RTI INTERNATIONAL | Memorandum

Date: February 22, 2008

To: Christian Fellner EPA/OAQPS/SPPD/ESG

From: Jeff Cole

Subject: Contact Summaries with Equipment Vendors Used for Obtaining Costing Information

This memorandum contains the contact reports on discussions with 6 equipment suppliers for the coal preparation industry. The following exhibit contains the company names, contact information, and phone number. Following the summaries of vendor's comments, Appendices 1 through 4 contains a record of email messages between RTI personnel and the vendors. Note: Contact made with Griffin Filters and Dover Conveyors, Inc. contacts were done solely over the telephone and no email messages were exchanged.

Exhibit 1. Vendor Contact Information

Company	Address	Contact Name	Phone	Email	Email Message Appendices	Initial Contact Date
Air-Cure, Inc.	8501 Evergreen Blvd., Minneapolis, MN 55433	Tim Swallow	763-717-0707	tim.swallow@aircure.com	1	11/07
AKJ Industries, Inc.	10175 Six Mile Cypress Parkway, Fort Myers, Florida 33966	Jack Cranfill	502-241-6932	jackcranfill@yahoo.com	2	12/07
Griffin Filters	106 Metropolitan Drive, Liverpool, New York, 13088	William Quigley	315-451-5300	N/A	N/A	12/07
Nalco Company	1601 W. Diehl Road, Naperville, IL 60563-1198	Steve Blubaugh Shaun Lendrum	630-305-2579 859-948-7238	sblubaugh@nalco.com) splendrum@nalco.com)	3	11/07
Arch Environmental Equipment, Inc.	P.O. Box 1760, Paducah, KY 42002-1760	Michael Archer	270-898-6821	mikea@aeec.com	4	11/07
Dover Conveyor, Inc.	3323 Brightwood Road, P.O. Box Midvale, OH 44653	Joe Coniglio	740-922-9390	N/A	N/A	1/08

Air-Cure, Inc.

Contact Name: Tim Swallow

Comment summary: first call

Air-cure, Inc. manufactures and supplies dust collection systems and equipment, and specialize in Powder River Basin (PRB) coal both at mines and utilities. Air-Cure's engineers have invented and built many baffle and dust containment enclosures for many processes from Rotary Car Dumps, trestle dumps, rotary breakers, batch load-outs, and zipper ducts.

They specialize in a baghouse filter technology known as an RF Filter. RF filter can cut power costs by as much as 75 percent. The cleaning system of this efficient filter is powered by an air pump rather than the conventional fan. The result is the RF filter demands only 25 percent of the power needed by similar filters.

Dust laden air enters the RF filter on a tangent to the filter chamber and a circular baffle keeps the incoming air from moving directly to the filter tubes. Instead, it is spun around the lower portion of the filter; a cyclonic action that strips the heavier dust particles from the moving air and drops them directly into the hopper. Next, the air straightener vanes redirect the incoming air to a uniform upward velocity. As a result, the pre-cleaned air carries the remaining dust up through the felted filter tubes depositing the dust over the maximum surface area for maximum efficiency.

Air-Cure's "RF" filter cleaning system creates a high-pressure wave using a high volume of air at lower pressure (7.5 psi). This fills the full length of the tube when injected into the filter tube through a mean orifice of 0.5"x 3" in area.

The RF filter cleaning system is an electromechanical. When the air reservoir reaches approximately 7.5 psi, a pressure or time derived pulse energizes the solenoid valve. The solenoid valve opens a diaphragm valve feeding air to the rotary manifold plenum and nozzles.

It's the amount of filter cloth area that determines a filter's capacity and efficiency. The more area put to work the more efficient the filter (When the proper air to cloth ratio and can velocities are combined with a properly designed system). Air-Cure's RF filter features a nonaligned arrangement of the filter tubes to provide more tubes and more filter cloth in a given area. The A/C ratio of the RF filter system is in the range of 4:1 to 6:1.

Tim Swallow stated that their installations have been achieving emissions of less than 0.01 gr/dscf, regularly, and have had one system tweaked to less than 0.002 gr/dscf. However the latter was very dependent on the specific conditions in the uncontrolled dust stream and is very tough to replicate.

As far as obtaining cost estimates on installing and operation this technology, Tim had a number of concerns. These are custom installations and no two designs are exactly the same. He also stated that if two equally-sized dust control installations could have very different costs based on added bells and whistles. For example, an RF filter system controlling a rotary railcar dumping mechanism and enclosure, installed in the northwest, would probably include a heated skirt support for product quality and worker comfort purposes. The same skirt would not be installed in an identically sized unit in Florida. Such an accessory would increase capital and annual operating costs.

I asked about the potential explosion hazard caused by fully enclosing a conveyor. Tim stated that, in his opinion, a properly ventilated and PM controlled system have little chance (there is always a chance for something to happen when dealing with an explosive dust, however, dust control reduces the chances of a problem by continually changing out the dusty air with fresh air to help keep the dust level below the LEL (lower explosive limit) of any explosion concerns. See attached paper on "Increasing Plant Safety".

I mentioned that we are looking at costing three size units (i.e., 30, 200, and 800 t/hr) and asked if he was willing to estimate costs for these systems based on the 3 sizes and noting what features to include (i.e., what bells and whistles would be assumed).

Comment summary: second call

He stated that fully enclosed conveyors controlled by a baghouse use a manifold system with multiple extraction points to pull the particulate matter through the filter. He has recently added a special baffle system to the (rotary barrel of the car dumper) conveyor loading chute inside the rotary car dump that reduces fugitive emissions inside the enclosure. He also stated that water/chemical sprays cannot be used in northern climates in the winter months as the water can freeze to the coal (and water and/or chemicals can not wash the dust from the air).

He mentioned when queried that UARG's model plant's rotary car dump enclosure's airflow (300,000 acfm) seemed too large for a 222 t/hr coal prep plant. He asked if it might be a controlling a double railcar dump operation rather than a single. He believes that 140,000 to160,000 acfm is more reasonable for a 222 t/hr single dump enclosure. The largest rotary car dump (this was a bottom dump) enclosure he had ever designed an enclosure for was a 230,000 acfm unit that dumped (multiple cars as they moved through the building) 2 to 3 cars at a time.

He mentioned that UARG's model plant's transfer point enclosures also seemed too large at 25,000-50,000 acfm each to be controlling such points at a 222 t/hr coal prep plant. He believes that a more reasonable airflow would be 5,000-6,000 acfm (using 3 hoods for control). He also stated that the 30 t/hr model plant would have similar airflows at its transfer point enclosures. The 800 t/hr coal preparation plant transfer point enclosures would have approximately 10,000-12,000 acfm flowrate (using 3 hoods for control). (Assuming that these are simple transfers without much of a drop height)

A crusher house at would probably have an airflow of 5,000-6,000 acfm (at a 30 t/hr model plant) or 10,000-18,000 acfm (at a 200 t/hr model plant). He stated that the cost of controlling PRB vs. Bituminous enclosures with fabric filters is a wash (little to no cost difference).

He also stated that not only would more chemical suppressant be needed at PRB coal preparation plants but also spraying may be needed at more locations than and equivalently-sized plant processing bituminous coal because of PRBs tendency to dust. He also stated that enclosures using water or chemical sprays for dust suppression are not under negative pressure.

When asked about fan and motor efficiencies he stated that fans haven't changed in a long time(There are variations of fan types that are different in efficiencies, so selecting the correct type fan can make a difference in energy consumption) but motor efficiencies have increased. He quoted a Siemens guide to motors listing a 250 to 300 hp motor was 95.8 percent efficient. This motor was an EPAC rated motor (the best available). This act known as "EPAC" established efficiency levels for electrical appliances and equipment including general purpose industrial electric motors. The law goes into effect on October 24, 1997 and defines specific efficiency levels, testing and labeling procedures. The least efficient one he could find was a 94.1 percent efficient motor. He believes that in the mid-eighties (i.e., at the timeframe of the second revision of the subpart Y NSPS) the efficiencies may have been around 80 percent. His last large installation used two 500-600 hp ID fans.

