of refuse-derived fuels from which appropriate analytical samples may be prepared defined as follows in ASTM STP 832:[4]

RDF–1—Waste used as a fuel in as-discarded form with only bulky wastes removed..

RDF–2—Waste processed to coarse particle size with or

[1] This practice is under the jurisdiction of ASTM Committee D34 on Waste Management and is the direct responsibility of Subcommittee D34.03 on Treatment, Recovery and Reuse.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

[4] Hollander, H.I. *Thesaurus on resource recovery terminology.* Philadelphia: American Society for Testing and Materials, 1983

without ferrous metal separation.

RDF–3—combustible waste fraction processed to particle sizes, 95 % weight passing 2-in. screening.

RDF–4—Combustible waste processed into powder form, 95 weight % passing 10-mesh screening.

RDF–5—Combustible waste densified (compressed) into the form of pellets, slugs, cubettes, or briquettes.

3.2.9 *representative sample*—a sample collected in such a manner that it has characteristics equivalent to the lot sample.

3.2.10 *sample division*—the process of extracting a smaller sample from a sample so that the representative properties of the larger sample are retained. During this process it is assumed that no change in particle size or other characteristics occurs.

3.2.11 *sample preparation*—the process that includes drying, size reduction, division, and mixing of a laboratory sample for the purpose of obtaining an unbiased analysis sample.

3.2.12 *sample reduction*—the process whereby sample particle size is reduced without change in sample weight.

3.2.13 *significant loss*—any loss that introduces a bias in final results that is of appreciable importance to concerned parties.

4. Summary of Practice

4.1 Sample moisture is reduced by air-drying to allow the mechanical reduction of the sample without significant change to the sample's fuel properties. The final sample is in a form suitable for further analysis.

5. Significance and Use

5.1 Using this procedure a sample of RDF can be converted into a physical form suitable for laboratory fuel analysis.

5.2 As indicated in Test Method E791, air-dry moisture, which is determined by this procedure, is essential to the calculation of other laboratory results on an as-received basis. The air-dry moisture value is used in conjunction with the results of the residual moisture determination in Test Method E790 to calculate total sample moisture.

6. Apparatus

6.1 *Air-Drying:*

6.1.1 *Drying Oven*—A large chamber mechanical draft oven capable of maintaining a controlled temperature in the range from 25 to 40 ± 1°C. Air changes should be at the rate of one to four changes per minute. Air flow should be baffled to prevent samples from being blown out of the sample containers.

6.1.2 *Drying Pan*—A noncorroding pan or mesh basket to be used for holding the sample during air-drying operations.

6.1.3 *Balance (Laboratory Sample)*—A balance of sufficient capacity to weigh the sample and container with a sensitivity of 0.1 g.

6.2 *Sample Reduction:*

6.2.1 *Mill*—A mill operating on the principle of cutting or shearing action shall be used for sample particle size reduction. It shall have the capability to regulate the particle size of the final product by means of either interchangeable screens or mill adjustments. The mill shall be enclosed and should generate a minimum amount of heat during the milling process to minimize the potential for loss of moisture. The final product shall pass through a 0.5-mm or smaller screen into a receiver integral with the mill. Access should be provided so that the mill can be quickly and easily cleaned between samples.

6.3 *Analysis Sample Containers*—Heavy, vapor impervious bags, properly sealed; or noncorroding cans, glass jars, or plastic bottles with airtight sealing covers may be used to store RDF samples for analysis. Containers shall be checked for suitability by measuring weight loss or gain of the sample and container stored for 1 week under ambient laboratory conditions. The weight loss or gain should be less than 0.5 % of the sample weight stored in the container.

6.4 *Drying Oven*—A drying oven of either the mechanical or natural circulation type which is capable of constant uniform temperature within the specimen chamber regulated at 107 ± 3°C.

6.5 *Shredder*—A laboratory shredder capable of shredding or cutting larger particle sizes of solid waste. The final product shall pass through a 2-in. or smaller screen into a receiver integral with the shredder.

NOTE 1—A garden-type shrubbery shredder equipped with a screen and bag for collection of shredded samples is satisfactory.

7. Hazards

7.1 Due to the origins of RDF in municipal waste, precautions should be observed when conducting tests on samples. Recommended practices include use of gloves when handling RDF; wearing dust masks (NIOSH-approved), especially while shredding RDF samples; conducting tests under a negative pressure hood when possible; and washing hands before eating, using the restroom, or smoking.

7.2 Laboratory sample handling and reduction shall be performed by trained personnel. If all precautions regarding sample preparations are not followed, the error in the preparation may bias some or all of the analyses performed on the sample.

7.2.1 All preparative steps shall be done rapidly and in as few operations as possible, since moisture loss depends on several factors other than total moisture content, such as time required for milling, atmospheric temperature and humidity, and the type of laboratory sample reduction equipment.

7.2.2 At all times RDF samples should be protected from moisture change due to exposure to rain, snow, and sun, or contact with absorbent materials.

7.2.3 Samples should be transported to the laboratory and analyzed as soon as possible. If any sample-handling step involved an extended time period, the sample and container should be weighed before and after the process to determine any weight gain or loss. This weight gain or loss shall be included in the calculation of moisture content.

7.2.4 Force-feeding of the sample through the mill can overload the motor. An overload can cause rapid heating of the rotor and mill chamber with possible loss of residual moisture.