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October 19, 2015

Via Hand-Delivery

Maricopa County
Air Quality Department
1001 N. Central Ave., Suite 125
Phoenix, Arizona 85004

Re: ***Hickman (Arlington) Hearing***
October 21, 2015 at 6:00 p.m.
Arlington Elementary School Gymnasium

Dear Sirs:

This letter is written to protest the approval of Permit No. 040136 Rev. 2.0.2.0 of Hickman's Egg Ranch on behalf of Don't Waste Arizona ("DWAZ"); Socially Responsible Agricultural Project ("SRAProject"); and Save Tonopah Oppose Poultry Plant ("STOPP").

The Application of Hickman's Egg Ranch in Arlington seeks to add a Rotary Dryer with Baghouse for manure drying operations; the installation of a 15,000-gallon propane tank; and removal of the animal feeding production operations requirements from its Air Quality permit.

This Application is deficient as delineated in the attached Written Comments by Daniel E. Blackson. (See Attachment A) The Written Comments of Kathy J. Martin, a Professional Engineer, also specifically speaks to each of the statements set forth in the Permit Application to show the deficiencies in the Application. (See Attachment B)

Additionally, the Arizona Department of Environmental Quality ("ADEQ") has assumed jurisdiction of the adequacy of the rotary dryer. (See Attachment C) In fact, the rotary dryer has been in operation without a permit for some time and is only now seeking to be permitted because of numerous citizens' complaints.

However, the fact that a DRAFT Approved Permit has been created prior to any public comment or hearing, seems to indicate that the "fix" is in, as predicted.

As to the "Best Management Practices" cited by ADEQ, two well-known experts in this area, David B. Bilby, an Agribusiness Analyst with CF Industries, and Professor Paul N. Wilson with the University of Arizona's Department of Agricultural and Resource Economics, concluded that the best management practices only "satisfy the objectives of agricultural interests, meet the rule making expediency of the regulators, [but] likely failed to significantly mitigate dust pollution" thus "minimizing the operational practices." (See Attachment D)

The Arlington plant is already within a federally designated "8-hour Non-Attainment Area for Ozone" which puts it in direct conflict with existing EPA air pollution control regulations.

For all of the above reasons, the present permit should be denied, or at least subject to further investigation. There is sufficient reason to believe that the modifications requested are in violation of the requirements for an acceptable application under A.R.S. § 49-426(C) and the proposed permit conditions are not sufficient under A.R.S. § 49-480(F) and A.R.S. § 480.03 and 480.04, because of the increased air pollution.

The Arlington Plant is not a farming operation but a massive, corporate, industrial business which produces enormous amounts of poultry waste causing obnoxious odors, dust and dander which pollute the air of neighboring properties and their residents, twenty-four (24) hours per day, every day.

The Arlington egg production plant of Hickman seems to continue to act as its own regulator ignoring the persons affected and only acting when required to, through governmental action. The people of Maricopa County rely on its government to enforce the rules for the best interest of its residents who elect them to do so. The Maricopa County Air Quality Department is run by the county for its residents and must take an aggressive stand against any attempt by any group, no matter how influential, to destroy the environment for mere monetary gain.

The groups identified herein are only some of those who will address those assembled at the hearing.

Cordially,

G. Gregory Hagleburger
For the Firm

GGE/jmr
Enclosures

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ATTACHMENT A

Written Comments on the Proposed Air Permit Modification #040136
Regarding Hickman's Egg Ranch, Arlington, Arizona

Submitted by Daniel E. Blackson, 42211 W. Salome Hwy, Tonopah, AZ 85354

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Air Quality Permit to Operate and/or Construct Permit #040136 Application ID #408551 Comments

1. Page 2, Section 1

   There is reference to "Also, please see attachments". There are not any attachments that refer to Section 1. Either there is an error or the application is incomplete.

2. Page 2, Section 2

   The "Assigned Equipment Number" is blank making the application incomplete. It is important at equipment numbers be assigned so the permittee can be properly inspected.

3. Page 2, Section 2

   Elsewhere in the application the propane tank is identified as 63,600 gallons and 15,000 lbs. To represent it as 15,000 gallons in this section is very misleading. Because of this and other errors the application must be denied.

4. Page 2, Section 2

   A rating of "15MMBTU" seems to be an error. Propane may be rated in BTU, but not a tank. This should be corrected before the application is approved.

5. Page 2, Section 2

   Clarify if the propane tank has an exhaust vent to a baghouse as indicated in this section. Literature supports that the rotary dryer vents to the baghouse. The application must be denied until this is clarified.

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6. Page,2, Section 2

   The rotary dryer and baghouse are not listed on the "list of equipment and emission control devices, which will be installed or modified", making the application incomplete. The application must be denied until it is complete.

   Note that the air pollutant emissions are included in Section Z-M and the Equipment List, so the rotary dryer and baghouse must be additions to the permit and the reason for the modification.

7. Page 2, Section 3

   The application is incomplete because the "Equipment Number in Which Used" for the Propane HD-5 is blank.

8. Page 2, Section 3

   The application is incomplete because the MSDS for propane HD-5 is not attached. The application must be denied until it is provided. Without the proper MSDS provided, on-line MSDS shows that the chemical composition is 90-95%, not 96.7%.

9. Page 2, Section 3

   The application is incomplete because the baghouse "Name/ID" is not identified and the flow rate through the baghouse is not identified ("Gas Flow Rate SCFW")

10. Page 3, Section Z-M, Pollutant Table

    Columns (i) & (iii) record "negligible" for Oxides of Sulfur, Particulates of 10 Microns, and Total Suspended Particulates, which are an opinions, rather than quantifiable values that are on the Emissions Calculations attachment.

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11. Page 3, Section Z-M Table

No documentation or calculations were provided to account for the baghouse efficiency, so with this incomplete application, no credit should be awarded to reduction for Particulates of 10 Microns or Smaller and Total Suspended Particulates and the value of "0.12 tpy" should be entered for both pollutants.

The application does not provide a process drawing to understand the location of the baghouse. It probably is on the output of the rotary dryer and not on the propane burner discharge (Vulcan Systems paperwork identifies it as a "15 MMBtu/hr Fired Boiler- which implies indirect heating). This makes a difference when calculating emissions.

12. Page 3, Section Z-M, Pollutant Table

Column (ii) is blatantly left blank rather than providing the regulated pollutant emissions from the regulated equipment on the Permit's Equipment List. Which also falsifies the entire site's emissions in Column (iii). The permit application must be denied until accurate pollutant emissions information is provided.

13. Attachment: Emissions Calculations, Item 4

The PTE has an error. (24/7/265) does not equal 8,760 hours. If the intent is to estimate the maximum hours it would be (24/7/365) or 61,320 hours. Note that the operational days for "5 days week" is 260 days.

14. Attachment: Emissions Calculations, Item 5, bullet

The applicant claims that "Emissions are negligible after calculating baghouse efficiency and are reported as such on Section Z-M of the Minor Permit Modification Form." However, there is no calculation to support this opinion. The permit application in SECTION Z-M states: "**If supporting calculations are not included with the application, the application will be deemed incomplete.**" By Maricopa County Air Quality Department's own requirements, this application must be deemed incomplete.

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15. Attachment: Emissions Calculations, Item 9

Item 9 is a statement of the applicant's opinion and should be removed from the permit application. Arizona Department of Environmental Quality (ADEQ) does not regulate the rotary dryer. Maricopa County Air Quality Department regulates the rotary dryer as evidenced by MCSIP, Maricopa County Air Quality Department rules, inclusion in this permit with permit conditions, and included on the associated Equipment List. There is no exemption or shield for rotary dryers in the revised Arizona Administrative Code agricultural best management practices and associated regulations.

Maricopa County Air Quality Department Rule 323 exempts kilns per § 103.2 and although the rotary kiln may be considered an indirect-fired process heater with a heat input greater than 10 MMBtu/hr in § 102.4, it is excluded by definition in § 214: "… A process heater is not an oven or kiln used for drying, curing, baking, cooking, calcining, or vitrifying."

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16. SPECIFIC CONDITIONS 4. Compliance Demonstration

The Compliance Demonstration is too limiting to effectively demonstrate compliance with the odor control standards. The permit needs to be modified to include comprehensive demonstration of odor control to protect the environment and public health. Currently the permittee frequently violates this permit condition and Maricopa County State Implementation Plan Regulation 1 – General Provisions, Rule 3 Air Pollution Prohibited and Regulation 3 – Control of Air Contaminants Rule 32 Odors and Gaseous Emissions.

Maricopa County Air Quality Department is required to enforce it's federally mandated State Implementation Plan. The Department can only do this by establishing a comprehensive Compliance Demonstration requirements for "air pollutants, smells, aromas or stenches commonly recognized as offensive, obnoxious, or objectionable" in this permit so they can be enforced.

17. SPECIFIC CONDITIONS 4. Compliance Demonstration

Sampling for hydrogen sulfide within any 12-month period after the receipt of three odor complaints is inadequate and does not protect the environment or public health. First, the permittee can continue to violate the odor control standards at will. Second, the permittee can choose to conduct the testing within 90 days during favorable conditions and falsely demonstrate compliance. Third, it does not compel the permittee to take immediate corrective action to cease generation of the stench. Fourth, the compliance demonstration allows the permittee to continue to pollute and in a way encourages it. This Compliance Demonstration violates Maricopa County State Implementation Plan Regulation 8 – Validity and Operation, Rule 81 Operation because this Compliance Demonstration creates and maintains a nuisance. Additionally, this Compliance Demonstration violates Maricopa County State Implementation Plan Regulation 7 – Ambient Air Quality Standards, Rule 71 by allowing degradation of air quality that is preventable.