First set of questions/answers:

For coal preparation installations of baghouses:

Q1 What is a common inlet stream temperature (°F)? (Comment by RTI) "I would think this would be ambient at each location."
A1 Ambient, however if the building is heated then the filter needs to be insulated to prevent condensation.

Q2 What is a common inlet dust loading (gr/dscf)?
A2 Depending on the application, we figure 5 to 15 g/dscf^3

Q3. What is a common dust mass median diameter (microns)?
A3 A wide range, once again based on the application we figure 1 to 100 as the main sizes.

Q4. What is a common filtration time (min)? (Comment by RTI) "I am costing baghouses to handle flowrates of 5,000, 10,000, 15,000, 25,000, and 150,000 acfm."
A4 Not sure what you are asking here?

Q5 What is a common dust specific resistance (in.H_2O/fpm/lb/ft^2)?
A5 The dust is suspended in the air as it travels down the ductwork pipes. We figure no difference in the resistance through the pipe with the dust in it.

Q6 What bag material would you use to control coal dust from these three coal types?
A6 We use a polyester felt, and typically specify 19 ounce fine denier polyester with internal scrim. This will meet the .01gr/dscf emission level that is for most applications now.

Q7 Do you have a cost estimate (per 100 yards of conveyor length) for installing the manifold system for controlling fugitive dust emissions from an enclosed coal conveyor?
A7 We put a front and back hood on at the loading point of the conveyor and then typically one at the discharge end. If the conveyor is closed for the complete length, then it would depend on how long it is to determine whether or not we have intermediate hoods on the

enclosed conveyor. This dust control of the conveyor is normally part of a complete system for a building, whether transfer building, crusher building etc. So to price out just for a conveyor would not be meaningful.

Q8 How do you site baghouses to control emissions from these enclosed conveyors (i.e., do you have one baghouse for every 100 yards of conveyor length or do you install larger units that control multiple conveyors)?

A8 See answer to #7 above. Yes, one larger filter.

Second set of questions/answers: (Note there was no Question 1 in this set of questions)

Q2 Would you say that inlet dust loading would be approximately 5 gr/dscf for bituminous coal dust and approximately 15 gr/dscf from PRB and lignite coal dust?

A2 We use a range of 5 to 15 gr/dscf for PRB and Lignite depending on if it is on a dumper, crusher, silo, transfer applications. Bituminous is quite a bit less, you may want to figure half.

Q3 When you say it varies by application do you mean by coal type. (i.e., the same across all points at a single plant) or coal type being constant, does it vary at a plant depending on the location (e.g., car dump, transfer point). Is there a range of sizes by coal type? The reason I am asking this question is that the cost model I am using has a default of 7 microns.

A3 The range of size particles stays the same, however the percentage of size particles changes the more the coal is broken up. In some PC fired boilers, the mass mean is much smaller than say on a spreader stoker boiler, as the coal is reduced in size much more. Once again, the range may stay the same, but the percentage of smaller particles is typically greater the further down the line you go.

Q4 Based on your comments and others from other vendors, I have estimated the flow rates for the 800 t/hr coal preparation plant sources (controlling a PRB surface mine) to be the following:
Crusher House: approximately 25,000 acfm
Transfer point enclosures: approximately 10,000-12,000 acfm
Conveyor operations: approximately 10,000-12,000 acfm
If these are reasonable what would these sizes be at:
At a 1,000 t/hr capacity coal preparation plant at an eastern underground bituminous coal mine? Also at a 2,000 t/hr capacity coal preparation plant at a western PRB surface mine?

A4 I think you are trying to put air volumes on different capacity plants that can vary widely by changes in the coal flow, chutes, drop heights, belt speeds, belt widths etc. I can see where an 800 tph plant may require 10,000 to 12,000 cfm when handling PRB, and then a plant handling a much greater capacity could actually be less air depending on the criteria above. We design the volume up per each system dependent upon this criterion, so it is very difficult and possibly misleading to state an air volume based strictly on ton per hour. Also, when designing a dust control system, for each pickup point, the induced, displaced and capture air volumes are looked at. It is this volume that determines the total system *volume, not the actual amount of dust in this volume of air. So, the difference between a system handling PRB, lignite or bituminous coals does not vary dramatically.*

AKJ Industries, Inc.

Contact: Jack Cranfill

Comment summary: first call

Jack's company specializes in chemical dust control for a number of sectors including coal preparation plants at mines, steel mills, and at utility plants. He mentioned that utility plants use his company's products for haul road dust control and process dust control.

They apply the surfactants to control dust from rotary car dumping mechanisms, crushers, stack outs, and other coal piles. The normal method of applying the chemical dust suppressant is to catch the coal in a free fall thus coating all surfaces of the coal.

He also noted that while water alone can be used to control dust after the water evaporates the problem is back. Adding chemical dust suppressants bind the dust so that as it moves from process point to process point, its dust stays bound to the larger pieces of coal.

As far as costing is concerned the following estimates apply (as shown in Exhibit 2):

Exhibit 2. Costing Estimates from AKJ Industries, Inc.

Source	Cost ($0.01/ton)
Rotary Dump (wet spray/ water only-no chemical)	< 1
Coal pile dump/ Stack out	
Treat control as discharge (water only)	1-2
Treat entire surface of coal (chemical)	2-4
Crusher-Applied to intake and outlet of crusher (chemical)	2
Screening (chemical)*	<1
Latex Sealant for coal pile (long term storage)	$10-20/1000 sqft

*The cost for screening was estimated from a coal preparation plant as a steel mill.

Jack's company has been working on controlling dust in coal cars by applying a chemical treatment to each car load. This type of control (known as car top binding) may soon to be mandated by the western rail industry. He also mentioned that this new coating technology is hydroscopic so it actually helps to continue providing dust control.

Comment summary: second call

Jack stated that to his knowledge coal preparation plants at eastern underground mines receive their coal from the mine by conveyor to stackout silos. From these silos the coal is feed by conveyor to the crusher house. In his experience with this type of plant he hasn't seen a dusting problem because the coal is wetted to keep its surface moisture content high enough to prevent dusting during coal handling.

He clarified our use of the term surfactant as apposed to surfactant plus a binder. A surfactant controls dust until the coal is dry while the use of a binder in combination with a surfactant binds the dust particles until the coal is crushed or worked. He stated that the $0.03/ton estimate that we have gotten from him and other vendors would cover the surfactant/binder combination.

In answer to a question about dust control on haul roads at PRB coal preparation plants he stated that the companies would probably us a chloride-based product (e.g., $CaCl_2$) because it is readily available in that area of the U.S. This would be applied at a rate of approximately 0.1-0.3 gal/square yd. and would cost approximately $0.60/gal. Because of the dryer climate at PRB mines this rate of application is normally higher than the same type of haul road dust suppression done at a eastern bituminous mine because of higher evaporation. He suggested that we call Mr. Mat Winger (574-253-1213) at Dow Chemical for more information on haul road dust suppression.

When asked about chemical dust suppression capitol and annualized costs inside enclosures at coal prep plants he stated that the systems do not vary in capital cost because of size differences like a baghouse system controlling a 150,000 acfm as opposed to a 5,500 acfm enclosure. The chemical dust suppression systems he designs and installs average $50,000 +/- 20 percent per each emission source (i.e., railcar dump, transfer points, or crusher house). All site installations (i.e., for each coal prep plant) contain a bulk chemical tank, PNC controller, and pumps. The bulk chemicals tank at each installation would probably be a about a 5,000 gallon tank.

