

**Applicability Determination for Combusting Tire Derived Fuel  
in Humboldt Wedag Kiln (Kiln #2)**

Ash Grove Cement Company  
16215 Highway 50  
Louisville, Cass County, Nebraska

October 15, 2007

**DESCRIPTION OF THE FACILITY OR ACTIVITY:**

Ash Grove Cement Company (Ash Grove), NDEQ ID#4129, operates a portland cement plant (Standard Industrial Classification, SIC, code 3241) and a limestone quarry located in Louisville, Cass County, Nebraska, and an off-site limestone screening plant located in Weeping Water, Cass County, Nebraska. Ash Grove is an existing major stationary source.

The portland cement plant consists of the grinding and drying of raw materials, raw material storage, blending operations, two dry process cement kilns with preheating equipment, clinker coolers, and final product storage and loadout. The plant is capable of producing up to 3,000 tons of clinker per day. Clinker is produced when raw materials, including limestone, sand, clay, iron ore, gypsum, and fly ash, are heated to temperatures of approximately 2,750 degrees Fahrenheit which allows for series of physical and chemical reactions to occur.

On December 11, 2006, the Department received a Construction Permit application for the construction of a Tire-Derived Fuel (TDF) system at the Ash Grove facility. Ash Grove plans to utilize the TDF as a fuel supplement which will be added to the coal that is currently combusted. Ash Grove indicated in a phone conversation on May 10, 2007 that TDF could provide up to 30% of the total million British thermal units (MMBtu) necessary for Kiln #2 to operate. Ash Grove requested that federally enforceable permit limitations be established in a construction permit so that the project would not be subject to review under the Federal Prevention of Significant Deterioration (PSD) program. Ash Grove also requested that the permit be written in a manner that would allow the TDF feed system to be constructed in two phases. A meeting was held at the Department on January 12, 2007 to discuss the application. The Department requested additional information concerning the project, which was received on January 31, 2007.

The Ash Grove Portland cement facility was originally constructed in 1928. Ash Grove was issued a construction permit on December 21, 1983 for the construction of the Humboldt Wedag Kiln and Clinker Cooler and Associated Equipment. On March 30, 2000, a construction permit was issued for an off-site limestone screening operation in Weeping Water, NE. The Department issued a no-permit-required determination on October 13, 2000 for venting four existing baghouses to the atmosphere. The vents previously exhausted into the finish mill building. A construction permit was issued on September 12, 2000 for the construction of a cement storage dome and associated conveying equipment. A construction permit was issued on August 1, 2003 for flyash/cement handling system that included the modification of the finish mill separator to handle the flyash. On August 27, 2004 a construction permit was issued for a new quarrying operation located near Weeping Water. The permit incorporated the conditions contained in the construction permit issued on March 30, 2000.

Since Kiln #2 will be the only unit affected by the fuel change, information about this unit is discussed in the remainder of this document.

Kiln #2 is a preheater/precalciner kiln that will utilize TDF as a fuel supplement, replacing up to 30% of MMBtu needed in the kiln which is currently supplied by coal. Kiln #2 has a maximum heat input capacity of 280.0 million British thermal units per hour (MMBtu/hr) and produces up to 657,000 tons of clinker per year.

The construction of the TDF system on Kiln #2 at Ash Grove will occur in two phases. Phase One will involve the construction of a manual TDF system. A new double-gate airlock system will be installed on Kiln #2 so that whole tires can be introduced into the preheater. This tire feed point is directly onto the feed shelf of the kiln inlet. A temporary construction passenger/freight elevator will also be installed. Phase Two will involve constructing an automatic TDF feed system on the kiln. The temporary construction elevator will be removed and a truck lift will be installed along with a singulator, conveyor belt, elevator, and transfer belt. The truck lift will receive the TDF; the singulator will sort the TDF and ensure the whole tires are placed on the incline belt one at a time. The incline belt will move the TDF to the elevator, which will deliver the individual tires to the chute leading to the double-gate airlock system.

