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Cotton Gins — Method of Utilizing Emission Factors in Determining Emission Parameters

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Developed by the ASAE Cotton Engineering Subcommittee. Approved by the ASAE Power and Machinery Division Standards Committee March 2005. Adopted as an ASAE Standard March 2005; reaffirmed January 2010; December 2016.

Keywords: Cotton, Emission

1 Purpose and scope

1.1 The purpose of the procedures and data included in this standard is to aid permit and consulting engineers in calculating various air pollution parameters, such as daily and seasonal TSP and PM_{10} emission rates. Consultants representing cotton gins should utilize the presented calculation methods as a basis in preparing air pollution permit applications for their customers. Further, these procedures should be utilized by consultants when responding to notice of violations, recommending modifications to existing ambient air pollution control systems, or designing and developing new air pollution abatement systems in order to comply with SAPRA regulations. Regulators should use the data and procedures when reviewing permits or investigating complaints against a permitted facility.

1.2 This Standard establishes preferred terminology for use in air pollution engineering and defines terms that may not have air pollution related definitions in a desktop dictionary.

2 Additional information

2.1 SAPRA permit engineers may be required to perform in-depth analyses of cotton gin emissions, if the cotton gin is not covered under a general operating permit. This analysis may include calculation of emission rates for all point sources using emission factors or calculation of emission factors and/or emission rates from emission concentrations determined through source sampling of particular point sources. The primary regulated pollutant emitted by cotton gins is PM_{10}. In some states, emissions of TSP are regulated.

2.2 This standard defines the operations of a cotton gin with engineering data that can be used by both consulting and permit engineers such that cotton gins are appropriately regulated. Included in the scope of this standard are standardized procedures for calculating emission factors from emission concentrations and hourly and seasonal emission rates from given (permitted) emission factors. Emission factors, specified in a permit, represent the allowable mass of PM that can be emitted per bale of cotton processed at a gin for a specified air pollution abatement system, while maintaining compliance with the permit. Emission factors may be dependent upon a combination of factors, including the number of process streams and abatement devices used. The appropriate use of emission factors in calculating cotton gin emission rates and inventories is demonstrated in this standard.

3 Normative references

3.1 Federal regulations establish the basis of air pollution control in the United States. Several pieces of federal legislation have created agencies, such as the EPA, allocated funding, and granted state agencies the right to develop more stringent rules and regulations in an effort to reduce emissions. All federal, state, and local laws,

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rules, and regulations governing cotton gin emissions should be followed. Necessary approvals and permits for air pollution control systems should be secured from accountable authorities.

3.2 The following standard constitutes provisions of an engineering practice for the appropriate method of calculating emission rates, concentrations, and factors for cotton gins. All standards are subject to revision, and parties to agreements based on this engineering practice are encouraged to investigate the possibility of applying the most recent editions of the standards and references indicated in Annex A. Standards organizations maintain registers of currently valid standards. At the time of publication, the editions indicated were valid.

3.3 The United States Environmental Protection Agency (EPA) has published emission factors in AP-42, which can be used as guidelines in the permitting process for cotton gins. It is generally assumed that AP-42 emission factors correspond to PM emissions emitted from a typical gin equipped with BACT. The current total AP-42 (U.S. EPA, 1996) emission factor for a cotton gin is 3.05 pounds of TSP (1.2 pounds of PM_{10}) per bale processed. The following EPA documents were used in the development of this engineering practice:

- U. S. Code. (1991) Clean Air Act, § 108, air quality criteria and control techniques, §109, national ambient air quality standards. U. S. C. 42: §§7408-7409.
- U. S. EPA. 1987. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources. Research Triangle Park, North Carolina.
- U. S. EPA. 1996. Interim AP-42 emission factors for agricultural and food industry. Research Triangle Park, North Carolina.

3.4 The following EPA document was used in the development of the terminology used in this engineering practice.

- ANSI/ASAE S525-2 FEB03, Agricultural Cabs - Engineering Control of Environmental Air Quality. Part 2: Pesticide Vapor Filters - Test Procedure and Performance Criteria
- ANSI/ASAE S525-1.2 JAN03, Agricultural Cabs - Engineering Control of Environmental Air Quality. Part 1: Definitions, Test Methods, and Safety Practices
- U. S. EPA. 1997. Terms of environment. National Source Center for Environmental Publications. Cincinnati, OH. EPA No. EPA175B97001.