Griffin Filters

Contact: William Quigley

Comment summary: first call

Griffin Filters has been a leading designer and manufacturer of dust collection systems for over 40 years. They have worked designing and selling fabric filter systems to the coal preparation source category.

Mr. Quigley stated that while he couldn't be specific about actual prices, he could give me general rule of thumb conservative cost numbers. He stated that he is quoting these figures from the Industrial Vent Guide. The cost of fabric filter equipment in retail dollars is about $3.50/cfm, installation is about $1.50/cfm, and operational costs of about $0.01/cfm. The cost of the ductwork is not included in these numbers as it is too site specific. He also could not estimate the cost of I.D. fans would have to be determined by fan equipment installers.

Mr. Quigley mentioned that the enclosures at transfer points have slots were the conveyors drop coal onto a second conveyor that leaves the enclosure though the other slot. The enclosure itself is controlled by a baghouse and an I.D. fan and negative pressure is maintained.

Mr. Quigley stated that their installations have been achieving emissions of less than 0.01 gr/dscf, regularly, and that the A/C ratio of the filter system is in about 5:1. Most installations use polyester bags however if screens or crushers are controlled by filter systems they probably have coating on polyester.

As far as air flow rates by processes are concerned the following estimates apply (as shown in Exhibit 3):

Exhibit 3. Process flow rates from Griffin Filters

Emission Source	General Emission of PM by Source
Fugitive Dust Pickups (Hooding)	500 cfm/ft^2
Crusher	2000-5000 cfm
Screening	500 cfm/ft^2
Transfer Point	200 cfm/ft^2 of belt width
Transfer Enclosures	100 cfm/ft^2 of slot opening

*(Mr. Quigley had no way to size estimate these control costs)

He mentioned that there was a new requirement for such installations to comply with National Fire Protection Association (NFPA) standard 68: Standard on Explosion Protection by Deflagration Venting. Revised from a Guide to a Standard for 2007, NFPA 68 applies to the design, location, installation, maintenance, and use of devices and systems that vent the combustion gases and pressures resulting from a deflagration within an enclosure so that structural and mechanical damage is minimized. This standard requires designers of ductwork where there is an explosive dust hazard to employ pressure-activated dampening or foam suppression systems. He recommended a company known as Fike Corporation (www.fike.com) for costing information on installing such systems.

Nalco Company

1st Contact: Steve Blubaugh

Comment summary: first call

Steve Blubaugh (Nalco's Marketing Manager for Mined Energy Materials [coal, synfuel, oils sands]) explained that Nalco is a company that markets and designs wet suppression programs (products and systems) for dust control to a variety of mineral processing sectors. The developmental work has taken place in the United States but much of the demand comes from Europe and Latin America. This technology is starting to be used in U.S. facilities. Nalco is a company that, among other efforts, provides chemicals to mineral handling facilities to control dust emissions. As part of these efforts they work with both mineral producing prospects and current customers as well as design firms that construct conveyors, enclosures, and fabric filter systems on mineral processing sector facilities.

We asked Steve about his knowledge of separation and dewatering operations at mine-based coal preparation plants. Our research of the industry noted that the plants use a variety of dry methods to reduce the "top size" (crushing), remove contamination (e.g., rocks, wood, iron and steel residue from mining machine tools) that is usually introduced by the mining process from the Run-of-mine (ROM) coal. These early-stage dry processes could add to fugitive emissions from mine-based coal preparation plants. Steve stated that beyond crushing and sizing, most coal preparation plants are using spiral classification, cyclones, froth floatation to separate the desirable fine coal fraction from the waste material (clays) and then dewater that coal using vacuum and/or pressure filtration and in some a few cases (primarily for metallurgical coals) thermal drying. The later processes are inherently wet and should not add to possible fugitive emissions. The dewatering processes are used to remove surface moisture (as opposed to inherent moisture). Coal preparation facilities then use thickeners or clarifier tanks to clean and recycle water for re-use.

Steve mentioned that one of his company's best received programs uses a product known as “Dust Foam Plus” that uses a proprietary combination of chemicals that are applied as foam. This program adds minimal surface moisture but has the dust control performance of wet suppression. Adding too much surface moisture adds additional costs and performance challenges for coal preparation plant as well as Btu penalties the coal consumer. It is easier and cheaper to work with a dryer product.

He stated that chemical suppressants that are added to control crusher generated dust or often injected at the mouth of the crusher while always attempting to disperse the surfactant without applying too much moisture. Over application again can cause excessive surface moisture.

We asked Steve if he could give us any estimated costs for wet suppression dust control at various points in a coal preparation plant. He stated that we should contact his colleague, Shaun Lendrum, for specifics on costing.

2nd Contact: Shaun Lendrum

Comment summary: first call

Shaun Lendrum is an ITC (Industry Technical Consultant) with Nalco. He travels to mining, quarrying and material handling industrial processes all over the world to advice companies on how to solve dust control problems. He stated that basically in order to have fugitive dust emissions; it always required two components, Fine PM and air velocity. Of these, controlling the **d**isplaced, **i**nduced and **g**enerated air velocities tended to be the biggest challenge.

We asked him about the cost of control on crushers and he explained that it is extremely difficult to give a general number. There are high speed crushers (300 to 400 tons/hr) and low speed (? to? tons/hr) crushers that have vastly different dust emissions due to the 'fan' effect the internal mechanisms of these units can produce. The cost of controlling the later is much less than the former given the same coal.

We asked Shaun about the prevalence of dust collection or extraction systems at mineral handing facilities? He stated that his recent experience indicates somewhat of a reluctance by companies to go this route due to the enormous capital cost now involved in installing these systems combined with the high maintenance and operational costs that go hand in hand in running these systems. Disposal (of the collected PM) also remains a problem. Many companies operating extraction or collection systems add all the collected PM back into the original material at later stages downstream in their material handling systems. This can result in large cloud of PM every time the collected PM is dumped back into the system. Shaun stated that modern wet suppression techniques utilizing the latest more efficient chemical suppressant technologies developed over recent years, now has the ability to provide long lasting 'residual' dust control across multiple transfer points in a material handling system. Modern efficient dust suppression foams also only add minimum moisture to the materials they are treating.

Shaun stated that from experience, PRB subbituminous coal by nature has proved to be extremely dusty in comparison to eastern produced coals, and typically requires a much higher degree of dust suppression treatment than the eastern coals. Whereas it may require 10 to15 ppm of chemical suppressant/ton of coal treated for eastern bituminous coal, it would likely need 24 to 30 ppm of chemical suppressant/ton of PRB coal treated. Eastern coal costs on average from 0.005 to 0.08 cents/ton for total treatment (depending on specific conditions). Powder River Basin coal costs on average from 0.03 to 0.10 cents/ton for total treatment (depending on specific conditions). These two cost estimates are for chemicals only (no equipment costs).

For questions on and information about the capital costs of installing conveyors and transfer point enclosures, belt hoods, belt skirting and sealing etc., Shaun suggested we talk to conveyor vendors as his company does not do that kind of work.

Shaun also stated that to use chemical suppressants efficiently and effectively, adequate effective containment at application points must be achieved. All transfer points (where wet suppression/chemical suppressants are applied) should have enclosures allowing a conveyer to enter the enclosure and another conveyor to leave the enclosure. The three types of air (displaced, induced, and generated) have to be controlled in such a way to induce a negative pressure inside such an enclosure.

He also noted that in numerous material handling operations, some of the largest dust problems were generated at screening processes. Crushers are typically enclosed by design and only their inlets and outlets or discharges are the areas where dust is generated.

Comment summary: second call

We contacted Shaun Lendrum of Nalco a second time to ask him more specific questions on costing of chemical dust suppression systems. When asked about how often chemical dust suppression was required (i.e., the latency of chemical used for dust control) at a coal preparation plant, Mr. Lendrum stated that the chemical mixture need not be added again if the coal is not worked or crushed after initial application.