18. SPECIFIC CONDITIONS 5. Compliance Plan

There is a Compliance Plan for the hydrogen sulfide limitation, but not for "air pollutants, smells, aromas or stenches commonly recognized as offensive, obnoxious, or objectionable". Consequently, the permit is insufficient and must be modified to include a Compliance Plan for the event of "air pollutants, smells, aromas or stenches commonly recognized as offensive, obnoxious, or objectionable" exceedances.

19. FUEL BURNING EQUIPMENT

The baghouse has the potential to exceed the opacity limit, so the compliance requirements in Maricopa County State Implementation Plan Regulation 1 – General Provisions, Rule 3 Air Pollution Prohibited and Regulation 3 – Control of Air Contaminants, Rule 300 - Visible and Maricopa County Rule 300 – Visible Emissions should be added to the permit section for Fuel Burning Equipment. The baghouse is connected to an industrial process. There is no exemption or shield for rotary dryers and baghouse in the revised Arizona Administrative Code agricultural best management practices and associated regulations.

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Air Quality Permit to Operate and/or Construct Permit #040136

Equipment List Comments

20. Through public records requests, Maricopa County Air Quality Department has provided Equipment List (Date 12/23/2014 Revision 2.0.1.3) for current Air Quality Permit to Operate and/or Construct Permit #040136 and the Equipment List for the requested modification. The equipment on the two lists are inconsistent with the permit modification permit. The application must be denied until the Equipment Lists can be reconciled so the public can understand the entire scope of the modification and operation of the air pollution source.

21. "DRYER – PROPANE ROTARY DRYER WITH BAGHOUSE; INSTALLED 07/15" is clearly an error and misleads the public. Maricopa County Air Quality Department has multiple documents demonstrating that the rotary dryer was in operation prior to and since February 25, 2015.

    The original date of the rotary dryer installation must appear on the Equipment List and Maricopa County Air Quality Department should issue a Notice of Violation.

22. Emergency Generator G-3 has been removed from the Equipment List and it is not recorded on the minor permit modification application or reflected in Section Z-M Air Pollution Emissions.

23. Emergency Generator FM-1 has been added to the Equipment List and it is not recorded on the minor permit modification application or reflected in Section Z-M Air Pollution Emissions.

24. Emergency Generator G-39 has been added to the Equipment List and it is not recorded on the minor permit modification application or reflected in Section Z-M Air Pollution Emissions.

25. TANK ABOVEGROUND STORAGE – PROPANE has been added and the Rated Capacity appears to be incorrect. The applicant has provided conflicting information and 63,600 gallons is probably the correct value.

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ATTACHMENT B

Written Comments on Proposed Air Permit Modification

Hickman's Egg Ranch, Arlington Facility Air Permit No. 040136
32425 W. Salome Highway, Arlington, Maricopa County, Arizona

The following written comments were prepared by Kathy J. Martin, PE (OK#18254) at the request of local citizens and submitted to the Maricopa County Air Quality Department in response to public notice for public comment on the proposed permit modification.

1. Propane-fueled rotary dryer specifications.

The one page information sheet from Vulcan Systems attached to the permit application does not specify a particular model of rotary dryer. According to their website, Vulcan Systems manufacturers several models of rotary dryers that differ in diameter, length, and throughput (tons per hour).[1] The equipment list in the proposed permit claims the rotary dryer and baghouse were installed July 2015, thus the exact model is known. It is important to identify the exact piece(s) of equipment that are going to be regulated under this permit modification so that the public and the agency understand the intended use, maximum throughput, and justification for the emission factors used.

2. Rotary dryers produce steam and dust during operation.

The application for permit modification date stamped received July 20, 2015 does not acknowledge the steam and dust generated during the drying of poultry manure in the rotary dryer. Online videos of similar types of rotary dryers show both steam exhaust (from the removal of moisture in the poultry manure) and dust exhaust from the on-loading of poultry manure into the equipment and off-loading of dried manure after treatment.[2][3]

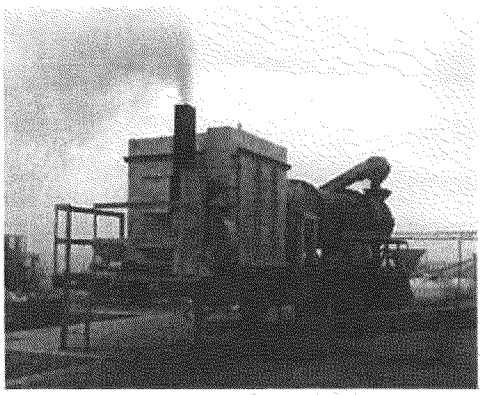

Figure 1 – Image from Vulcan website poultry manure system using rotary dryer. http://getavulcan.com/chicken-manure-dryer/

[1] See website: http://getavulcan.com/equipment/drying-systems/components/rotary-dryers/
[2] *See* video at: https://www.youtube.com/watch?v=sKSfYwgMx_Q
[3] *See* advertisement: http://getavulcan.com/chicken-manure-dryer/

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3. Baghouse efficiency and manufacturer's specifications.

The permit application does not state how much poultry manure will be processed using the rotary dryer nor does it make any attempt to identify and quantify the air pollution generated from the process. On page 2 of 4 of the permit application, the applicant claims a control efficiency of 99.5% for the baghouse but does not provide information such as manufacturer's model and specifications. No mention is made on acceptable pressure drop across the baghouse filter materials. The permit application does not describe the quantity of emissions expected to be controlled by the baghouse.

4. Limit of propane burned per 12 consecutive month period.

Condition 21 states:

> "The Permittee shall burn no more than 341,120 gallons of propane in the rotary dryer per twelve consecutive month period."

The Technical Support Document states on page 3 of 7:

> "Conditions 21-22 regulate the manure dryer and were included to keep the facility from exceeding any applicable threshold, such as BACT."

In the Emissions Calculations table provided on page 5 of the permit application, the propane tank is described as capable of holding 15,000 lbs or 63,600 gallons of propane. The information in the table states that the 15 MMBtu/hr dryer can operate for 388 hours per tank of propane.

Using the permit limit of 341,120 gallons, the capacity of the propane tank, and the hours of use per tank, the following can be calculated:

> (341,120 gallons/12 cons mo)/63,600 gal/tank = 5.4 tanks of propane/12 cons mo
> 5.4 tanks/12 cons mo x 388 hours of operation/tank = 2,081 hrs of op/12 cons mo

The permit application claims a limit of 2,080 hours of operation assuming a 5 day work week, 8 hours per day, and 52 weeks per year. The potential to emit assuming 24 hrs per day and 7 days per week would be based on 8,760 hours per 12 cons mo or four times the permitted operating time (8,760/2,080 = 4.2).

What is not explained is whether 2,081 hours of operation is sufficient to dry the poultry manure generated at both the Arlington and Tonopah egg laying facilities. The permit application fails to explain how this limited time is sufficient to process the combined poultry manure. The missing information includes the throughput (tons per hour) of the rotary dryer and the total tons of poultry manure intended to be processed through the dryer in any twelve consecutive month period (12 cons mo).

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For example, if the rotary dryer throughput was 20 tons per hour and is limited to 2,081 hours then the facility could only process 41,620 tons per 12 cons mo.[4]

Table 6 of Midwest Plan Services MWPS-18 Waste Characteristics includes a design factor of 0.15 lbs manure per bird per day for layers. The Arlington facility has 8 million layers and 4 million pullets. The Tonopah facility has 4.3 million layers and a maximum capacity planned at 10-12 million layers.[5] The tons of manure produced by 16.3 million layers can be calculated as follows:

> 16.3 million layers x 0.15 lbs/hd/day x 365 days/yr = 892,425,000 lbs
> or 446,212 tons of manure
>
> 219,000 tons/41,620 tons = 10.7 times more manure generated than can be treated with one rotary dryer.

Using the limiting factors of the proposed permit, the single rotary dryer can only treat nine percent (9%) of the poultry manure generated by 16.3 million layers in any twelve consecutive month period.

5. Relying upon Agricultural Best Management Practices.

On page 2 of 7 of the Technical Support Document, Item C includes this statement:

> "Rotary Dryer Baghouse (1) Controls particulate emissions from the rotary dryer. It is regulated under agricultural BMPs rather than the Control Officer."

There are no AgBMPs that specifically address the use of baghouses, rotary dryers, or any type of poultry manure drying for that matter. In fact, the AgBMPs suggest increasing the moisture of stored manure as a control for particulate emissions. The July 24, 2015 Notice of Final Exempt Rulemaking related to AgBMPs does not list rotary dryers, baghouses, or manure drying systems under R18-2-611.01(D) for commercial poultry facilities as follows:[6]

> (D)(2) Animal waste (and Feed) Handling and Transporting:
> (a) Remove spilled feed,
> (b) Store feed,
> (c) Add oil and/or moisture to the feed,
> (d) Use enclosed feed distribution system,
> (e) Use flexible discharge spout,

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[4] *See*: http://www.wwrequip.com/equipment/erkd020pics.htm

[5] *See*: http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/technical/nra/rca/?cid=nrcs143_014154 "Chickens three months and older" were assumed to be layers knowing the group could be either layers or breeders. There does appear to be some difference between layer and breeder manure, possibly due to the roosters housed with the breeder hens. The difference did not appear to be significant enough to divide "chickens three months and older" into two categories. "Broiler and other meat type chickens" were assumed to be broilers.

