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Standard Guide for Carbon Reactivation[1]

This standard is issued under the fixed designation D6781; 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 set of guidelines is offered to users of activated carbon to provide a better understanding of the reactivation process and some of the problems associated with sending carbon off-site or to a third party for thermal reactivation. It is not intended to serve as an operating procedure for those companies or persons that actually operate reactivation facilities. This is true because each reactivation facility is unique, using different types of furnaces, using various operating and performance requirements, and running spent activated carbons either in aggregate pools (combining different suppliers of carbon) or in custom segregated lots. Additionally, proprietary information for each facility relative to the particular equipment used cannot be addressed in a general set of guidelines.

1.2 *This standard does not purport to address any environmental regulatory concerns associated with its use. It is the responsibility of the user of this standard to establish appropriate practices for reactivation prior to use.*

1.3 *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 requirements prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D2652 Terminology Relating to Activated Carbon

2.2 *Other Standard:*

AWWA B605-99 Standard for Reactivation of Granular Activated Carbon

3. Terminology

3.1 *Definitions:*

3.1.1 *reactivated carbon*—spent activated carbon that has gone through a thermal reactivation process.

3.1.2 *spent activated carbon*—activated carbon that has seen service in some application, and that has some adsorbate on the carbon.

3.1.3 *virgin carbon*—activated carbon produced from a raw material carbon source that has never seen service.

4. Procedure

4.1 *Thermal Reactivation Process :*

4.1.1 In order to appreciate the parameters or properties of the spent activated carbon that influence the success of the reactivation process, one must have a basic understanding of the reactivation process and the equipment used therein. Basically, the equipment and process used for reactivation is similar, if not identical, to those same items used for activation of coal, coconut, wood, or other chars, into activated carbon, post devolatilization and carbon fixation (which are necessary steps in virgin carbon manufacture).

4.1.2 The equipment used for these types of processes usually consists of rotary kilns, vertical tube furnaces, fluidized beds, or a multiple hearth furnace. All of these can be fired directly or indirectly. Auxiliary equipment to the furnace or kiln consists of feed screws, dewatering screws, direct feed bins, dust control equipment, product coolers, screening equipment, off-gas pollution abatement equipment, and tankage.

4.1.3 The spent carbon can come from either liquid or gas phase service. Thus, the spent carbon will contain more or less water (or other liquids) depending on its service—less for gas phase service compared to liquid phase service. Additionally, the carbon could be fed to the furnace as a water slurry if received in a bulk load, or if the spent carbon was slurried out of adsorbers. Gross dewatering of such a slurry is normally done by gravity separation of the water from the carbon in an inclined dewatering screw.

4.1.4 Once the spent carbon is introduced into the reactivation furnace, the carbon undergoes a three-step process. As the spent carbon progresses through the furnace and is heated up, the carbon first loses moisture and light volatiles; then the carbon loses heavier volatiles by a combination of vaporization, steam stripping, and thermal cracking of heavies into a pseudo-char which deposits in the pores of the carbon;

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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.

and then, the char is removed from the pores by gasification with