He clarified that the cost per ton of chemical (mixed with water) dust suppressant should be calculated overall at a coal preparation plant on the total tonnage of coal processed not separately at each process. He also mentioned that dust suppression is not necessary (after a specific process point) at coal preparation plants at eastern bituminous mines or regional coal processing centers (i.e., once the coal reaches the part of the plant where the coal is washed to remove ash and sulfur).

In describing his experience with enclosed rotary railcar dumps he made the following observations. He recently observed an enclosed rotary railcar dump that emptied a 120 ton railcar in 3 seconds. He stated that this site had its enclosure controlled by a baghouse that was operating approximately 5 seconds before the dump cycle had been completed. This installation was capable of discharging 2,400 ton/hr (40 ton/min) onto sets of feeders that distribute the dumped coal onto a conveyor located directly under the rotary railcar dump enclosure. The chemical dust suppressant is applied as the coal free falls at the sets of feeders below the car dump. He mentioned that a baghouse control is used to control dust during railcar unloading while the chemical dust suppression is used to control the fugitive emissions from the coal leaving the enclosure on the conveyor (i.e., to his knowledge if chemical dust suppression is used in this context it is usually used in combination with a railcar dump enclosure vented to a baghouse).

He stated that the capital cost of installing all aspects of a chemical dust control system at a rotary car dump facility would be approximately $65,000 to $75,000. This would include all headers, nozzles, chemical feed system, bulk chemical storage tank, and the program logic control (PLC) system to control such an operation. He stated that transfer points require a much smaller chemical dust suppression application system costing approximately $2,000 in capital costs per installation. These capital costs reflect systems that contain some additional cost to properly winterize the systems for use in northern climates.

Mr. Lendrum stated that, as a rule of thumb, 1 transfer point is needed to adequately treat 500-800 ton/hr of coal. A good average is for a single transfer point is 600 ton/hr of coal. This is based on the ability of a chemical dust suppression system to treat a maximum volume of coal surfaces in a short timeframe at a single transfer point. When asked about our 2000 ton/hr PRB coal preparation plant he stated that 4 transfer points would be need for adequate chemical dust suppression.

When asked about the costs (both capitol and annualized) involved with controlling fugitive dust emissions from haul roads. He mentioned that he has seen a recent haul road chemical dust control effort that was designed to control dust on a 40’ wide, 22 mile long unpaved road. The annualized costs for this effort were approximately 440,000/yr and the chemical (mixed with water) dust suppressant was applied to the road for only 7-8 months a year (due to climatic conditions in the winter months at the northwestern state location). The mixture was applied once a week by one of two 20,000 gallon spray trucks. The amount of the mixture that was applied equated to 1 qt/square yd of road surface.

When asked about applying water to open conveyors he stated that this is not an efficient way of achieve dust control. He stated that this can turn a conveyor load of coal into a slurry of coal and water that adds significant cost to the process as further drying is need. He stated that if a system is implemented to mass treat coal with chemical dust suppressant there is no need for top application on a conveyor.

Arch Environmental Equipment, Inc.

Contact: Michael Archer

Comment summary: first call

We contacted Mike Archer (Arch Environmental's Marketing Manager) to ask him about costing of dust control at coal preparation plants. Arch Environmental designs and installs dust foggers systems that use water only. Mike stated that he would be glad to respond to an email with our specific costing questions. The email was sent shortly after this meeting.

During the call he stated that to control fugitive dust at mineral handling operations one must first achieve containment and then apply suppressant (water). We mentioned the two lignite electric utility facilities whose coal preparation operations use the monitor canons on tall towers that apply water to the sites to control fugitive dust emissions at the sites. He stated that such systems are normally only utilized if the plants are near populated areas and cause a nuisance opacity problem.

When asked about whether newly built conveyors would be better at controlling dust than older conveyor systems he agreed. The industry's new conveyor systems create less dust (less dust contamination and thus fewer equipment failures) and are more energy efficient.

He stated that the coal type with the most dust and handling issues is PRB coal. Powder River basin coal, while low in sulfur content has high ash content. If sufficient preparations aren't made to coal piles (i.e., partial containment or wind shields) that PRB coal can just blow away. Additionally, PRB coal's fine dust also can cause an explosion hazard when being moved through enclosed conveyors especially if there are electrical issues present (e.g., sparking electrical feeds to conveyor motors). This same tendency is not there with eastern bituminous and lignite coal.

Dover Conveyor, Inc.

Contact: Joe Coniglio

Comment summary: first call

Joe stated that the normal conveyor system installed at coal preparation plants is an open conveyor costing approximately $1,000 per 10 foot length (belt width 30-36" [the normal size for coal preparation application). For maintenance all conveyors have a walkway along side them. The fully enclosed conveyor (with doors on the sides for access) cost approximately $1,500 per 10 foot length (same belt width). He stated there is a type of fully-enclosed conveyor known as a "Galley" where the conveyor and the walkway are both enclosed together. This type of conveyer has to have lighting, cameras, fire exits, and ventilation and be taller (to accommodate the worker). The Gallery costs upwards of $25,000-$30,000 per 10 foot length.

Comment summary: second call

Joe stated that a conveyor system installed at coal preparation plant that is partially enclosed (i.e., rain covers) would cost approximately $1,300 per 10 foot length.

Appendix 1. Email contacts with representatives of Air-Cure, Inc.

Cole, Jeffrey D.

From: Tim Swallow [tim.swallow@aircure.com]
Sent: Tuesday, November 27, 2007 9:39 AM
To: Cole, Jeffrey D.
Subject: RE: Contact summary for your review and additional questions

Yes, they mine it (all strip mining) load it into the trucks that take it to the truck dump which dump it through the crusher and then onto the conveyor up to the silos. In the pictures I sent you, there are two transfer towers to get from the truck dump to the silos along the way as the distance from the truck dump to the silos is to far for one continuous belt.

Timothy R. Swallow
Manager of Applications
Air Cure, Inc.
Phone 763 717 0707
Fax 763 717 0394
mailto: tim.swallow@aircure.com

-----Original Message-----
From: Cole, Jeffrey D. [mailto:colejd@rti.org]
Sent: Tuesday, November 27, 2007 8:35 AM
To: Tim Swallow
Subject: RE: Contact summary for your review and additional questions

Tim,

Based on this description, and others I've found, I don't see a coal storage pile(s) anywhere in this operation. The trucks bring the coal directly from the mine to the crusher. To your knowledge, for PRB mines, is this correct.

Jeffrey Cole
Research Environmental Science Engineer
RTI International
Environment, Health and Safety Division
Environmental Engineering Group
P.O. Box 12194, RTP, NC 27709-2194 (USPS)
(919) 316-3408 (voice) (919) 316-3420 (fax)

From: Tim Swallow [mailto:tim.swallow@aircure.com]
Sent: Monday, November 26, 2007 12:45 PM
To: Cole, Jeffrey D.
Subject: RE: Contact summary for your review and additional questions

Jeff,
See attached pictures. The first shows a truck dump (grizzly on top behind shed) that drops the coal into a breaker (or crusher the red object) then onto a belt that takes it up to the two silos in the second picture, where it is then loaded into trains. Our filter is the green tank on the right. The third picture is of a different mine that has 3 silos.
The coal drops out of the silo into a weigh bin, where it is then dropped out into a second loadout hopper where it is then loaded into the rail car in batches. The trains move very slowly as they are being loaded. Typically only one train car is loaded at a time.
Hope this helps.

