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This Test Method may include safety precautions which are believed to be appropriate at the time of publication of the method. The intent of these is to alert the user of the method to safety issues related to such use. The user is responsible for determining that the safety precautions are complete and are appropriate to their use of the method, and for ensuring that suitable safety practices have not changed since publication of the method. This method may require the use, disposal, or both, of chemicals which may present serious health hazards to humans. Procedures for the handling of such substances are set forth on Material Safety Data Sheets which must be developed by all manufacturers and importers of potentially hazardous chemicals and maintained by all distributors of potentially hazardous chemicals. Prior to the use of this method, the user must determine whether any of the chemicals to be used or disposed of are potentially hazardous and, if so, must follow strictly the procedures specified by both the manufacturer, as well as local, state, and federal authorities for safe use and disposal of these chemicals.

Dirt in paper and paperboard

1. Scope

1.1 This method (1-3) is suited for the visual estimation of dirt in paper or paperboard in terms of equivalent black area. For dirt in pulp, see TAPPI T 213 “Dirt in Pulp.”

1.2 This method is a visual inspection method for the evaluation of the Equivalent Black Area (EBA) measurement of dirt in paper and paperboard. An equivalent instrumental method using image analysis for the measurement of dirt in pulp, paper, and paperboard in units of parts per million is given in TAPPI T 563 “Equivalent Black Area (EBA) and count of visible dirt in paper and paperboard by image analysis.” T 537 “Dirt count in paper and paperboard (optical character recognition - OCR)” reports the number of specks of 0.02 mm² or larger per square meter.

2. Definitions

2.1 Dirt in paper or paperboard is defined as any foreign matter embedded in the sheet, which, when examined by reflected, not transmitted, light has a contrasting color to the rest of the surface and has an equivalent black area of 0.04 mm² or over.

2.2 The equivalent black area of a dirt speck is defined as the area of a round black spot on the white background of the TAPPI Dirt Estimation Chart that makes the same visual impression on its background as does the dirt speck on the particular background in which it is embedded.

3. Significance

3.1 The method provides a measure of the apparent dirt area of a white or a colored sheet, affecting its aesthetic appearance using reflected light. A transparent dirt estimation chart **must not** be used.

3.2 The estimated equivalent black area of a gray or colored speck is smaller than its actual area, in inverse proportion to the intensity of its color contrast with its background. Thus the equivalent black area of a black spot in a brown paper would be considerably smaller than its actual area because its appearance would not be as pronounced as it would be if it were embedded in a white sheet.

Approved by the Standard Specific Interest Group for this Test Method



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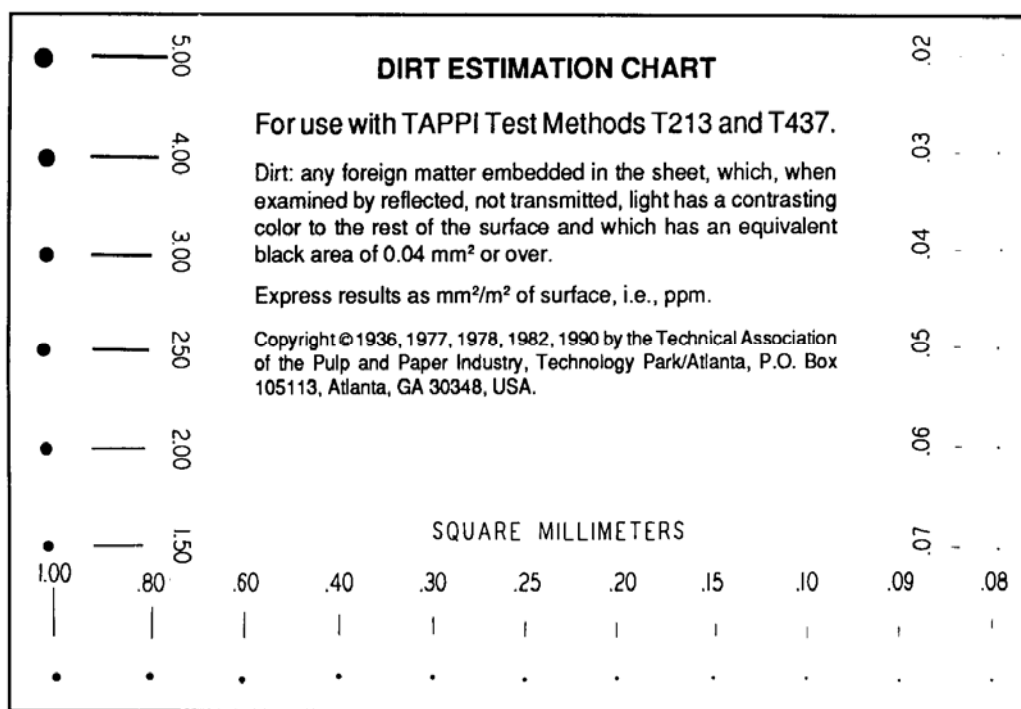
3.3 This method differs from T 537 “Dirt Count in Paper and Paperboard (OCR),” where each dirt speck is counted, regardless of size, shape or color.

4. Apparatus

4.1 *Dirt estimation chart*¹ (see Fig. 1). The actual chart is a photograph approximately 3 1/2 in. x 5 in. (89 mm x 127 mm) of a series of round black spots of various areas on a white background such that using an instrument and method in accordance with TAPPI T 452 “Brightness of Pulp, Paper, and Paperboard (Directional Reflectance at 457 nm)” the reflectance of the white background is $81.5 \pm 1.0\%$ and that of the black dots is $2.4 \pm 0.4\%$. In accordance with Graff’s findings (4) all the round spots on the present chart are correct to within an average 10% or 0.005 mm^2 , whichever is the larger. The dirt estimation chart is intended for use on this method only. The chart is sufficiently precise within the limits of human visual acuity. It is not intended for use as a calibration standard on high resolution image analyzers.

4.1.1 Plastic-covered cards, photocopies, or printed charts other than the TAPPI Dirt Estimation Chart print, do not give equivalent results (5). Transparent dirt estimation charts must not be used.

4.1.2 Only the round spots are used for analysis (see 11.5).



4.1.3 For highly precise work, the spot sizes can be measured microscopically, and correction factors can be developed and used as indicated by Graff (4).

4.2 *Illuminant*, lighting arrangements to give about 540 lm/m^2 (50 fc) of white light or daylight on the specimens. Because the light affects equally the appearance of both the dirt specks and the comparison spots on the charts, the intensity of illumination is not critical.

4.3 *Common reading glass* (optional).

¹ Available for purchase from TAPPI.