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Project Summary for a  
Revised Construction Permit Application  
from Aventine Renewable Energy, Inc.  
for an Ethanol Expansion Project  
in Pekin, Illinois

Site Identification No.: 179060ACR  
Application No.: 05010062  
Date Received: January 26, 2005

Schedule

Public Comment Period Begins: July 21, 2008  
Public Comment Period Closes: August 20, 2008

Illinois EPA Contacts

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## **I. INTRODUCTION**

Aventine Renewable Energy, Inc. (Aventine) has applied for a revision to the air pollution control construction permit for its new dry mill ethanol facility. Aventine has requested that the permitted ethanol production of this new facility, which began operation in 2007, be increased to 63.3 million gallons ethanol per year, from 56.5 millions gallons per year as currently authorized.

The Illinois EPA has reviewed Aventine's application for a revised permit and made a preliminary determination that the application meets applicable requirements. Accordingly, the Illinois EPA has prepared a draft of the revised construction permit that it would propose to issue. However, before issuing a revised permit, the Illinois EPA is holding a public comment period to receive comments on the proposed issuance of a revised permit and the terms and conditions of the draft of the revised permit.

## **II. BACKGROUND**

Aventine performs corn wet milling and ethanol production at its complex in Pekin. Aventine added a dry mill ethanol facility to the complex pursuant to Construction Permit 05010062, which was issued on November 1, 2005. The new facility began operation in January 2007. The new facility produces ethanol from whole corn, with animal feed produced as a by-product. The steam for the new facility is supplied by a new natural gas fired boiler system, which is part of the new facility.

There are a number of distinct operations at the facility. First, corn is prepared for fermentation, by cleaning (removing foreign matter), grinding, mixing with water, and cooking with enzymes that convert the starch in the corn into sugar. The resulting corn mash is then sent to the fermentation tanks for batch fermentation. Yeast is added to the corn mash in the fermentation tanks. The yeast converts the sugar in the corn mash into alcohols, primarily ethanol, and carbon dioxide (CO<sub>2</sub>). Two scrubbers are used to control emissions of ethanol and other organic compounds from the fermentation tanks.

The ethanol-laden beer from the fermenters is separate into ethanol, water, and solid material by the distillation process. The ethanol is further purified in a molecular sieve to 200 proof (100 percent ethanol). After being denatured with gasoline, the ethanol is stored in existing tanks at the complex prior to load out and shipping by truck, rail or barge. The emissions from the distillation units and ethanol loadout to trucks are controlled by the natural gas-fired oxidizer system, which also serves to supply the steam for the new facility.

The solids-rich material recovered from the bottom of the beer still is the source of the by-product feed produced by the facility. This material is first mechanically processed by centrifuges to remove water from the material, to produce "wet cake". The recovered water from the centrifuges is processed in steam driven evaporators to drive off water, to produce "thick syrup". The syrup from the evaporators is mixed with the wet cake from the centrifuges and further processed in natural gas-fired dryers to produce dry feed. The natural gas fired oxidizer/boiler system for the distillation and truck loadout also controls the emissions from the feed dryer.

The new facility was permitted as a major project subject to the rules for Prevention of Significant Deterioration of Air Quality (PSD), 40 CFR 52.21, because the existing Aventine complex was already a major source of emissions and the permitted annual emissions of the new facility would be at levels at which the facility would be considered a major modification (i.e., permitted annual emissions of PM, VOM and NO<sub>x</sub> equal to greater than 15, 40 and 40 tons, respectively). As a major project, the facility was subject to a case-by-case determination of Best Available Control Technology (BACT), which requires use of appropriate equipment for effective control of emissions of PM, NO<sub>x</sub>, and VOM from various operations at the facility. An ambient air quality impact analysis was also conducted to confirm that the project would not cause or contribute to a violation of the National Ambient Air Quality Standard(s) (NAAQS) or applicable PSD increment(s).