[6] *See* http://apps.azsos.gov/public_services/register/2015/30/13_final_exempt.pdf

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(f) Minimize drop distance,
(g) Enclose transfer points,
(h) Clean floors and walls in a commercial poultry facility,
(i) Clean aisles between cage rows,
(j) Stack separated manure solids, or
(k) Maintain moisture in manure solids.

On page 2 of 7 of the Technical Support Document, Item C also includes:

> "Corn Grinder (1) The grinder is self-contained to reduce particulate emissions. It is regulated by ADEQ under agricultural BMPs rather than the Control Officer."
> "Feed Mixer (1) The feed mixer is self-contained to reduce particulate emissions. It is regulated by ADEQ under agricultural BMPs rather than the Control Officer."

As shown in the list of (D)(2) AgBMPs, it is clear that the BMPs were not written envisioning the application to a large-scale feed manufacturing facility but rather focuses on the distribution of the feed within the animal feeding operation itself.

The reliance upon AgBMPs to limit particulate emissions from the rotary dryer and the feed mill processes appears to be a poorly considered hand-off of responsibility. In this case, the Control Officer has abdicated responsibility for emission controls to a system (AgBMPs) that has no readily identifiable method of identifying, quantifying, or controlling those emissions, including particulates and volatile organic compounds.

6. Emission factors used in calculating emissions for new backup generators.

The manufacturer's specification for QSL9-67 NR3 is available online, including exhaust emission information. The Compliance Statement says the horsepower rating for the Cummins QSL9-G7 NR3 is 464 hp, which is less than the 600 hp trigger to use Table 3.4-1 emission factors.[7] In the table on page 5 of 7 of the Technical Support Document, the horsepower ratings for the 19 new diesel engines shows that only one of the engines is rated higher than 600 hp (G-1 at 755 hp and designated Tier 2).

7. Emission factors used in calculating emissions for "old" backup generators.

The emissions estimates for the old backup generators (G-2, G-4, G-5, G-6, G-7, and G-9) were made using AP-42 Table 3.3-1 for CO, NOx, PM10, PM, and VOC. The emission factor for SOx was based on Table 3.4-1.

The EPA emission factor for SOx in AP-42 Table 3.3-1 is 2.05×10^{-3} or 0.00205 lbs/hp-hr, but the draft permit worksheet shows 0.0001 lbs/hp-hr for both the new diesel and old diesel engines. That value comes from Table 3.4-1 which is the emission factor for

[7] *See* 2015 EPA Tier 3 Exhaust Emission Compliance Statement https://powersuite.cummins.com/PS5/PS5Content/SiteContent/en/Binary_Asset/pdf/Commercial/Datasheets/Emissions/epa-1101.pdf

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SOx for diesel engines with greater than 600 hp. All of the old backup generators are rated for 380 hp, which is far below the trigger to use Table 3.4-1.

The Technical Support Document does not explain the use of the equation from Table 3.4-1 to determine SOx based on percent sulfur in the diesel fuel. Nor does it explain why the emissions estimate for the existing backup generators was made using AP-42 Tables rather than actual emissions measured during usage.[8]

Table 3.3-1. EMISSION FACTORS FOR UNCONTROLLED GASOLINE AND DIESEL INDUSTRIAL ENGINES[a]

Pollutant	Gasoline Fuel (SCC 2-02-003-01, 2-03-003-01)		Diesel Fuel (SCC 2-02-001-02, 2-03-001-01)		EMISSION FACTOR RATING
	Emission Factor (lb/hp-hr) (power output)	Emission Factor (lb/MMBtu) (fuel input)	Emission Factor (lb/hp-hr) (power output)	Emission Factor (lb/MMBtu) (fuel input)	
NO_x	0.011	1.63	0.031	4.41	D
CO	6.96 E-03[d]	0.99[d]	6.68 E-03	0.95	D
SO_x	5.91 E-04	0.084	2.05 E-03	0.29	D
PM-10[b]	7.21 E-04	0.10	2.20 E-03	0.31	D
CO_2[c]	1.08	154	1.15	164	B
Aldehydes	4.85 E-04	0.07	4.63 E-04	0.07	D
TOC	0.015	2.10	2.47 E-03	0.35	
Exhaust	6.61 E-04	0.09	0.00	0.00	D
Evaporative	4.85 E-03	0.69	4.41 E-05	0.01	E
Crankcase	1.08 E-03	0.15	0.00	0.00	E
Refueling					E

[a] References 2,5-6,9-14. When necessary, an average brake-specific fuel consumption (BSFC) of 7,000 Btu/hp-hr was used to convert from lb/MMBtu to lb/hp-hr. To convert from lb/hp-hr to kg/kw-hr, multiply by 0.608. To convert from lb/MMBtu to ng/J, multiply by 430. SCC = Source Classification Code. TOC = total organic compounds.

[b] PM-10 = particulate matter ≤10 m aerodynamic diameter. All particulate is assumed to be ≤ 1 m in size.

[c] Assumes 99% conversion of carbon in fuel to CO with 87 weight % carbon in diesel, 86 weight % carbon in gasoline, average BSFC of 7,000 Btu/hp-hr, diesel heating value of 19,300 Btu/lb, and gasoline heating value of 20,300 Btu/lb.

[d] Instead of 0.439 lb/hp-hr (power output) and 62.7 lb/mmBtu (fuel input), the correct emissions factors values are 6.96 E-03 lb/hp-hr (power output) and 0.99 lb/mmBtu (fuel input), respectively. This is an editorial correction. March 24, 2009

[8] *See* AP-42 Chapter 3 at: http://www3.epa.gov/ttn/chief/ap42/ch03/index.html

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8. BACT for NOx emission reduction.

On page 3 of 7 of the proposed permit, the NOx emissions for the backup generators and the rotary dryer are shown to add up to 24.5 tons per year, just shy of the BACT trigger of 25 tons per year. The Technical Support Document states:

> "Except as noted, CO, NOx and PM10 emission factors are set at the appropriate emission standards for non-road diesel engines specified in 40 CFR 89.112."

40 CFR 89.112 includes the following requirements:

> "(a) Exhaust emission from nonroad engines to which this subpart is applicable shall not exceed the applicable exhaust emission standards contained in Table 1, as follows: [Table 1- Emission Standards (g/kW-hr)].
> (b) Exhaust emissions of oxides of nitrogen, carbon monoxide, hydrocarbon, and nonmethane hydrocarbon are measured using the procedures set forth in subpart E of this part.
> (c) Exhaust emissions of particulate matter is measured using the California Regulations for New 1996 and Later Heavy-Duty Off-Road Diesel Cycle Engines. This procedure is incorporated by reference. See §89.6."

At no point does 40 CFR 89.112 allow or otherwise condone the substitution of the emission *standard* as a replacement for determining the *actual emissions* from the diesel engine. The Technical Support Document assumes the diesel engines will not exceed the emission standard by merely saying so – rather than requiring monitoring and recordkeeping of the *actual emissions* to assure compliance with the *standard*.

This becomes most worrisome when considering MCAQD determined NOx emissions to be just slightly less than the amount that would trigger BACT (using an assumed emission value of 4 g/kw-hr) when the Cummins exhaust emission data sheet for QSL9-G7 NR3 diesel engine has NOx emission of up to 5.25 g/hp-hr (7.0 g/kw-hr) when the engine is on full stand-by.[9]

> Where: 5.25 g/hp-hr x 1.341 hp/kw = 7.0 g/kw-hr

9. Section Z-M existing air pollution emissions disclosure.

This permit application serves two purposes: to increase the number of backup generators and to identify the new use of a rotary dryer in the manure handling process. On page 3 of 4 of the permit application, the applicant did not provide information regarding the existing emissions as described on the form:

> "Provide a summary of the actual air emissions on an annual basis for the following three columns:

[9] *See*: https://www.cumminspower.com/www/Commercial/Datasheets/Emissions/eds-1056.pdf

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(i) Emissions to be released from only the equipment and affected processes described on this notification.
(ii) the entire site prior to the modifications of the equipment and processes described in (i) above.
(iii) The entire site including the emissions identified in (i) above. Normally, this column will be the sum of (i) and (ii)."

The emissions for the entire site prior to the backup generator modification should have included the emissions from the existing six (6) diesel powered stationary engines (backup generators). Instead, the application claims zero emissions from the existing backup generators.

It is understood that the existing emissions related to the rotary dryer would be zero because it is the first rotary dryer to be installed in the manure handling area of the facility and that the emissions from current manure handling processes are purportedly regulated under Agricultural Best Management Practices (AgBMPs). However, the AgBMPs do not address rotary dryer emissions specifically and thus cannot be relied upon to control particulate emissions during the operation of the rotary dryer.

On page 6 of the permit application, Item 9 states:

> "It is noted that MCAQD views the rotary dryer as part of the facility's waste management operations for purposes of manure drying, of which, such operations are regulated by the Arizona Department of Environmental Quality (ADEQ). The associated baghouse (and its fines) for the rotary dryer will be regulated by the ADEQ through Agricultural Best Management Practices (BMPs). The ADEQ will establish BMPs for the baghouse outside of this permit."