**TYPE AND QUANTITY OF AIR CONTAMINANT EMISSIONS ANTICIPATED:**

Air emissions associated with the TDF project will only occur when the tires are combusted with the coal. It is expected that no air emissions will be emitted as a result of transporting and handling tires. Emissions of sulfur oxides (SO<sub>x</sub>), nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), and numerous hazardous air pollutants (HAPs) were measured during the air emissions test at the Ash Grove facility during a trial burn of TDF, approved by NDEQ, which occurred May 25-26 and July 13-14 of 2005. Particulate matter (PM), PM with an aerodynamic diameter equal to or less than ten (10) microns (PM<sub>10</sub>), and volatile organic compounds (VOC) are not expected to change as a result of the fuel change due to the particulate matter controls currently in place and no increase in VOC content in the fuel.

Ash Grove has indicated that approximately 30% of the MMBtu content of Kiln #2 will be provided by TDF. Kiln #2 is rated at 280.0 MMBtu/hr, therefore 84.0 MMBtu/hr of heat input, which correlates to approximately 3.0 tons/hour of tires, will be utilized. This is the rate at which air emissions testing was conducted. Emissions results of the TDF trial burn were utilized to develop the emission factors that were used in evaluating this permitting request. If Ash Grove was to burn more than 30% of the MMBtu content of the kiln utilizing tires, the emission factors used to make this applicability determination would not be valid. Ash Grove would have to conduct additional emissions testing utilizing the different tire percentage and demonstrate that a permit is not required if additional tires are used. The table below presents the emissions expected when only coal is combusted (“Coal”) in the kiln and then when 3.0 tons/hour of TDF is utilized to supplement the coal (“TDF”). It can be shown that emissions of SO<sub>2</sub>, NO<sub>x</sub>, and CO decreased while TDF was used.

	Coal		TDF	
	lb/hr <sup>[1]</sup>	lb/MMBtu <sup>[2]</sup>	lb/hr <sup>[1]</sup>	lb/MMBtu <sup>[2]</sup>
Sulfur Dioxide (SO <sub>2</sub> )	320.0	1.27	196.0	0.78
Nitrogen Oxides (NO <sub>x</sub> )	376.0	1.49	158.0	0.63
Carbon Monoxide (CO)	437.0	1.73	431.0	1.71

<sup>[1]</sup>lb/hr emission rates from 2005 Emissions Testing

<sup>[2]</sup>lb/MMBtu = lb/hr / MMBtu/hr during testing

**APPLICABLE REQUIREMENTS AND VARIANCES OR ALTERNATIVES TO REQUIRED STANDARDS:**

## **Title 129, Chapter 17 – Construction Permit Requirements**

Ash Grove originally requested a construction permit to limit the emissions from the proposed modification to below significance thresholds in order to avoid the requirements of New Source Review (NSR). However, upon closer examination of this project by the Department, it has been determined that the modification does not require a construction permit since the project is not a major modification.

The trial TDF burn conducted at Ash Grove indicated that cadmium, hexavalent chromium, lead, selenium, dioxins and furans, and polychlorinated biophenyls (PCBs) emissions (all HAPs) increase as a result of TDF combustion. All of the pollutants that increased, increased in amounts that are less than the thresholds contained in Title 129, Chapter 17, Section 001.01, therefore a State construction permit is not necessary, even if a TDF/coal mixture is burned during the entire year.

Chapter 17, Section 001.03 of Title 129 requires that all incinerators obtain a construction permit from the Department. Title 129 defines an incinerator as “any furnace used in the process of burning solid waste, except for a furnace owned and operated by law enforcement agencies solely to dispose of ammunition, fireworks or similar flammable or explosive materials.”

In implementing the above provision, the Department has held that the purpose of the furnace must be the burning of solid waste. In this case, the purpose of the furnace is to produce clinker in the cement manufacturing process. Because of this, the TDF is considered a supplemental fuel. This is consistent with other determinations made by the Department. For example, the Department has allowed wood waste from milling processes to be burned in boilers, and other burning chambers, as supplemental fuel and not classified them as incinerators. On the other hand, the Department has classified a “teepee” burner (a conical burning chamber with the sole purpose of burning wood waste) as an incinerator. Based on the above, the Department has determined that the act of burning TDF does not result in the kiln becoming an incinerator. In addition to being consistent with other determinations made by the Department, this is consistent with how other states in Region VII have permitted the use of TDF in kilns; that is they consider TDF a supplemental fuel. Therefore, a permit is also not required under Section 001.03 of Chapter 17.