4 Definitions

4.1 abatement: Controlling emissions.

4.2 aerodynamic equivalent diameter (AED): The diameter of a unit density sphere (i.e.: density = 1.00 g/cm^3) that would have the same settling velocity as the particle or aerosol in question.

4.3 airborne particulates: Solid particles or liquid droplets found in the atmosphere that include, but are not limited to: windblown dust, emissions from industrial processes, and motor vehicle or non-road engine exhausts.

4.4 air pollution: The presence in the outdoor atmosphere of any one or more substances or pollutants in quantities, which are or may be harmful or injurious to human health or welfare, animal or plant life, or property (health effects standard), or unreasonably interfere with enjoyment of life or property, including outdoor recreation (nuisance standard).

4.5 air pollution abatement system: Devices used to remove pollutants from an exit air stream to bring emissions into compliance with regulations.

4.6 air pollution control device: A device that is part of an air pollution abatement system.

4.7 air quality: A term indicative of the quantity of pollutants present to which people, animals, plants, and property are exposed relative to EPA standards.

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4.8 air quality standards: Standards that limit either the emission rate or concentration emitted from a source.

4.9 allowable emission rates (AER): Allowable pollutant emission rates (usually in terms of mass per unit time) determined by SAPRA's, typically in the form of permitted emission factors.

4.10 ambient air: Any unconfined portion of the atmosphere; open air; outside surrounding air; air that is accessible to the public.

4.11 ambient air quality standards: see: criteria air pollutants and National Ambient Air Quality Standards.

4.12 ambient monitoring: All forms of monitoring conducted beyond the immediate influence of any single discharge source.

4.13 attainment: The successful achievement of emission standards.

4.14 attainment area: A geographic area where levels of a criteria air pollutant meet the health-based primary standard (NAAQS) for that pollutant. An area considered as having air quality as good as or better than the NAAQS as defined in the Clean Air Act. An area may have an acceptable level for one criteria pollutant, but may have unacceptable levels for others.

4.15 attainment objectives: A set of site descriptors and parameters together with standards as to what the desired level should be for the parameters. These objectives usually include the chemicals or particulates to be tested, the cleanup standards to be attained, the measures or parameters to be compared to the cleanup standard, and the level of confidence required if the environment and human health are to be protected.

4.16 best available control technology (BACT): An emission limitation based on the maximum degree of emission reduction (with consideration given to the technical practicability and economic reasonableness of reducing or eliminating emissions from the facilities exhausts) achievable through application of production processes and available methods, systems, and techniques. BACT does not permit emissions in excess of those allowed under any applicable Clean Air Act provisions. This is typically defined for cotton gins as high efficiency cyclones (1D3D or 2D2D) on all centrifugal fan exhausts and covered condenser drums with 70–100 fine-mesh screens on all axial fan exhausts.

4.17 best available control measures (BACM): The most effective measures for controlling small or dispersed particulates and other emissions from sources such as roadway dust, soot and ash from woodstoves and open burning of brush, timber, grasslands, or trash.

4.18 Clean Air Act (CAA): Originally passed in 1963, it is the federal law that provides the enabling legislation for regulating air pollution. States will have State CAA's that provide enabling legislation for the respective Local and State Air Pollution Regulatory Agencies (SAPRA). The current national air pollution control program is based on the 1970 version of the law. Substantial revisions in federal law were made by the 1990 Clean Air Act Amendments (CAAA).

4.19 concentration: The relative content of a component in a mixture or solution.

4.20 contaminant: An undesirable component in any material or system. A harmful, irritating or nuisance airborne material that may be in the form of gases, vapors, aerosols, or particulate matter.

4.21 contamination: Introduction into water, air, and soil of microorganisms, chemicals, toxic substances, wastes, or wastewater in a concentration that makes the medium unfit for its next intended use. Also applies to surfaces of objects, buildings, and various household and agricultural use products.

4.22 criteria air pollutants: The 1970 Clean Air Act required EPA to set National Ambient Air Quality Standards for certain pollutants known to be hazardous to human health. EPA identified and set standards to protect human health and welfare for six pollutants: ozone, carbon monoxide, particulate matter, sulfur dioxide, lead, and nitrogen oxide.

4.23 emission: The release or discharge of a pollutant into the environment.

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