Arizona Statute A.R.S. §49-457 (Agricultural Best Management Practices Committee) describes the rule-making process as follows[10]:

> H. The committee shall adopt, by rule, an agricultural general permit specifying best management practices, including record keeping and reporting requirements, for regulated agricultural activities to reduce PM-10 particulate emissions. A person who is subject to an agricultural general permit pursuant to this section is not subject to a permit issued pursuant to section 49-426 except as provided in subsection K of this section. The committee shall adopt by rule a list of best management practices, at least one of which shall be used in areas designated as moderate nonattainment for PM-10 particulate matter and at least two of which shall be used in areas designated as serious nonattainment for PM-10 particulate matter, to demonstrate compliance with applicable provisions of the general permit. Best management practices may vary within the regulated area, according to regional or geographical conditions or cropping patterns.

[10] See: http://www.azleg.gov/ars/49/00457.htm

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First, it must be understood that the air pollution generated during the drying of manure is not limited to "fines" but can include other air pollutants, such as ammonia, volatile organic compounds, pathogens, sulfide compounds, and malodors. These pollutants, especially volatile gases, are generated during the transfer of the manure from storage to the rotary dryer and while the rotary dryer is in operation where moisture and thus volatile gases are driven off of the manure solids by sustained high temperatures.

Secondly, the AgBMPs are part of the ADEQ rule making and if the ADEQ "established" BMPs for the rotary dryer baghouse, there would be a rule-making procedure to follow. The casual statement that ADEQ would resolve the baghouse emissions does not explain the complexity of the actual process.[11]

10. LPG Combustion Emissions Calculator.

The permit application includes three pages titled "Liquefied Petroleum Gas (LPG) Combustion Emissions Calculator – Revision D 2/1/2010 – Output Screen." The form does not include the name of the facility, the facility ID number, the facility location, or the name of the person that prepared the spreadsheet. The form itself has the logo for North Carolina Department of the Environment and Natural Resources (NCDENR) and can be found on the NCDENR website as an interactive spreadsheet.[12] There is no explanation for why this particular form/spreadsheet was used and the purpose for including the spreadsheet outputs in an Arizona air permit application.

11. Number of backup generators and when they were installed.

The Technical Support Document permit history indicates the first generators (number unknown) were included in the 2004 new permit application. Since that time, the Hickman Egg Ranch, Inc. has submitted minor permit modifications to include more emergency generators in 2011 (number unknown), 2013 (3 additional generators), and 2014 (3 additional generators). The permit history dated 7/20/2015 includes the statement:

> "The Permittee also requested the equipment list to be updated with a replacement emergency generator."

The Technical Support Document includes a page titled "Emission Worksheet for New Diesel Engines" and includes manufacturer's NOx and VOC specifications for Cummins QSL9-G7 NR3 engine. The page includes a table with nineteen (19) engines listed with unique identification numbers (G-1, G-10, G-11, G-12, G-13, G-14, G-15, G-16, G-17, G-18, G-19, G-20, G-21, G-22, G-23, G-24, G-25, G-39, FM1). The next page in the Technical Support Document is titled "Emission Worksheet for Old Diesel Engines" and includes six (6) engines with unique identification numbers (G-2, G-4, G-5, G-6, G-7, and G-9). It should be noted that there is not a G-3 or G-8 on either list.

---

[11] *See*: https://agriculture.az.gov/sites/default/files/Ag_Air_Quality_publication.pdf and https://www.azdeq.gov/environ/air/plan/download/webguide.pdf for description of AgBMP for PM10 process.
[12] *See* http://daq.state.nc.us/permits/spreadsheets/

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The proposed permit includes an Equipment List with items 1 to 20, where item 1 is the rotary dryer with baghouse, item 2 is the aboveground gasoline storage tank, and the remaining 18 items are emergency diesel powered generators – some of which represent more than one generator of a particular horsepower rating – for a total of 25 emergency generators. The list of emergency generators includes dates, one described as "installed", others as "manufactured" and the remaining dates are without description. When comparing the dates from the proposed permit Equipment List to the Technical Support Document, one can surmise that the dates without description are the date of manufacture, which is important when applying emissions standards.

In order for the Equipment List to be consistent, the date of manufacture for FM-1 should be 2010. It would also be helpful to include the date of installation for all of the emergency generators rather than just one of them (ie., FM-1). It would be helpful to the general public if the Technical Support Document explained the difference between "old" and "new" generators as a dividing line of date of manufacture used to determine which emissions standards apply. Otherwise, it looks like this permit is allowing the facility to add 19 generators that just happened to be manufactured at various times.

The permit application does not include a facility map that shows where any or all of these generators are/will be located.

Figure 1 – Hickman Egg Ranch, Inc. Arlington facility in September 2003.

Figure 2 - Hickman Egg Ranch, Inc. Arlington facility in August 2006.

Figure 3 - Hickman Egg Ranch, Inc. Arlington facility in September 2010.

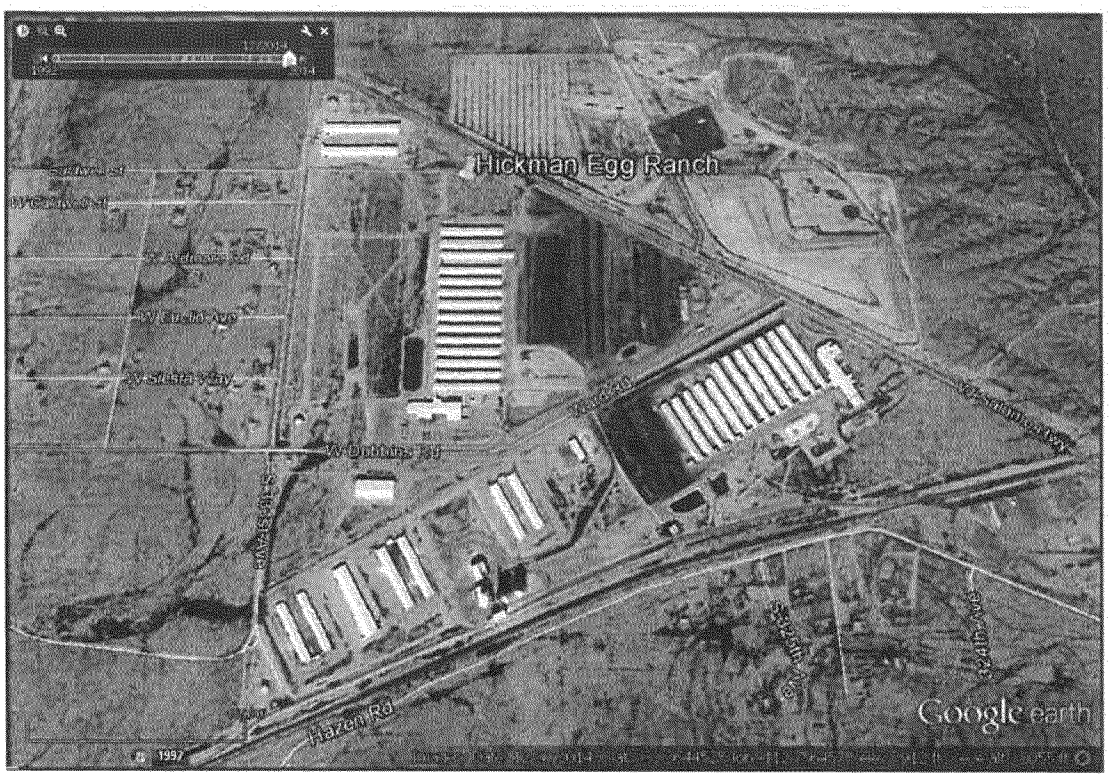

Figure 4 - Hickman Egg Ranch, Inc. Arlington facility in December 2014.

12. Permit Resolution regarding Notice of Violation for compost fire.

The permit modification includes Specific Condition 2 that refers to "mulching" and the requirement to get a burn permit as a reaction to the Notice of Violation for a "mulch" fire on March 7, 2014. The facility is not "mulching" but is composting poultry manure and dead chickens not only from the Arlington egg laying operation, but also the new Tonopah egg laying operation. The fire is/was not from a "burn event" but most likely from the overheating of manure/mortality compost causing spontaneous ignition.

It is not enough to prohibit open burning without a Burn Permit when the cause of the fire is due to the improper operation and maintenance of the manure and dead animal compost piles. The MCAQD must acknowledge that the compost burning is in violation of Rule 314, paragraph 305.1 that states:

> "Prohibited materials cannot be burned in open outdoor fires except as provided in Sections 303.2 and 303.4."

Neither Rule 303.2 nor 303.4 relates to the Hickman Egg Ranch. Rule 303.2 refers to 'fires prohibited during restricted-burn periods in Maricopa County' and the requirement to call the hotline. The only exemptions listed in the subparagraphs are for fire extinguisher training and disposal of dangerous materials conducted in compliance with

ADEQ's regulations. Rule 303.4 refers to 'testing of potentially explosive-containing products during restricted-burn periods'.

The definition of 'prohibited materials' in Rule 314 Section 211 includes "animal wastes and carcasses". Thus Hickman Egg Ranch should be prohibited from burning the compost material that contains both poultry manure and poultry carcasses. The idea that they should get a "burn permit" belies the purpose of regulating the proper handling and disposal of millions of cubic feet of poultry manure per year.

Arlington facility: 8 million egg layers and 4 million pullets
Tonopah facility: 4,300,800 egg layers

Using Midwest Plan Services MWPS-18 Waste Characteristics design factors for manure production, the combined manure can be estimated as follows:

12.3 million layers x 0.002 ft^3/hd/day x 365 days/yr = 8.98 million ft^3/yr
4 million pullets x 0.002 ft^3/hd/day x 365 days/yr = 2,920,000 ft^3/yr
Total: 11.9 million ft^3/yr

13. Potential for odors from manure handling and composting operations.

The Technical Support Document for the proposed permit states:

> "Conditions 3-5 were taken from Rule 320 and were included due to the potential for odors from manure handling and composting operations."