### **III. PROJECT DESCRIPTION**

Aventine has requested an increase in the permitted capacity of its new ethanol facility in terms of ethanol production prior to blending in denaturant to 63.3 million gallons of ethanol per year, from 56.5 millions gallons per year as currently authorized. The increase will not require construction of new equipment but rather be achieved through improved operating procedures for the facility as achieved at other similar plants. These improvements are reflected in a higher guarantee for the capacity of this facility from the firm that designed this facility.

This increase in production of the new facility would be accompanied by an increase in ethanol shipped and associated increases in emissions of particulate matter, volatile organic material and acetaldehyde of certain units at the facility (i.e., feed cooling, process ethanol tank and ethanol loadout). However, Aventine has not requested an increase in total permitted emissions of the facility. This is because certain other units that has performed better than anticipated and would be limited to lower levels of emissions (i.e., milling and the oxidizer/boiler).

Aventine has requested an increase in the permitted particulate matter emissions from feed cooling and transport. This is because initial testing showed higher emissions than permitted.<sup>1</sup> This limit would be scaled up to account for increased production. However, the higher permitted PM emissions from feed cooling and transport would be accompanied by lower permitted PM emissions from grain milling whose actual emissions are significantly lower than currently permitted.

VOM emissions from ethanol storage and loadout operation would be higher directly in proportion to the increase permitted in production of the facility. Acetaldehyde emissions from the feed cooling and transport operation would also be higher to have a greater compliance margin. However, Aventine has proposed to decrease the permitted VOM

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<sup>1</sup> Testing of the feed cooling and transport in June and October/November, 2007 showed particulate matter emissions of 0.72 and 0.70 pounds per hour, compared to an emission limit of 0.38 pounds per year. Aventine has requested a revised limit of 0.98 pounds per hour to reflect the actual performance of this unit, considering an increase in production. At the same time emission testing for milling showed particulate matter emissions of 0.23 pounds per hour, compared to 1.0 pounds per hour. Aventine has requested a revised limit that is lower for this unit, 0.40 pounds per hour.

and acetaldehyde emissions for the oxidizer/boiler, whose actual emissions are significantly lower than the current limit.

Aventine has also identified several units for which alternative or additional operating parameters should be monitored to verify compliance with emissions limits set in the permit. For example, monitoring for the rate of sodium bisulfite addition to scrubbant water should be monitored as the key parameter for the fermentation and purge scrubbers. This would take the place of monitoring inlet gas flow rate for the fermentation and purge scrubbers.

**IV. PROJECT EMISSIONS**

The potential or permitted annual emissions of Aventine's new facility, as allowed by the original permit for the facility, are summarized below. These permitted emissions would not be changed by the revised permit.

Permitted Annual Emissions of the Project (Tons/Year)

	<u>PM<sup>a</sup></u>	<u>VOM</u>	<u>SO<sub>2</sub></u>	<u>NO<sub>x</sub></u>	<u>CO</u>	<u>Indiv. HAP</u>	<u>Aggr. HAP</u>
Dry Mill Facility	34.3	91.9	37.3	54.8	96.2	9.5	23.5
Existing Facilities <sup>b</sup>	11.4	25.5	--	--	--		
Total:	45.7	117.4	37.3	54.8	96.2		

Notes:

- a. Particulate matter (PM) including condensable particulate as measured by USEPA Method 202.
- b. Increase in emissions associated with this project at grain elevator and other existing facilities, at the source.

Actual emissions are less than the permitted emissions to the extent that the facility would operate at less than its maximum capacity and control equipment normally operates to achieve emission rates that are lower than the applicable standards and limitations.<sup>2</sup>

The proposed changes to certain unit annual emission limits are described below:

Pollutant	Emission Unit	Limits (tons/year)	
		Original	Proposed
PM	Feed Cooler	1.65	3.84
	Milling	4.38	2.19
Total		6.03	6.03

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<sup>2</sup> For 2007, Aventine reported actual emissions of PM, VOM, SO<sub>2</sub>, CO and individual HAP from operation of 20.0, 47.7, 35.0, 69.7, and 6.2 tons/year, respectively. This was less than the permitted emissions of the facility. NO<sub>x</sub> emissions were 61.3 tons/year, which were more than the permitted level. This is because the feed dryer/oxidizer/boiler system was not in compliance with its NO<sub>x</sub> limit until the burner was fully tuned and rate of flue gas recirculation was increased. The system is now operating in compliance. The excess emissions were the subject of an enforcement action. Permitted NO<sub>x</sub> emissions of this system are not increased in the revised permit.