Chapter 17, Section 014 of Title 129 outlines when the Department can issue a construction permit when the criteria contained in Section 001 are not triggered. The following is a list of the criteria and a discussion of their applicability to Ash Grove’s request:

### 014.01 Establishing enforceable limits to avoid otherwise applicable requirements under the provisions of Title 129.

As pointed out previously, the proposal to burn TDF does not trigger any applicable requirements in Title 129. Therefore, this provision does not apply to their proposal.

### 014.02 Modifying existing construction permits to incorporate modifications that cannot be processed under the provisions of Chapter 15, Section 003.

The purpose of this provision is to allow the Department to process permit modification requests where a permit includes conditions or limitations that would prohibit a proposed activity. As pointed out previously, the existing construction permit for this kiln does not specify the type of fuels to be burned. Because of this, there is no need to modify their permit for the purpose of burning TDF, i.e., the use of an alternate fuel is not prohibited by their existing permit. Therefore, this provision does not apply to their proposal.

014.03 Establishing a PAL pursuant to the provisions of Chapter 19 of Title 129. The construction permit used to establish a PAL must include the information and conditions listed in Chapter 19, Section 011.06.

This provision does not apply since the source was not requesting Plantwide Applicability Limits.

The facility-wide potential emissions once TDF combustion commences in accordance with the assumptions provided to the Department by the source fall into the following category:

- 100 tons or more per year of any air pollutant; or
- 10 tons or more per year of any single HAP; or
- 25 tons or more per year of any combination of HAPs

Therefore, the facility submitted a \$3,000.00 fee when they submitted their construction permit application, in accordance with Title 129, Chapter 17, Section 003.01.

### **Title 129, Chapter 19 – Prevention of Significant Deterioration (PSD)**

The modification to install doors on Kiln #2 (phase one) and the automated TDF feed system (phase two) does not constitute a major modification under Title 129, Chapter 19 effective December 13, 2006, therefore a construction permit, in accordance with Chapter 19 is not needed.

Title 129, Chapter 19, Section 003 states “prior to beginning actual construction of a new major stationary source or a major modification of an existing major stationary source, the owner or operator must obtain a permit, issued by the Department, stating that the source will comply with the requirements [of Chapter 19]”

Title 129, Chapter 1, Section 085 defines a “modification” as any physical change in, or change in method of operation of, an affected facility which increase the amount of any air pollutant, except that: routine maintenance, repair, and replacement (except as defined as reconstruction) shall not be considered physical changes; and an increase in the production rate or hours of operating shall not be considered a change in the method of operation, unless such change would violate a permit condition.

The installation of doors and the automated TDF feed system is a physical change and the trial TDF burn indicated that cadmium, hexavalent chromium, lead, selenium, dioxins and furans, and polychlorinated biphenyl (PCBs) increased when tires were combusted; therefore the project is a modification.

Title 129, Chapter 1, Section 076 defines a “major modification” as any physical change in or change in the method of operation of a major stationary source that would result in a significant emissions increase of a regulated NSR pollutant and a significant net emissions increase of that pollutant from the major stationary source.

Lead is the only regulated NSR pollutant that will increase as a result of the change being made to the kiln. The other pollutants that will increase are HAPs, which are regulated under section 112 of the Clean Air Act, or are not regulated by an NSPS and therefore are not regulated NSR pollutants (Title 129, Chapter 1, Section 127.04). Lead is expected to increase 0.000263 tons/year as a result of TDF combustion, calculated using information in the “Tire-Derived Fuel Test Program Summary Report – Revision 1” that was submitted to the Department.