On page 1 of 9 of the proposed permit, section 3 regarding odor control states:

> "(3)(a) No person shall emit gaseous or odorous air contaminants from equipment, operations or premises under his control in such quantities or concentrations as to cause air pollution."
>
> "(3)(b) Material Containment Required: Materials including, but not limited to, solvents or other volatile compounds, paints, acids, alkalies, pesticides, fertilizer, and manure shall be processed, stored, used and transported in such a manner and by such means that they will not unreasonably evaporate, leak, escape or be otherwise discharged into the ambient air in such quantities or concentrations as to cause air pollutions smells, aromas or stenches commonly recognized as offensive, obnoxious or objectionable to a substantial part of a community. Where means are available to reduce effectively the contribution to air pollution from evaporation, leakage or discharge, the installation and use of such control methods, devices or equipment shall be mandatory."

The agency fails to address the distinctive odor of "stinky feet" or isovaleric acid and other malodors and dusts that currently emanate from the Hickman Egg Ranch, Inc. Arlington property. This foul odor travels beyond the boundary of the facility and invades the homes and properties in the nearby community.

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15. Removal of the animal feeding production operations requirements.

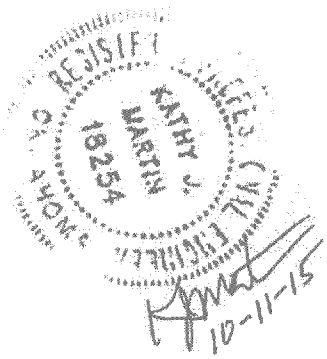
On page 2 of 4 of the permit application, the narrative description of the proposed modification includes the following statement:

> "Addition of Rotary Dryer with Baghouse for manure drying operation, and the installation of a 15,000 gallons propane tank. A request for the removal of the animal feeding production operations requirements from the Air Quality permit. The animal feeding operations are cover by the ADEQ BMP's."
>
> **Note:** The narrative does not include an emergency diesel engine generator.

The proposed permit does not include strikeout/underline to show what language was removed related to "animal feeding production operations requirements". The Technical Support Document does not identify applicable AgBMPs that would apply to any or all of the operations that were removed from the permit.

Kathy J. Martin, PE (OK#18254) — October 11, 2015 Date

Seal:



ATTACHMENT C

Douglas A. Ducey
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Misael Cabrera
Director

RECEIVED
OCT 0 1 2015

September 25, 2015

Director Phil McNeely
Maricopa County Air Quality Department
1001 North Central Ave, Ste. 125
Phoenix, AZ 85004

Re: Agricultural Best Management Practices for Hickman

Dear Mr. McNeely,

The Arizona Department of Environmental Quality (ADEQ) has reviewed the Hickman Farm's use of a rotary dryer for the chicken manure waste at its Tonopah, Arizona location. We determined that the operation of the dryer is integrated with the farm's waste handling operations and subject to requirements under ADEQ sole authority to regulate particulate emissions from agricultural activities.

The Arizona Revised Statutes provide that PM_{10} emissions produced by regulated agricultural activities is a matter of statewide concern and the regulation of such by counties, cities, towns, or their political subdivisions is preempted by the State of Arizona. ARS 49-457(O). Regulated agricultural activities is defined as "[c]ommercial farming practices that may produce PM-10 particulate emissions within the regulated area, including activities of a dairy, a beef cattle feed lot, a poultry facility and a swine facility." ARS 49-457(P)(5)(a). Under the Arizona Administrative Code, a commercial poultry facility is "a poultry operation with more than 25,000 egg laying hens within the boundary of the Maricopa PM nonattainment area." R18-2-611(4)(g) (2015), 21 AAR 1156, July 24, 2015.

The Hickman Farm, which is located within the Maricopa PM_{10} nonattainment area, houses more than 25,000 egg laying hens and is therefore a commercial poultry facility subject to ADEQ's PM_{10} requirements. Under the state agricultural best management practices (BMP) rules, a commercial poultry facility must implement animal waste handling and transporting practices. Animal waste handling and transporting means the process by which any animal excretions and mixtures containing animal excretions are collected and transported. *Id.* at 611(1)(a). Since the rotary dryer is used in the farm's collection and transportation of manure waste it falls under the purview of Arizona's BMP rules.

Maricopa County will retain permitting authority for the natural gas combustion processes at the Hickman Farm. ADEQ will regulate the poultry facility's PM_{10} emissions by working the Governor's Agricultural Best Management Practices Committee to develop and codify a BMP covering its operation. Once final, the new BMP will appear in Title 18, Chapter 2, Article 6 of the Arizona Administrative Code.

Please contact ADEQ if you have any questions regarding the BMP development process.

Sincerely,

Eric Massey

ATTACHMENT D

Best Management Practices and the Mitigation of Dust Pollution: An Arizona Case Study

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ABSTRACT

This study explores recent rulemaking interactions of agricultural and regulatory parties in developing best management practices for agricultural dust control. Regulatory outcomes are predicted based on each party's interests and power utilizing a mutual gains negotiation framework. A triangulated research design reveals that the final rules satisfied the economic objectives of agricultural interests, met the rulemaking expediency of the regulators, and likely failed to significantly mitigate dust pollution. The analysis provides rare empirical support for the concern that a collaborative rulemaking process can be captured by regulated interests in the sense that required changes in regulatee operational practices are minimized in the adopted regulations with the, at least temporary, approval of the regulator.

Key words: best management practices, dust pollution, negotiation, rule making, regulatory capture

JEL Codes: Q15, Q53, Q58

I. INTRODUCTION

Best Management Practices (BMPs), particularly at state levels, are often integrated into the negotiation process used to design rules for environmental mitigation or natural resource conservation. In this broad context, a BMP is "…a practice or combination of practices that are determined (by state or designated…agency) through problem assessment, examination of alternative practices, and appropriate public participation to be the most effective, practicable (including technological, economic, and institutional considerations) means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with … quality goals."(Ice 2004, p. 685). Expectedly, the tradeoff between meeting environmental goals and maintaining economic viability frequently produces tension in the rule design process (Bailey and Waddell, 1979; Murphy, 1979). However, according to Leathers (1991), reaching the socially optimal tradeoff between producer and environmental objectives should be the goal of any negotiated BMP program, tension or not.

A regulatory negotiation process, commonly referred to as reg-neg, provides a mechanism that encourages the design of bargained solutions acceptable to the regulator and the regulatee. Federal agencies utilizing reg-neg procedures are required to follow the guidelines of the Negotiated Rulemaking Act of 1990 (Coglianese 1997; Harter 2000; Pritzker and Dalton 1995; Ryan 2001; Wondolleck and Ryan 1999). Most states follow an ad-hoc reg-neg process based on their adaptation of the federal guidelines to their unique circumstances (Hadden 1995). Advantages of reg-neg procedures include direct representation, reduced commentary on the final rules, higher compliance rates, improved relationships between regulators and regulated parties, better information flows, and greater public support for the rules. Documented disadvantages include the exclusion of some affected parties, high short-term transaction costs, and outcome (i.e. rule) risk (Fiorino 1998; Kazmierczak and Hughes 1997; Kerwin 1997; Langbein 2002; Polkinghorn 2000).

Outcome risk may emerge when state agencies encourage regulated interests to collaborate in rulemaking. The targeted regulatee may capture the reg-neg process by designing rules that benefit them and not the general public (Stigler, 1971). In their synthesis of the regulatory capture literature, Levine and Forrence (1990) argue that slack--discretion or freedom in rulemaking--represents a necessary condition for regulatory capture. Slack generally exists when monitoring the rulemaking process represents significant transaction costs for other stakeholders. Capture, according to these authors, only occurs when the regulator expects to benefit personally by adopting rules that (1) favor the regulatee and (2) would be opposed by the public. Otherwise, rule making is either Burkean, when the other-regarding regulator promotes rules that the public may or may not support, or a "happy accident" when the policy outcome of the self-interested regulator and the public interest coincide.

Zinn (2002) also recognizes the policy outcome risk associated with reg-neg rulemaking. But rather than defining regulatory capture as binary as do Levine and Forrence, Zinn argues that the degree of capture falls on a continuum where personal enrichment on the part of the regulator is an extreme position. Regulators are exposed to a wide range of pressures and incentives that may move them towards the regulatee's position without requiring some form of personal, individual reward. Political pressure for a timely agreement, budgetary concerns associated with negotiation and implementation, shared regulatory norms and interests, agency discretion (i.e. slack), a desired reputation for collaboration, and the lack of competing interest group involvement (i.e. asymmetric participation) are all factors that determine where the rulemaking process will emerge on the capture continuum. State agencies may benefit, at least organizationally, from capture-like outcomes because they want to minimize complaints from stakeholders, reduce rulemaking costs and deter future litigation (or all of the above). While an expansive literature exists on the theory of regulatory capture, the authors are unaware of any detailed empirical analyses of capture outcomes emerging from the reg-neg process.

The following section presents a brief overview of a rulemaking environment that utilized a reg-neg, BMP design process in Arizona: fugitive dust control. The next section presents a standard mutual gains model that captures the negotiation process for the regulatee and regulator when the payoffs to negotiation are uncertain, followed by a discussion of our triangulated research design. The results are discussed in the context of the mutual gains model and the paper closes with an evaluation of the BMP process as a potential example of mutually advantageous collaboration or regulatory capture. Our hypothesis is that agricultural bargaining power in the reg-neg BMP process led to the legal codification of dust control improvement strategies that

were already in common use on most Arizona farms at the time of the negotiations—thereby largely maintaining the status quo.