VOM	Process Tank	0.30	0.32
	Ethanol Loadout	21.50	24.00
	Oxidizer/Boiler	33.90	31.38
Total		55.70	55.70
Acetaldehyde	Feed Cooling	0.27	0.88
	Oxidizer/Boiler	1.54	0.93
Total		1.81	1.81

**V. APPLICABLE EMISSION STANDARDS**

The permit application for the facility and the initial performance testing conducted for the facility shows that the proposed project complies with applicable state and federal emission standards, including the emission standards and regulations of the State of Illinois (35 Ill. Adm. Code: Subtitle B) and applicable federal emission standards adopted by the United States EPA (40 CFR Part 60).

The revised permit would correct the classification of the oxidizer/boiler under the applicable federal New Source Performance Standards (NSPS), 40 CFR 60 Subpart Db. For purposes of identifying the applicable NO<sub>x</sub> emission standard, the oxidizer/boiler is regulated as a duct burner, as defined by 40 CFR 60.41b. This is because the burner of the oxidizer/boiler is located in the exhaust duct from the feed dryer and is designed to fire additional fuel to heat this exhaust before it enters the heat recovery portion or boiler portion of the oxidizer/boiler. In addition, as the oxidizer/boiler functions as the source of steam to the new facility, it is essential to various processes that are conducted at the facility to convert corn into ethanol.

**VI. PREVENTION OF SIGNIFICANT DETERIORATION (PSD)**

The new facility was subject to PSD review as a major modification because it was significant for emissions of PM, VOM and NO<sub>x</sub> and represented a major modification of an existing major source. After reviewing Aventine's application for a revised permit, the Illinois EPA has determined that the requested revisions do not affect the BACT determination that was made for the facility.

The air quality analyses submitted as part of the original application demonstrated that the project would not cause violations of the National Ambient Air Quality Standards for PM, NO<sub>x</sub> and ozone or the associated PSD increments. The revisions to the permit would not affect this finding.

**VII. DRAFT OF REVISED PERMIT**

The conditions of the revised permit would continue to set forth the air pollution control requirements that the project must meet. These requirements include the applicable emission standards that apply to the project. They also include the measures that must be used and the emission limits that must be met as BACT for emissions of PM, VOM and NO<sub>x</sub> from the new facility.

The permit would also continue to establish enforceable limitations on the amount of emissions for which the project is permitted. Limitations

are set for PM, VOM and NOx, for which the project is major, and for pollutants for which the project is not major. In addition to annual limitations on emissions, the permit includes short-term emission limitations and operational limitations, as needed to provide practical enforceability of the annual emission limitations. As previously noted, actual emissions associated with the project have been less than the permitted emissions to the extent that the facility operates at less than capacity and control equipment normally operates to achieve emission rates that are lower than the applicable standards and limitations.

The permit also would continue to establish appropriate compliance procedures for the ongoing operation of the new facility, including requirements for emission testing, required work practices, operational monitoring, recordkeeping, and reporting. These measures were imposed to assure that the operation and emissions of the new facility are accurately tracked to confirm compliance with the various limitations and requirements established for individual emission units.

#### **VIII. REQUEST FOR COMMENTS**

It is the Illinois EPA's preliminary determination that the request for a revised permit meets applicable state and federal air pollution control requirements. The Illinois EPA is therefore proposing to issue a revised permit.

Comments are requested on this proposed action by the Illinois EPA and the conditions of the draft permit.