Timothy R. Swallow
Manager of Applications
Air Cure, Inc.
Phone 763 717 0707

Fax 763 717 0394
mailto: tim.swallow@aircure.com

-----Original Message-----
From: Cole, Jeffrey D. [mailto:colejd@rti.org]
Sent: Wednesday, November 21, 2007 12:24 PM
To: Tim Swallow
Subject: RE: Contact summary for your review and additional questions

Tim,

I haven't been able to do a site visit at a PRB mine. On one of their websites I found this quote, "The coal is mined from four pits and is hauled by truck to one of three hoppers at the complex, where it is crushed and ultimately conveyed to silos for loadout on unit trains." Have you seen such an operation at a PRB mine? Are there usually multiple silos that can load multiple train cars simultaneously? If so how many railcars have you seen loaded at once? Also, to your knowledge is such loading ever done in a FF controlled enclosure? Thanks.

Jeffrey Cole
Research Environmental Science Engineer
RTI International
Environment, Health and Safety Division
Environmental Engineering Group
P.O. Box 12194, RTP, NC 27709-2194 (USPS)
(919) 316-3408 (voice) (919) 316-3420 (fax)

From: Tim Swallow [mailto:tim.swallow@aircure.com]
Sent: Thursday, November 15, 2007 11:42 AM
To: Cole, Jeffrey D.
Subject: RE: Contact summary for your review and additional questions

Timothy R. Swallow
Manager of Applications
Air Cure, Inc.
Phone 763 717 0707
Fax 763 717 0394
mailto: tim.swallow@aircure.com

-----Original Message-----
From: Cole, Jeffrey D. [mailto:colejd@rti.org]
Sent: Thursday, November 15, 2007 10:25 AM
To: Tim Swallow
Subject: RE: Contact summary for your review and additional questions

Tim,

Thank you for your help on this effort. In answer to your comments on the questions below:

Q 2. Would you say that bituminous coal dust would be ~5 (gr/ft3) and PRB and lignite ~15 (gr/ft3)?We use a range of 5 to 15 gr/dscf for PRB and Lignite depending on if it is on a dumper, crusher, silo, transfer applications. Bituminous is quite a bit less, you may want to figure half.

Q 3. When you say it varies by application do you mean by coal type, The range of size particles stays the same, however the percentage of size particles changes the more the coal is broken up. In some PC fired boilers, the mass mean is much smaller than say on a spreader stoker boiler, as the coal is reduced in size much more. (i.e., the same across all points at a single plant) or coal type being constant, does it vary at a plant depending on the location (e.g., car dump, transfer point once again, the range may stay the same, but the percentage of smaller particles is typically greater the further down the line you go.)? Is there a range of sizes by coal type ? The reason I am asking this question is that the cost model I am using has a default of 7 microns.

Based on your comments and others from other vendors, I have estimated the flow rates for the 800 t/hr coal preparation plant sources (controlling a PRB surface mine) to be the following:

Crusher House: ~25,000 acfm
Transfer point enclosures: ~10,000-12,000 acfm
Conveyor operations: ~10,000-12,000 acfm

If these are reasonable what would these sizes be at:

1. A 1,000 t/hr coal prep plant at an eastern underground bituminous coal mine.
2. A 2,000 t/hr coal prep plant at an western PRB surface mine

I think you are trying to put air volumes on different capacity plants that can vary widely by changes in the coal flow, chutes, drop heights, belt speeds, belt widths etc. I can see where a 800 tph plant may require 10,000 to 12,000 cfm when handling PRB, and then a plant handling a much greater capcity could actually be less air depending on the criteria above.
We design the volume up per each system dependent upon this criteria, so it is very difficult and possibly misleading to state an air volume based strictly on ton per hour.

Also, when designing a dust control system, for each pickup point, the induced, displaced and capture air volumes are looked at. An it is this volume that determines the total system volume, not the actual amount of dust in this volume of air. So, the difference between a system handling PRB, lignite or bituminous coals does not vary dramatically.

Jeffrey Cole
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RTI International
Environment, Health and Safety Division
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(919) 316-3408 (voice) (919) 316-3420 (fax)

From: Tim Swallow [mailto:tim.swallow@aircure.com]
Sent: Thursday, November 15, 2007 9:41 AM
To: Cole, Jeffrey D.
Subject: RE: Contact summary for your review and additional questions:

Jeff,
I've put some answers and comments in red below. I've also attached a short paper that talks about plant safety that you may find interesting.
Hope this helps you out.

Best regards,

Timothy R. Swallow
Manager of Applications
Air Cure, Inc.
Phone 763 717 0707
Fax 763 717 0394
mailto: tim.swallow@aircure.com

-----Original Message-----
From: Cole, Jeffrey D. [mailto:colejd@rti.org]
Sent: Wednesday, November 14, 2007 9:24 AM
To: Tim Swallow
Subject: FW: Contact summary for your review and additional questions

Tim,

I don't know if you already got these emails but one bounced back to me so I thought I'd send it again as a single email. Thanks again for the information and opinions yesterday and during the original call. I am including my draft comment summary from the first and second conversations. Please edit this text to clarify your comments. Note: I added some of the text from your website to clarify the operation of your RF filter. Also, I am trying to do some costing for installing FF's on the facilities we previously discussed. From your experience, could you give me some of the likely parameters for PRB, eastern bituminous, and lignite coal, respectively? Ranges would be fine if a representative number is not realistic.

1. Inlet stream temperature (Deg F). I would think this would be ambient at each location. Ambient, however if the building is heated then the filter needs to be insulated to prevent condensation.
2. Inlet dust loading (gr/ft3): depending on the application, we figure 5 to 15 gr/dscf
3. Dust mass median diameter (microns): a wide range, once again based on the application we figure 1 to 100 as the main sizes.
4. Filtration time (min). Note: I am costing FF's to handle flowrates of 5,000, 10,000, 15,000, 25,000, and 150,000 acfm.Not sure what you are asking here?
5. Dust Specific Resistance (in.H2O/fpm/lb/ft2): The dust is suspended in the air as it travels down the ductwork pipes. We figure no difference in the resistance through the pipe with the dust in it.
6. What bag material would you use to control coal dust from these three coal types? We use a polyester felt, and typically specify a 19oz. fine denier polyester with internal scrim. This will meet the .01gr/dscf emission level that is for most applications now.
7. Do you have a cost estimate (per 100 yards of conveyor length) for installing the manifold system for controlling fugitive dust emissions from an enclosed coal conveyor?We put a front and back hood on at the loading point of the conveyor and then typically one at the discharge end. If the conveyor is closed for the complete length, then it would depend on how long it is to determine whether or not we have intermediate hoods on the enclosed conveyor. This dust control of the conveyor is normally part of a complete system for a building, whether transfer building, crusher building etc.. So to price out just for a conveyor would not be meaningful.
8. How do you site FF's to control emissions from these enclosed conveyors (i.e., do you have one FF for every ### yards of conveyor length or do you install larger units that control multiple conveyors)? See answer to #7 above. Yes, one larger filter.

Draft Contact Summary

Air-cure
8501 Evergreen Blvd.

Minneapolis, MN 55433
763-717-0707
www.aircure.com

Contact Name: Tim Swallow

First call

Air-cure manufactures and supplies dust collection systems and equipment, and specialize in PRB coal both at mines and utilities. Air-Cure engineers have invented and built many baffle and dust containment enclosures for many processes from Rotary Car Dumps, trestle dumps, rotary breakers, batch load-outs, and zipper ducts.

They specialize in a baghouse filter technology known as an RF Filter. RF filter can cut power costs by as much as 75%. The cleaning system of this efficient filter is powered by an air pump rather than the conventional fan. The result is the RF filter demands only 25% of the power needed by similar filters.

Dust laden air enters the RF filter on a tangent to the filter chamber and a circular baffle keeps the incoming air from moving directly to the filter tubes. Instead, it is spun around the lower portion of the filter; a cyclonic action that strips the heavier dust particles from the moving air and drops them directly into the hopper. Next, the air straightener vanes redirect the incoming air to a uniform upward velocity. As a result, the pre-cleaned air carries the remaining dust up through the felted filter tubes depositing the dust over the maximum surface area for maximum efficiency.