II. RULEMAKING BACKGROUND

In 1991, the Environmental Protection Agency (EPA) classified portions of Maricopa and Pinal counties in central Arizona as moderate PM_{10} nonattainment areas in violation of the National Ambient Air Quality Standards (NAAQS) of the Clean Air Act (ADEQ 2001a,b; EPA 2001; Fields et.al. 2001). The majority of this 2,916 square mile nonattainment area is in Maricopa County (2,880 square miles) and encompasses the entire Phoenix metro area. PM_{10} is particulate matter composed of small dust particles 10 micrometers in diameter or smaller. The deadline to attain NAAQS was set for December 31, 1994. For the next seven years, the Maricopa Association of Governments (MAG) and Arizona Department of Environmental Quality (ADEQ) struggled to (1) develop and implement a court and EPA acceptable state implementation plan (SIP) and (2) meet court and EPA compliance deadlines. During this period, the EPA reclassified the Maricopa County nonattainment area as serious and re-initiated, in 1997, the development of a federal implementation plan (FIP). As part of the renewed FIP, the EPA initiated collaboration with both the agricultural community and ADEQ to develop PM_{10} control strategies (i.e. reasonably acceptable control methods (RACM) and best available control methods (BACM)) for agricultural sources of fugitive dust.

Within this turbulent tension-filled policy environment, Arizona's governor signed into law Arizona Revised Statutes (ARS) §49-457 (Arizona Best Management Practices Committee) in May 1998. This statute required (1) the state to adopt an agricultural general permit rule, based on BMPs, by June 10, 2000, and (2) farms to adopt the BMPs required by the rule within 18 months of rule implementation. Meanwhile, the EPA promulgated a FIP that included a

commitment to (1) propose a RACM for agricultural dust sources by September of 1999, (2) finalize the RACM by April 2000, and (3) implement the control measures by 2001. In September of 1998, ADEQ submitted ARS §49-457 to the EPA for meeting the RACM requirements of the CAA. ADEQ requested that the EPA approve ARS §49-457 in the SIP to replace the EPA's FIP. In December 1998, the EPA proposed approval of ARS §49-457, then finalized this approval, and in June 1999 withdrew their FIP requirements.

ARS §49-457 established a PM_{10} committee and specified the requirements for the PM_{10} BMP permit. BMPs are defined in this law as "techniques verified by scientific research, that on a case by case basis are practical, economically feasible, and effective in reducing PM_{10} particulate emissions from a regulated agricultural activity" (ARS §49-457, (N)(3)). The statute detailed the committee membership as follows: the director of ADEQ (or director's designee), the director of Arizona's Department of Agriculture (ADA) (or director's designee), the dean of the College of Agriculture and Life Sciences (CALS) at the University of Arizona (or dean's designee), the state director of the U.S. Natural Resource Conservation Service (NRCS) (or director's designee), a soil taxonomist from the University of Arizona, and five agricultural producers representing a specific crop: alfalfa, citrus, cotton, grain, and vegetables. The governor made committee appointments for a six-year term. The committee's chairman could be reelected after an initial two-year term. In addition, the PM_{10} BMP Committee could establish a technical committee to generate science-based recommendations.

III. A CONCEPTUAL FRAMEWORK

The mutual gains negotiation model represents a useful analytical framework for the evaluation of potential rulemaking conflicts associated with dust mitigation (Susskind, Levy, and Thomas-Larmer 2000). The model hinges on negotiating parties understanding each other's

interests and creating agreements that result in net gains for all involved. A potential negotiation, using the dust mitigation context, is illustrated in Figure 1(a). Each axis is the satisfaction index of the negotiating parties. Satisfaction may also be referred to as "gains", "welfare", or "well-being". A movement northward on the *y*-axis is an increase in the welfare of player A (Agriculture). Likewise, movement to the right on the *x*-axis is an increase in the R's (Regulator) welfare. Each party has a reservation value, their best alternative to a negotiated agreement (BATNA), represented as dotted lines *a* and *r*. In order for the two parties to enter into a negotiation, they must expect that the resulting reg-neg BMP program will be no worse than either of their BATNAs; otherwise, the adversely affected party will choose not to negotiate. At the point of intersection of *a* and *r*, L represents the worst-case scenario that can be achieved through negotiation. Beyond L (to the "northeast") lies an area for which both parties increase their satisfaction by negotiating (zone of potential agreement (ZOPA)). The ZOPA is bounded by the set of efficient agreements for which the maximum possible gains are achieved (the negotiation possibilities frontier (NPF), or efficient frontier). There can be a wide range of agreements along the NPF, some which may favor agriculture (A*) and some of which may favor the regulator (R*). All points on this NPF between M and N are Pareto-efficient, such that maximum possible gains are incurred and neither party can do better without making the other party worse off.

A Nash cooperative bargaining solution demonstrates the importance of bargaining power in this mutual gains model (Dixit and Skeath 2004, pp. 566-575). A's BATNA is to accept an alternative rule designed by R. Assume the opportunity costs associated with this outcome are designated as *a* (Figure 1(b)). If negotiations fail, A cannot expect a better outcome from the R-designed rule than *a*. The net gains to negotiation available to A are associated with

moving northward on the y-axis (y-a). Similarly, R's gains from negotiating will be designated as x with the opportunity cost for failure being r, the regulator's BATNA with the net benefit being x-r. The NPF can be represented by $y=f(x)$ where along this frontier lies the set of maximum possible allocations of gains from negotiation available to either party: A receives a total payoff of y-a and R receives a total payoff of x-r.

Now assume that some division of gains is received by each of the bargaining parties such that R receives an h-proportion of the surplus, A receives a k-proportion of the surplus, and the two proportions sum to one. So the objective function to be maximized is $(x-r)^h(y-a)^k$ represented by the contract curves c_1, c_2 and c_3 where $c_1 < c_2 < c_3$ with regard to overall participant satisfaction. To find the cooperative solution to this negotiation we choose x and y to

$$\text{maximize } (x-r)^h(y-a)^k \quad \text{subject to } y=f(x) \tag{1}$$

which gives the unique Nash cooperative solution:

$$(x-r)/h=(y-a)/k \text{ or alternatively } (y-a)/(x-r) = k/h. \tag{2}$$

The final negotiated outcome is dependent on the bargaining power of either party (h and k). The highest possible contract curve subject to the NPF in Figure 1b is c_2 so the tangency (O) is the optimal solution for the negotiation given levels of h and k.

Since the proportions of bargaining power affect the shape of the objective function, there is a range of efficient, optimal solutions for the negotiation. Each of the possible optimal solutions lies along the efficient frontier. As one party's bargaining power increases, the stronger negotiator influences the objective function such that the set of available contract curves (and the optimal agreement) moves in their favor along the NPF. Embedded in the bargaining power variables, h and k, are the abilities of A or R to change one another's perception of the BATNAs, interests, and satisfaction received from the agreement. An increase in h decreases k,

corresponding to an increase in *(x-r)* and a decrease in *(y-a)*, respectively. As *h* increases, the set of efficient agreements available become more attractive to R and less so to A. Assume here that point O in Figure 1(b) represents the case where *h* and *k* are equivalent. Then any increase in *h*, or movement southeast away from O on the NPF, means the regulator (R) fares better. All bargaining power belongs to the regulator (h=1) at N. Similarly, as *k* increases the efficient agreement shifts northwest along the NPF, improving the outcome for agriculture, the regulatee. When k=1, agriculture holds all the bargaining power and the agreement is at point M.

IV. EMPIRICAL PROCEDURES

Case studies provide an opportunity to analyze events of a cause and effect nature that are outside of the investigator's control, thereby making this research approach valuable for understanding the origin, operations, and impact of reg-neg programs and the possibility of regulatory capture (Eisenhardt 1989; Helper 2000; Kennedy and Luzar 1999; Yin 1994). Our triangulated method of case analysis first relies on background information from regulatory documents, published literature, and interviews with both state and federal officials familiar with, but not directly associated with, the rulemaking process (Denzin 1971; Marshall and Rossman 1999; Mohr 1995; Patton 2002). The second component, BMP committee member interviews, provides us with an eyewitness understanding of the reg-neg BMP design process. Finally, a scoring survey evaluates technical experts' opinions on the use of BMPs at the farm level prior to program implementation. We utilize the mutual gains negotiation model to synthesize the information from these three sources.

BMP Committee members were selected for interviews based on their identifiable interests. A list of expected first-best respondents was constructed based on agency affiliation, expected participation, and technical expertise. At least one agricultural representative, one

regulator from a governing agency, and one technical expert were chosen for interviews. Those interviewed early in the process were asked to recommend other essential interviewees in order to expand the potential interview pool. The list of final interviewees was determined by their willingness to be interviewed. The original committee appointments (i.e. those that designed the program), a list of all interviewees, and all other survey protocols are available from the authors.

Interview questions for BMP committee members were composed utilizing a two-stage process. First, a list was constructed of all relevant questions about the negotiation process and BMP design decisions. Then these questions were reviewed and revised following the chronological sequence expected for reg-neg design (i.e. decision to use reg-neg, negotiation, rule implementation). This two-stage process produced an interview protocol of six open-ended questions and a series of in-depth, follow-up questions. The open-ended questions were designed so respondents could provide their observations concerning the negotiation process and decision-making. The follow-up questions were reserved for obtaining further details and pacing the interview. Questions required recall concerning negotiation processes that occurred six years prior to the interview. Each respondent received a copy of the questions several days before the interview to allow them time to reflect on past events. Interviewees were informed that their individual views would be kept confidential. Each respondent agreed to volunteer at least one hour of their time for the interview.