Baseline Emissions (coal combustion) Average: 0.00024 lb/hr of lead

TDF Emissions Average: 0.00030 lb/hr of lead

$0.00030 - 0.00024 = 0.00006 \text{ lb/hr} \times 8,760 \text{ hr/yr} / 2,000 \text{ lb/ton} = 0.00026 \text{ tons/yr}$

The significance threshold for lead is 0.6 tons/year (Title 129, Chapter 19, Section 010.07), therefore the increase in lead does not cause the project to be a major modification.

Barium emissions are expected to increase slightly, however barium is not a HAP, nor is it regulated by a New Source Performance Standard (NSPS). If barium is considered to be a municipal waste combustor (MWC) metal, MWC metals are measured as particulate matter, as stated in the definition. Any increase in particulate emissions (i.e. barium and/or MWC metals) is expected to be controlled by the existing PM control devices. The Humbolt kiln is subject to an emissions limitation of 0.30 lb/ton of material fed into the kiln. This emissions limitation is located in Ash Groves existing Class I Operating Permit (page 30) and must be complied with whether coal or a coal/TDF mixture is being combusted.

Since no regulated NSR pollutant will increase above the significance threshold as a result of the modification, the installation of doors on Kiln #2 (phase one) and the construction of the automated TDF feed system (phase two) is not a major modification and therefore the owner or operator does not need to acquire a construction permit to initiate the physical change to Kiln #2.

### **SIP Approved Rules**

Currently there is a gap between what currently exists in Title 129 and the rules that have been approved under the State Implementation Plan (SIP). This gap sometimes occurs when significant changes to rules occur and time is needed to secure both state and federal approvals. To ensure that the TDF project was thoroughly evaluated, the Department elected to evaluate the TDF project under the rules currently approved under Title 129 and the regulations approved under the SIP. The Department has determined that the modification does not constitute a major modification under 40 CFR 52.21 effective July 1, 1997, which are the rules currently approved under the SIP. The following paragraphs discuss this determination in more detail.

40 CFR 52.12(b)(2)(i) effective July 1, 1997 defines a “major modification” as any physical change in or change in the method of operation of a major stationary source that would result in a significant net emissions increase of any pollutant subject to regulation under the act.

The following is from the Federal Register, Vol. 61, No. 142, Tuesday, July 23, 1996, 40 CFR Parts 51 and 52, Prevention of Significant Deterioration and Nonattainment New Source Review; Proposed Rule, beginning on Page 38309, third column. This information provides the justification that HAPs have not been regulated under NSR since the Clean Air Act was amended November 15, 1990.

*Under the 1977 Act Amendments and regulations issued there under, the PSD requirements of the Act apply to all “major” new sources and “major modifications,” i.e., those sources exceeding certain annual tonnage thresholds. See, e.g., existing §§ 51.166(b)(2)(i) and (b)(23)(i). Typically, new sources and modifications become subject to PSD because their potential emissions exceed the specified tonnage threshold for a criteria pollutant (i.e., a pollutant for which a NAAQS has been established under section 109 of the Act). For a major new source, the PSD requirements apply to every pollutant subject to regulation under the Act that is emitted in “significant” quantities or, in the case of a modification to an existing major source, for which there is a significant net emissions increase. See, e.g., existing § 52.21(b)(23)(i). Under the 1977 Act Amendments, BACT and other PSD requirements applied*

*not only to emissions of criteria pollutants but also to emissions of pollutants regulated under other provisions of the Act, such as section 111 or section 112. This regulatory structure was altered by the 1990 Amendments. Section 112(b)(6) of Act generally excludes the HAP listed in section 112 (as well as any pollutants that may be added to the list) from the PSD provisions of part C. Some of the chemical compounds listed in (b)(1) are arsenic compounds, beryllium compounds, lead (Pb) compounds, and mercury compounds. These compounds are defined as including any unique chemical substance that contains the named chemical (i.e., arsenic, beryllium, etc.) as part of the chemical's infrastructure. These named chemicals are not independently listed on the section 112(b)(1) list; however, with the exception of Pb, the EPA is proposing that the named chemicals (i.e., arsenic, beryllium, etc.) that are components of the compounds listed under section 112(b)(1) are, like their compounds, exempt from the Federal PSD requirements. Regarding Pb, section 112(b)(7) states that elemental Pb (the named chemical) may not be listed by the Administrator as a HAP under section 112(b)(1); therefore, elemental Pb emissions are not exempt from the Federal PSD requirements because section 112(b)(6) exempts only the pollutants listed in section 112. Elemental Pb continues to be a criteria pollutant subject to the Pb NAAQS and other requirements of the Act.*