Air-Cure's "RF" filter cleaning system creates a high-pressure wave using a high volume of air at lower pressure (7.5 psi). This fills the full length of the tube when injected into the filter tube through a mean orifice of 0.5"x 3" in area.

The RF filter cleaning system is an electromechanical. When the air reservoir reaches approximately 7.5 psi, a pressure or time derived pulse energizes the solenoid valve. The solenoid valve opens a diaphragm valve feeding air to the rotary manifold plenum and nozzles.

It's the amount of filter cloth area that determines a filter's capacity and efficiency. The more area put to work the more efficient the filter (When the proper air to cloth ratio and can velocities are combined with a properly designed system) . Air-Cure's RF filter features a non-aligned arrangement of the filter tubes to provide more tubes and more filter cloth in a given area. The A/C ratio of the RF filter system is in the range of 4:1 to 6:1.

Tim stated that their installations have been achieving emissions of less than 0.01 gr/dscf, regularly, and have had one system tweaked to less than 0.002 gr/dscf. However the latter was very dependent on the specific conditions in the uncontrolled dust stream and is very tough to replicate.

As far as obtaining cost estimates on installing and operation this technology, Tim had a number of concerns. These are custom installations and no two designs are exactly the same. He also stated that if two equally-sized dust control installations could have very different costs based on added bells and whistles. For example, an RF filter system controlling a rotary railcar dumping mechanism and enclosure, installed in the northwest, would probably include a heated skirt support for product quality and worker comfort purposes. The same skirt would not be installed in an identically sized unit in Florida. Such an accessory would increase capital and annual operating costs.

I asked about the potential explosion hazard caused by fully enclosing a conveyor. Tim stated that a properly ventilated and PM controlled system have little chance (there is always a chance for something to happen when dealing with an explosive dust, however, dust control reduces the chances of a problem by continually changing out the dusty air with fresh air to help keep the dust level below the LEL – lower explosive limit) of any explosion concerns. See attached paper on "Increasing Plant Safety".

I mentioned that we are looking at costing three size units (i.e., 30, 200, and 800 t/hr) and asked if he was willing to estimate costs for these systems based on the 3 sizes and noting what features to include (i.e., what bells and whistles would be assumed).

Second call

He stated that fully enclosed conveyors controlled by a FF use a manifold system with multiple extraction points to pull the particulate matter through the filter. He has recently added a special baffle system to the (rotary barrel of the car dumper) conveyor loading chute inside the rotary car dump that reduces fugitive emissions inside the enclosure. He also stated that water/chemical sprays cannot be used in northern climates in the winter months as the water can freeze to the coal (and water and/or chemicals can not wash the dust from the air).

He mentioned when queried that UARG's model plant's rotary car dump enclosure's airflow (300,000 acfm) seemed too large for a 222 t/hr coal prep plant. He asked if it might be a controlling a double railcar dump operation rather than a single. He believes that 140,000 to160,000 acfm is more reasonable for a 222 t/hr single dump enclosure. The largest rotary car dump (this was a bottom dump) enclosure he had ever designed an enclosure for was a 230,000 acfm unit that dumped (multiple cars as they moved through the building) 2 to 3 cars at a time.

He mentioned that UARG's model plant's transfer point enclosures also seemed too large at 25,000-50,000 acfm each to be controlling such points at a 222 t/hr coal prep plant. He believes that a more reasonable airflow would be 5,000-6,000 acfm (using 3 hoods for control). He also stated that the 30 t/hr model plant would have similar airflows at its transfer point enclosures. The 800 t/hr coal preparation plant transfer point enclosures would have ~10,000-12,000 acfm flowrate (using 3 hoods for control). (Assuming that these are simple transfers without much of a drop height)

A crusher house at would probably have an airflow of 5,000-6,000 acfm (at a 30 t/hr model plant) or 10,000-18,000 acfm (at a 200 t/hr model plant). He stated that the cost of controlling PRB vs. Bituminous enclosures with fabric filters is a wash (little to no cost difference).

He also stated that not only would more chemical suppressant be needed at PRB coal preparation plants but also spraying may be needed at more locations than and equivalently-sized plant processing bituminous coal because of PRBs tendency to dust. He also stated that enclosures using water or chemical sprays for dust suppression are not under negative pressure.

When asked about fan and motor efficiencies he stated that fans haven't changed in a long time(There are variations of fan types that are different in efficiencies, so selecting the correct type fan can make a difference in energy consumption) but motor efficiencies have increased. He quoted a Seimens guide to motors listing a 250 to 300 hp motor was 95.8% efficient. This motor was an EPAC rated motor (the best available). This act known as "EPAC" established efficiency levels for electrical appliances and equipment including general purpose industrial electric motors. The law goes into effect on October 24, 1997 and defines specific efficiency levels, testing and labeling procedures. The least efficient one he could find was a 94.1% efficient motor. He believes that in the mid-eighties (i.e., at the timeframe of Rev 2 of this NSPS) the efficiencies may have been around 80%. His last large installation used two 500-600 hp ID fans.

Thanks for the help.

Jeffrey Cole
Research Environmental Science Engineer
RTI International
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(919) 316-3408 (voice)   (919) 316-3420 (fax)

INCREASE SAFETY FOR YOUR POWER PLANT

A Fire or explosion anywhere in your plant can be devastating both from a property loss standpoint and more importantly from a personnel safety standpoint.

Ultimately, we all hope that no problems will occur, however, reality has proven that when dealing with an explosive product (coal, and in particular PRB coal), eventually there will be a problem that causes some type of loss. The statement " not if you have a incident, but when you have an incident", has been made many times by users of PRB coal.

Along with the safety issues, are also the environmental issues that all plants need to concern themselves with. Dust leaving a building and getting into the air is a sure bet that the EPA will be calling at your door. And we all want a safe working environment for our employees.

In general, the NFPA code is an accepted source for safe practices. The guide mentions the MEC (minimum explosive concentration) of dust that can cause problems, and also outlines methods to increase safety when handling combustible solids (such as coal dust).

Dust collection is a method that is talked about in the NFPA code, and has been applied successfully in many coal fired power plants.

Keeping the atmosphere below the MEC is key in controlling the safety level of the atmosphere within areas of your power plant. If the levels of dust are not kept down inside tunnel, rooms, silos, buildings, then the potential of having a major catastrophe are greatly increased.

For a problem to occur, there are three items necessary; fuel (coal dust), oxygen and an ignition source.

We have all seen hot coal (ignition source) being reclaimed and brought into the power house, and there is always oxygen present. So that leaves eliminating the fuel (keeping the dust concentration below the MEC) as the best alternative to creating a safer environment for your facility.

Dust collection captures the majority of dust at its source, however just as important, it continually changes out the air within a belt loader hood, inside a silo, in a tunnel or a room. This continual displacement of air keeps the level of any residual dust that may escape into the air from accumulating and building up and keep it down to an acceptable (safe) level.

In the same manner, a dust collection system keeps the frequency of house cleaning down as well (although not eliminating it). By continually displacing the residual dust that may be in the air with fresh air, the light float dust (that by the way is the most dangerous dust as it is typically the PM10 dust), is also captured by the dust collection system, and not all ending up settling on the beams, conveyor covers and other equipment.

Once the coaling process is complete and silos are full, a dust collection system quickly displaces the dusty air within the silo with fresh air and lowers the level of dust within the silos down to an acceptable (safe) level.

Only with a negative type dust collection system which controls and dilutes the dust at the same time, are all of the above benefits for a safer operation obtained.

The NFPA code outlines the use and application of dust collection systems and is a recognized source for increasing safety.

By applying dust collection properly to your facility, the issues of safety, environment and employee work conditions are all met.