Following established case study procedures, the committee interview results were compiled by reviewing each respondent's answers for relevance to the questions and then reconstructing their response following a common chronological interview format. Then the responses for all interviewees were aggregated under each open-ended question and regrouped,

when appropriate, into subtopics. Finally a review of emergent themes within the interviews was constructed to capture key components of the reg-neg BMP process into a single narrative.

The expert survey was utilized as a "second best" approach to gather information on BMPs used on farms prior to the regulation; a proposed farm-level survey measuring the extent of *ex ante* and *ex post* dust mitigation practices was not supported by leaders in the agricultural sector. Each agricultural expert (e.g. Extension specialists and faculty) had a professional understanding of farming and worked in the PM_{10} nonattainment area. Each expert was asked to provide their best estimate of the percentage of farms that used each BMP prior to the implementation of the new law. The BMPs were listed and categorized within the survey instrument following each program's enrollment guidelines. The expert scores produce a rough estimate of the degree of BMP use by the agricultural sector prior to the reg-neg process.

The Agricultural PM_{10} BMP Program requires that all farms adopt at least one BMP from each of three categories: Tillage and Harvest, Non-Cropland, and Cropland (Table 1). The scoring model for PM_{10} evaluates one BMP category at a time. Each expert was asked what percent of central Arizona farms used the specific BMP. Two thresholds were set for the scores, at 50+ percent and 80+ percent, to allow for sensitivity and comparison in the analysis. The scoring model for the PM_{10} categories takes the form: If $BMP_i \geq 50\%$ then x_i=1, otherwise x_i=0, and the category point total is the sum $\sum_{i=1}^{n} x_i$, where *BMP* is the percentage score attributed by the expert to the ith BMP in the category, and x_i is the one point score the program awards the farmer applicant. The calculation at the 80 percent threshold takes the same form, where $BMP_i \geq 80\%$.

V. RESULTS AND DISCUSSION

In April 2000, the EPA proposed (1) the approval of the state's Revised Final Plan, and (2) an extension of the serious area attainment date from December 31, 2001 to December 31, 2006. The Agricultural PM_{10} permit was adopted by the PM_{10} BMP Committee in June 2000 and was included in the SIP revision. The PM_{10} BMP Committee identified 30 BMPs expected to reduce emissions in three categories. As noted in Table 1, the Tillage and Harvest category relates to farm management during periods when cropland is physically disturbed. Non-Cropland management consists of land that is not in agricultural production. This may include farm roads, ditches, equipment or storage yards, or land no longer used for crop production. The Cropland category accounts for bare land between harvest and planting periods, fallow lands, and for turn-rows. In order to qualify for the Agricultural PM_{10} general permit, farms must enroll and document the use of at least one BMP from each of these categories in at least one field.

A. BMP Committee Interview Results

In late 1997 ADEQ, MAG, and EPA initially approached the Arizona farming community, during a Farm Bureau meeting, to begin talks with the agricultural community concerning the design of the PM_{10} FIP. According to BMP Committee participants, the EPA was proposing costly FIP measures at that time toward controlling PM_{10} emissions from agricultural sources. The agricultural community quickly mobilized itself and convinced the State Legislature to establish the PM_{10} BMP committee. Members of the Farm Bureau and the vegetable and cotton grower's associations were instrumental in writing and lobbying for ARS §49-457. The precedent for the reg-neg BMP process was established by the Nitrogen BMP rule (ARS §49-248) that was legislated in the late 1980s. The two BMP committees (Nitrogen and

PM_{10}) are structured similarly, with both containing growers from the five major crops in Arizona. The governor selected the specific PM_{10} BMP Committee members who received some preparation, including technical materials and a history of PM_{10} in the Maricopa nonattainment area, as well as mandatory ethics training required of all state committees.

According to PM_{10} BMP Committee interviewees, all parties worked together in a collaborative manner to produce a feasible set of BMPs. During the first meeting, the PM_{10} BMP Committee selected a chairman (a grower) and created an Ad-Hoc Technical Advisory Committee (Ad-Hoc Committee). The first meeting also included reports from government staff on the rulemaking process, the timeline for rulemaking, and background on the PM_{10} problem. Spectators at committee meetings were usually representatives from the EPA (who were not formal members of the committee as the rule was a state-sponsored regulation), agricultural lobbyists, and members of the Ad-Hoc Committee. The public meetings were conducted in an informal manner, allowing spectator input and debate.

Interviewees provided consistent descriptions of participant interests. The dominant interests on the PM_{10} BMP Committee, in number and in persuasive power, were the agricultural interests, broadly defined. Agricultural-connected members provided most of the leadership on both the PM_{10} BMP Committee and the Ad-Hoc Committee. Agricultural members knew each other, while agency representatives and non-agriculture technical experts were unfamiliar with the other committee members. One participant noted that familiarity might have contributed to the decision to elect an agricultural producer as the BMP Committee chair. The goal of the agricultural representatives was to control the costs imposed by the BMPs, according to the respondents. Ad-Hoc Committee experts provided technical expertise on which BMPs would be effective at reducing dust emissions. Some of these technical experts strongly supported

agricultural concerns during the discussions. Regulatory agency representatives facilitated the negotiation and the design process, and state agencies provided regulatory information to the PM_{10} BMP Committee during the negotiations.

Interviewed participants provided an in-depth discussion of the deliberation process. The Ad-Hoc Committee developed a comprehensive list of 65 BMPs based on research from a wide range of academic, consultant, federal government, and state (e.g. California) sources. The Ad-Hoc Committee also reviewed questions from the PM_{10} BMP Committee as to effectiveness or applicability of specific BMPs. Most participants agreed that the BMPs selected by the committee were measures that were effective at reducing visible dust, practical to implement (i.e. economically viable), and enforceable. The growers in attendance informed both committees on (1) whether a practice could be implemented, (2) the cost of implementation and (3) how applicable the BMP was to Arizona agriculture.

There were several points of contention debated by PM_{10} BMP Committee members during the negotiations. First, several participants were concerned about the lack of quantitative data available to determine which practices would be more effective in reducing fugitive dust. Some interviewed participants countered that an assessment of each BMP's effectiveness was not necessary because the state requested a reduction in agricultural dust emissions without any specific quantity required. As a result, the committee simply searched for the best practices that could improve air quality. A second point of contention was that the monitoring requirements and specification of general permit requirements were too lenient. Several regulators and technical experts unsuccessfully argued for (1) more prescriptive BMP adoption language in the rule and (2) a more detailed recordkeeping system on how the farm had achieved compliance with the permit.

B. Expert Panel Results

Ten agricultural experts were surveyed to estimate the extent of PM_{10} BMP technology and management practices on farms prior to 2001. Each expert provided an estimated percentage of central Arizona farms, in the subject geographical area, using each BMP prior to the initiation of the PM_{10} program. As noted earlier, the scoring model yields aggregate results for each BMP category at two levels of sensitivity (50+ and 80+ percent) (Table 2). The scores are the total number of BMPs that the expert estimated at or above the sensitivity percentage.

Two of the experts, 1 and 4, scored the agricultural sector as far exceeding the program requirements at both the 50 and 80 percent levels for all three PM_{10} BMP categories. The scores provided by experts 2, 3, 5, 6, and 8 suggest that the Non-Cropland Management was the category most likely not met by the Arizona agriculture sector. At the 80+ percent level, experts 3, 5, and 8 agree that the minimum requirements are met in the Tillage and Harvest, and Cropland Management categories. At 80+ percent, the results of experts 7, 9 and 10 indicate only one category, Tillage and Harvest, was met by the sector prior to 2001. At the 50+ percent level only experts 2 and 10 (with expert 7 abstaining) fail to estimate that the agriculture sector meets the BMP requirements.

The results suggest the PM_{10} BMP Committee incorporated, in at least two categories, BMPs that were already in common use on most commercial farming operations. There were a number of consistently low-scoring BMPs in each category (meaning some approved practices were not widely used), but the number of expert scores above the 50+ and 80+ percent levels indicate that the program was accommodating to existing farm conditions at the time of program design. The agricultural sector was likely to qualify their farms into the BMP program by using current practices such as application of chemicals through irrigation systems, planting according

to soil moisture content, or reducing the number of passes during tillage (a practice several experts noted was already popular for economic reasons prior to program inception). It appears that a majority of farm operators only needed to meet the requirements of a single category (e.g. implement one BMP in Non-Cropland Management) in order to fulfill the full requirements of the PM_{10} BMP program.

C. Synthesis

Interview results point to the existence of bargaining power favoring agricultural interests in the reg-neg BMP design process. The structure of the PM_{10} BMP Committee alone suggests bargaining power weighted towards agricultural interests. Some of the general public attending the open meetings also were supportive of agriculture. Several committee members reported that contentious issues, though few, were decided by popular vote, a process that clearly favored agricultural interests. Another source of agricultural influence on the rule design process stems from the political astuteness of the farming sector's leadership. Members of the agricultural community developed the legislation behind the rule, giving agriculture a strong bargaining position from the start. In addition, agricultural members led all committee discussions and negotiations.