*In summary, the following pollutants currently regulated under the Act as of January 1, 1996, are still subject to Federal PSD review and permitting requirements: CO, NO<sub>x</sub>, SO<sub>2</sub>, PM, PM<sub>10</sub>, Ozone (VOC), Pb (elemental), Fluorides (excluding hydrogen fluoride), Sulfuric acid mist, Hydrogen Sulfide, Reduced sulfur compounds (including hydrogen sulfide), CFC's 11, 12, 112, 114, and 115, Halons 1211, 1301, 2402, Municipal waste combustor (MWC) acid gases, MWC metals, MWC organics, ODS regulated under title VI. The PSD program will also automatically apply to newly regulated pollutants, for example, upon final promulgation of an NSPS applicable to a previously unregulated pollutant.*

The significance thresholds for the pollutants listed in the previous paragraph are the same as those in the current version of Title 129. As discussed above, the only pollutant listed that is projected to have an increase in emissions as a result of TDF combustion project is lead. It has already been shown that the increase in lead emissions as a result of this project is less than the significance threshold of 0.6 tons/year.

Since the modification necessary to allow the Humboldt Wedag Kiln (Kiln #2) to combust TDF is not a major modification according to the rule approved under Nebraska's State Implementation Plan, a permit would not need to be obtained if the old regulations were still effective in Nebraska's Air Quality Regulations (Title 129).

### **Title 129, Chapter 33 – Compliance; Time Schedule For**

On July 28, 2004, the Department issued a variance to Ash Grove allowing them to conduct a trial burn using Tire Derived Fuel. Prior to issuing the variance, the Air program reviewed Ash Grove's request by evaluating the regulations that the request pertained to. Based on this review, the Air program determined that a variance was necessary in order to carry out the requested activities. The following is a summary of our findings.

The Department found that burning tires would be considered a modification under Chapters 1, 17, and 19 of Title 129 and would require a permit. This is based on the following:

- Adding tires as a fuel meets modification definition
- Burning tires also requires a physical change and a change in method of operation
- Although EPA data indicates a potential for overall emissions reductions with the burning of TDF, it was unknown whether pollutants could increase and whether that increase would be

significant. Based on the potential for increased emissions of specific pollutants, DEQ air quality staff has determined that a permit would be necessary under Chapter 17 in order for Ash Grove to conduct a trial burn to determine actual emissions when burning TDF.

Based on the above, the Department determined a variance was necessary to conduct the activities proposed in Ash Grove's request absent a permit modification.

As stated above, the Department concluded that there was a potential for increased emissions of specific pollutants. It is known that NO<sub>x</sub> emissions decrease when TDF is utilized as a fuel in a cement kiln. The Department also recognized the inverse relationship between NO<sub>x</sub> and CO, in that as NO<sub>x</sub> emissions decrease, CO emissions generally increase. Because an increase in CO emissions was expected, there was a potential for the increase to be greater than the thresholds, which trigger a permit.

The test data from the trial burn demonstrated that, in addition to a reduction in NO<sub>x</sub> emissions, CO emissions were also reduced. The only regulated pollutants that increased while combusting TDF were HAPs and lead; however the increases were not in amounts that would cause any new requirements to be triggered. Since no PSD regulated pollutants emission's increased in amounts greater than the significance thresholds, the modification is not considered a major modification which would have required a construction permit. Therefore the variance issued with regard to burning TDF was warranted, based on the information available at the time, however was not necessary based on the information obtained through the emissions testing.

**STATUTORY OR REGULATORY PROVISIONS ON WHICH PERMIT REQUIREMENTS ARE BASED:**

Applicable regulations: Title 129 - Nebraska Air Quality Regulations as amended December 13, 2006.