TRASH ONLY

Appendix 2. Email contacts with representatives of AKJ Industries, Inc.

Cole, Jeffrey D.

From: Jack Cranfill [jackcranfill@yahoo.com]
Sent: Wednesday, December 05, 2007 2:32 PM
To: Cole, Jeffrey D.
Subject: Re: Comment summary for phonecon with RTI International

Corrections;

The silos at coal mines feed coal preparation plants that size and wash the coal to remove impurities - for this reason (washing the coal) the coal is typically of a moisture where dust is not an issue.

For haul roads in the west they typically use magnesium chloride or calcium chloride.

Shipments of dust products are typically 5,000 gallons so bulk tanks for storage are typically 6,000 to 10,000 gallons.

Good luck,

Jack Cranfill

Jack Cranfill

Cole, Jeffrey D.

From: Cole, Jeffrey D.
Sent: Wednesday, October 03, 2007 10:51 AM
To: 'jackcranfill@yahoo.com'
Subject: FW: Recort of telecon with RTI International
Attachments: AKJ Industries contact report.doc

Jack,

Here are my recollections of our conversation. Please comment as necessary and email it back to me. Thanks for the help.

Jeffrey Cole
Research Environmental Science Engineer
RTI International
Environment, Health and Safety Division
Environmental Engineering Group
P.O. Box 12194, RTP, NC 27709-2194 (USPS)
(919) 316-3408 (voice)   (919) 316-3420 (fax)

Cole, Jeffrey D.

From:	Jack Cranfill [jackcranfill@yahoo.com]
Sent:	Monday, January 07, 2008 3:47 PM
To:	Cole, Jeffrey D.
Subject:	RE: Cost of sealing agent for long-term coal piles

$10 to $20 per 1000 sq ft.

From: Cole, Jeffrey D. [mailto:colejd@rti.org]
Sent: Monday, January 07, 2008 2:39 PM
To: jackcranfill@yahoo.com
Subject: Cost of sealing agent for long-term coal piles

Jack,

In early December you mentioned in our phone conversation what the cost would be to apply latex sealant on a long- term coal storage pile. I have misplaced that quote. What is your estimate of the $/1000 sqft.? Thanks.

Jeffrey Cole
Research Environmental Science Engineer
RTI International
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Environmental Engineering Group
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Appendix 3. Email contacts with representatives of Nalco Company

Cole, Jeffrey D.

From: Stephen J Blubaugh [sblubaugh@nalco.com]
Sent: Monday, November 05, 2007 5:39 PM
To: Cole, Jeffrey D.
Cc: Shaun P Lendrum
Subject: Re: Telephone contact minutes with RTI International

Dear Jeffrey,

I took the liberty of changing your draft below. My suggested changes are in red.

While we did not discuss it in our conversation, you may want to consider including some mention of the dust control steps taken by segments of the coal to control:

- Fugitive coal dust at the mine face
- Airborne particulate from on-site haul roads

Both of these are which are upstream of the coal preparation plant.

In addition, while there seems to be a great deal of resistance on the part of coal producers, there is an increasing clamor by the some of the railroads (most notably the Burlington Northern (Powder River Basin coal) for the use of binders to prevent coal loss from open gondola car tops while the coal is in transit to the coal customers (primarily utilities).

I hope this helps. If you have any other questions or have difficulty getting in touch with Shaun Lendrum, give me a call at your convenience.

Best regards,

Steve Blubaugh
Marketing Manager
Coal, Synfuel and Oil Sands
630 305 2579 (office)
630 305 2879 (fax)
630 730 3805 (cell)

"Cole, Jeffrey D." <colejd@rti.org>

11/05/2007 12:55 PM

To: <sblubaugh@nalco.com>
cc:
Subject: Telephone contact minites with RTI International

Steve,

Here are the notes I took during our conversation. Please let me know of any changes are needed.

Nalco Company
1601 W. Diehl Road
Naperville, IL 60563-1198 U.S.A.

Contact: Steve Blubaugh (630-305-2579, sblubaugh@nalco.com)

Steve Blubaugh (Nalco's Marketing Manager for Mined Energy Materials [coal, synfuel, oils sands]) explained that Nalco is a company that markets and designs wet suppression programs (products and systems) for dust control to a variety of mineral processing sectors. ~~Most of t~~The developmental work has taken place in the United States but much of the demand comes from ~~cutting edge work and installations have previously taken place in~~ Europe and Latin America. T~~but t~~his technology is starting to be used in U.S. facilities . Nalco is a company that, among other efforts, provides chemicals to mineral handling facilities to control dust emissions. As part of these efforts they work with both mineral producing prospects and current customers as well as design firms that construct conveyors, enclosures, and fabric filter systems on mineral processing sector facilities.

We asked Steve about his knowledge of separation and dewatering operations at mine-based coal preparation plants. Our research of the industry noted that the plants use a variety of dry methods to reduce the "top size" (crushing), remove contamination (e.g., rocks, wood, iron and steel residue from mining machine tools) that is usually introduced by the mining process from the Run-of-mine (ROM) coal. These early-stage dry processes could add to fugitive emissions from mine-based coal preparation plants. Steve stated that beyond crushing and sizing, most coal preparation plants are ~~he knew of some of the~~ using spiral classification, cyclones, froth floatation to separate the desirable fine coal fraction from the waste material (clays) ~~desired fraction~~ and then dewater that coal using vacuum and/or pressure filtration and in some a few cases (primarily for metallurgical coals) thermal drying. The later processes are inherently wet and should not add to possible fugitive emissions. The dewatering processes are used to remove surface ~~internal~~ moisture (as opposed to inherent ~~surface~~ moisture). Coal preparation facilities then use thickeners or clarifier tanks to clean and recycle water for re-use.

Steve mentioned that one of his company's best received programs uses ~~has~~ a product known as "Dust Foam Plus" that uses a proprietary ~~atented~~ combination of chemicals that are applied as foam. This program~~-duct~~ adds minimal surface moisture but has the dust control performance of wet suppression. Adding too much surface moisture adds additional costs and performance challenges for coal preparation plant as well as Btu penalties the coal consumer . It is easier and cheaper to work with a dryer product.

He stated that chemical suppressants that are added to control crusher generated dust or often injected at the mouth of the crusher while always attempting to disperse the surfactant without applying too much moisture ~~of the chemical~~. Over application again can cause excessive surface moisture.

We asked Steve if he could give us any estimated costs for wet suppression dust control at various points in a coal preparation plant. He stated that we should contact his colleague, Shaun Lendrum, for specifics on costing.

Jeffrey Cole
Research Environmental Science Engineer
RTI International
Environment, Health and Safety Division
Environmental Engineering Group
P.O. Box 12194, RTP, NC 27709-2194 (USPS)
(919) 316-3408 (voice) (919) 316-3420 (fax)

Cole, Jeffrey D.

From: Shaun P Lendrum [splendrum@nalco.com]
Sent: Monday, November 26, 2007 10:37 AM
To: Cole, Jeffrey D.
Subject: RE: Telephone contact minutes with RTI International

Jeffery,

My apologies for the delay in responding
I was away on a weeks vacation on getting back from Brasil.

Please see my comments in red below.

Thanks and regards,

Shaun.