The PM_{10} rule design process was characterized by both asymmetric information and asymmetric participation. First, agriculturalists were the primary source of information for whether practices could be implemented on farms and if farmers would adopt them. Secondly, results from the expert survey suggest that there were few new requirements imposed on farmers by the rule because many of the BMPs in the program were already common practice on the majority of the farms. Third, program compliance does not require that qualifying BMPs be new, farms only have to verify which approved practices they are using. Finally, it is important to

note again that a farm qualifies for a category if a BMP is implemented on only one field on the farm.

The interviewees noticed the absence of other stakeholders in the rulemaking process. EPA staff participated as observers, as appropriately noted above. However, local representatives from the legislature, cities, health sector, environmental groups, and other advocacy interests were not appointed to the BMP committees and did not participate in the public meetings. As a result, committee input was noticeably skewed towards agricultural interests.

Returning to Figure 1(b), the evidence from committee interviews and expert surveys indicate that the negotiated outcome approximates the "northwest" corner of the ZOPA. First, r, the regulator's BATNA, can be defined as the EPA's FIP. However, the terms of the BATNA were undefined at the time because the EPA, ADEQ, and MAG were working with agriculture to identify suitable control methods prior to the approval to use BMPs. Since the regulator's BATNA was not clearly established, the regulator entered negotiations without a firm bargaining position. Secondly, once entering into negotiation, the BMP Committee composition produced a strong bargaining position for agriculture. In Figure 1(b), if k is greater than h then the negotiated outcome is closer to M. Agricultural representatives negotiated an outcome where incremental program costs for agriculture were minimal and the regulator's outcome is equivalent or only slightly better than pursuing their BATNA.

VI. COLLABORATION OR CAPTURE?

The BMP reg-neg process requires regulator/regulatee collaboration, expecting the benefits associated with the BMP program to outweigh the costs of achieving, or not achieving, public policy goals. Evidence of active regulator/regulatee collaboration weaves its way

throughout this case study. Federal, state and agricultural interests invested significant amounts of time, both paid and unpaid, to resolve this environmental policy issue. The threat of EPA's FIP and looming federal deadlines drove ADEQ and the agricultural sector into close collaboration under the watchful eye of the Governor's Office and the State Legislature.

We conclude that the agricultural sector influenced, affected or even controlled the regulatory outcome in the BMP reg-neg process—evidence of regulatory capture (Laffont and Tirole 1991). The interview results indicate the presence of biased advisors, implicit future legal challenges, asymmetric information and participation, and rents earned (Bó 2006). Agriculture was dominant in the BMP negotiations and in writing the legislation. State regulators facilitated the reg-neg process but agricultural interests provided the technical and committee leadership in both cases. "It was agriculture in the driver's seat", as one BMP Committee member observed. State agencies appeared more concerned about achieving a timely agreement than clearly meeting the public policy goals of dust control.

Threats, veiled and unveiled, impacted all sides in the negotiations. For example, the EPA's intentions to implement a FIP focused both the regulator and regulatee's attention on the importance of avoiding significant transaction costs by reaching a mutually acceptable agreement in a timely manner. Whether the selected BMPs generated additional dust control was a secondary concern. The results from the expert surveys indicate that agriculture was not required to make significant changes in their day-to-day operations, therefore rents were earned in the reg-neg process. We can only speculate about whether federal and state regulators understood on-farm reality with regard to the existing use of final BMPs. Willingness to accept frequently used farming practices as BMPs and setting low, farm-level compliance hurdles indicate information asymmetry, the compelling urgency to strike a deal, or both.

VII. A POSTSCRIPT

Under pressure from a wide range of interests, the Arizona State Legislature amended ARS §49-457 in 2007 to require farmers to double the number (i.e. from one to two) of BMPs in each of the three dust control categories. Our research results indicate that most farms complied with this stricter rule without major changes in how they run their businesses.

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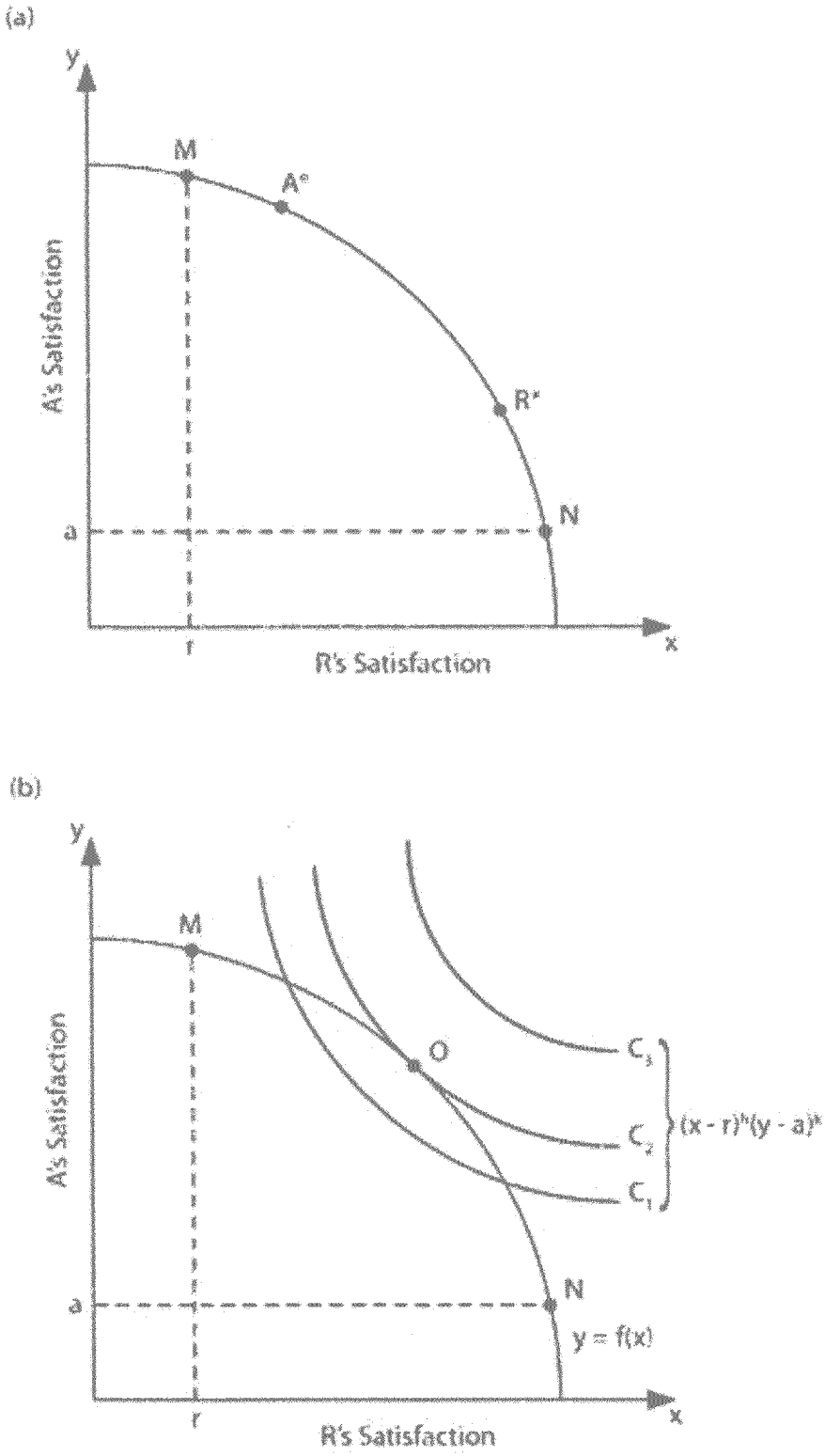

Figure 1: Mutual gains and Nash bargaining models

Table 1: Sample BMPs by Category for Dust Mitigation

Tillage and Harvest

- Chemical Irrigation: application of fertilizers, pesticides, or other agricultural chemicals to cropland through irrigation systems.
- Combining Tractor Operations: performing two or more operations, for tillage, harvesting, planting, or cultivation, in a single tractor or harvester pass.
- Equipment Modification: modifying agricultural equipment with shields, deflectors, dust shrouds, or spray bars to reduce dust emission.
- Limited Activity During a High Wind Event: performing no tillage or soil preparation when on-site wind speed measured at six feet above ground is in excess of 25 mph.
- Multi-Year Crop: crops that are grown continuously for more than one year.

Non-Cropland Management

- Access Restriction: using signs or physical obstructions to prevent public access to non-cropland areas.
- Aggregate Cover: using gravel, concrete, recycled road base or similar material to cover non-cropland.
- Artificial Wind Barrier: creating a physical barrier to the wind.
- Reduce Vehicle Speed: limiting farm vehicles to less than 20 mph on unpaved farm roads.

Cropland Management

- Cover Crop: plants that are grown between crops and protect or improve soils.
- Manure Application: apply animal waste or biosolids.
- Multi-Year Crop: crops that are, or will be, grown continually for more than one year.
- Planting Based on Soil Moisture: applying water to soil prior to planting operations.

Table 2: Expert scoring summary for PM_{10} BMPs utilized prior to 2001

		Expert									
	BMP Category*	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
BMPs Scored at 80+ Percent	Tillage and Harvest	5	2	4	3	3	5	2	4	1	1
	Non-Cropland Management	3	0	0	1	0	0	-	0	0	0
	Cropland Management	4	2	4	4	4	4	0	1	0	0
BMPs Scored at 50+ Percent	Tillage and Harvest	6	3	4	4	6	9	4	7	4	1
	Non-Cropland Management	3	0	1	2	1	2	-	2	1	0
	Cropland Management	4	2	4	6	7	6	4	3	3	0