"Cole, Jeffrey D." <colejd@rti.org>

11/12/2007 10:24 AM

To: "Shaun P Lendrum" <splendrum@nalco.com>
cc:
Subject: RE: Telephone contact minutes with RTI International

Shaun,

Thanks for your corrections. I have a few more questions. In the following paragraph you provided me an example of high speed crusher. Can you do the same for a low speed crusher?:

We asked him about the cost of control on crushers and he explained that it is extremely difficult to give a general number. There are high speed crushers (300 to 400 tons/hr) and low speed (? to? tons/hr) crushers that have vastly different dust emissions due to the 'fan' effect the internal mechanisms of these units can produce. The cost of controlling the later is much less than the former given the same coal. The lower speed crushers will be at the lower end of the cost ranges already provided vs the high speed which will be at the opposite higher end of the ranges.
Additional questions:

1. What is the longevity of chemical suppressants (properly applied) at a drop point? In examining the number of transfer (drop) points from one belt to another. Am I correct in assuming the three areas where suppressant needs to be applied is the drop point onto the active coal pile and at various points in the crusher house? If water spraying only is used, where are the nozzles usually located in a coal prep plant? In a typical coal plant, At transfer (drop) points, the material must always be treated on both its front and back side as it free falls in an 'expanded' state in order to achieve efficient effective suppression. This is where most organizations make the mistake. They usually only treat the front side because its easy to do. Installing sprays on the back or underside

of conveyor head pulley's is usually more time consuming and challenging but these are definitely the most effective ones as this is where all the majority of the fine fugitive material releases from. Nozzles must always be located inside well contained hoods of chutes [for control of as much displaced, induced and generated air as is possible] at transfer (drop) points. For efficient dust suppression, the no of transfer (drop) points is dictated by the material flow volume. i.e. a good rule of thumb is:- for every 500 tph, one transfer (drop) point must be treated. So for 800 tph you must treat at least two transfer (drop) points in the material handling system etc.

Depending on the chemistries applied, residual dust control from as low as 24 hours to as much as 21 days is readily

achievable.
2. Have you seen any use of chemical suppressants inside a rotary car drop point enclosure or do they usually use water spray only at this point? Yes.
Chemical additives are routinely added to the water supplies feeding the spray systems utilized at rotary dump stations to vastly improve the wetting capability of the water being sprayed.
3. How energy efficient (roughly) are the fans and motors used to create the negative pressure in enclosures, as opposed to 20-25 yeas ago?. One can assume that more modern fan designs and motor technologies have definitely improved over time. Maintaining the integrity of containment areas and the ducting fans operate in remains a burden.
4. Can you tell me roughly how much more air is treated at a transfer point (enclosure) as opposed to a crusher house (containing crushers and sizing screens)? A transfer point is typically a 'localized' confined and 'contained' area of far lesser cubic volume than an overall complete crusher house which by comparison is a vast open area that can extend over multiple levels or stories from ground level up. The total cubic area of any plant depends on the physical size of the plant which is a function of its designed tph capacity. A plant (crusher house) by definition will contain multiple machines, conveyor belts and chutes etc., all of which are some form of 'transfer points' themselves. All these separate transfer points, if individually are a source of fugitive emissions, will require to be individually 'contained' and treated whether by dust suppression or by dust collection.

Thanks.

Jeffrey Cole
Research Environmental Science Engineer
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(919) 316-3408 (voice) (919) 316-3420 (fax)

From: Shaun P Lendrum [mailto:splendrum@nalco.com]
Sent: Monday, November 12, 2007 9:57 AM
To: Cole, Jeffrey D.
Subject: Re: Telephone contact minutes with RTI International

Jeffery,

As requested, I reviewed your notes and have included my adjustments in blue below.

It was a pleasure conversing with you and please don't hesitate to contact me if I can be of any further assistance.

Best regards,

Shaun Lendrum.

ITC - Nalco Global Mining and Metals Division.
Cell: 859-948-7238
email: splendrum@nalco.com

"Cole, Jeffrey D." <colejd@rti.org>

11/05/2007 01:55 PM

To: <splendrum@nalco.com>
cc:
Subject: Telephone contact minites with RTI International

Shaun,

Here are the notes I took during our conversation. Please let me know of any changes are needed.

Nalco Company
1601 W. Diehl Road
Naperville, IL 60563-1198 U.S.A.

Contact: Shaun Lendrum (859-948-7238, splendrum@nalco.com)

Shaun Lendrum is an ITC (Industry Technical Consultant) with Nalco. He travels to mining, quarrying and material handling industrial processes all over the world to advise companies on how to solve dust control problems. He stated that basically in order to have fugitive dust emissions, it always required two components, Fine PM and air velocity. Of these, controlling the **d**isplaced, **i**nduced and **g**enerated air velocity's tended to be the biggest challenge.

We asked him about the cost of control on crushers and he explained that it is extremely difficult to give a general number. There are high speed crushers (300 to 400 tons/hr) and low speed (? to? tons/hr) crushers that have vastly different dust emissions due to the 'fan' effect the internal mechanisms of these units can produce. The cost of controlling the later is much less than the former given the same coal.

We asked Shaun about the prevalence of dust collection or extraction systems at mineral handing facilities? He stated that his recent experience indicates somewhat of a reluctance by companies to go this route due to the enormous capital cost now involved in installing these systems combined with the high maintenance and operational costs that go hand in hand in running these systems. Disposal (of the collected PM) also remains a problem.
Many companies operating extraction or collection systems add all the collected PM back into the original material at later stages downstream in their material handling systems. This can result in large clouds of PM every time the collected PM is dumped back into the system.
Shaun stated that modern wet suppression techniques utilizing the latest more efficient chemical suppressant technologies developed over recent years, now has the ability to provide long lasting 'residual' dust control across multiple transfer points in a material handling system. Modern efficient dust suppression foams also only add minimum moisture to the materials they are treating.

Shaun stated that from experience, Powder River Basin (PRB) subbituminous coal by nature has proved to be extremely dusty in comparison to eastern produced coals, and typically requires a much higher degree of dust suppression treatment than the eastern coals. Whereas it may require 10 to15 ppm of chemical suppressant/ton of coal treated for eastern bituminous coal, it would likely need 24 to 30 ppm of chemical suppressant/ton of PRB coal treated. Eastern coal costs on average from 0.005 to 0.08 cents/ton for total treatment (depending on specific conditions). PRB coal costs on average from 0.03 to 0.10 cents/ton for total treatment (depending on specific conditions). These two cost estimates are for chemicals only (no equipment costs).
For questions on and information about the capital costs of installing conveyors and transfer point enclosures, belt hoods, belt skirting and sealing etc., Shaun suggested we talk to conveyor vendors as his company does not do that kind of work.

Shaun also stated that to use chemical suppressants efficiently and effectively, adequate effective containment at application points must be achieved. All transfer points (where wet suppression/chemical suppressants are applied) should have enclosures allowing a conveyer to enter the enclosure and another conveyor to leave the enclosure. The three types of air (displaced, induced, and generated) have to be controlled in such a way to induce a negative pressure inside such an enclosure.

He also noted that in numerous material handling operations, some of the largest dust problems were generated at screening processes.
Crushers are typically enclosed by design and only their inlets and outlets or discharges are the areas where dust is generated.

Jeffrey Cole
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Cole, Jeffrey D.

From: Cole, Jeffrey D.
Sent: Monday, December 03, 2007 4:01 PM
To: 'splendrum@nalco.com'
Subject: Further questions on chemical suppresants use at coal preparation plants

Shaun,

I have some further detailed questions on top of the previous help you provided. I know this is asking a lot but we are trying to be as realistic as possible. I would appreciate any help you could give me.

Q1. I have a question about of the latency of the chemicals used to control dust as coal is transported through the coal preparation process. In the modeling we have done so far we have modeled the chemical cost as if it were constantly being applied to the coal at different points in the coal preparation plant (e.g., ~ $0.065/ton of PRB coal). If chemicals (other than foam) are being applied in the crusher house, at the transfer towers and during product loading onto railcar, can the amount of chemicals applied at later points be reduced as the coal moves through the coal preparation plant due to the chemical suppressants latent dust control? If so would this ability to reduce chemical use be seen at Eastern bituminous coal prep plants?

Q2. Can you give me an estimate of the annualized and capital cost for setting up a haul road chemical dust suppression system for a PRB surface mine (in Wyoming) with the following parameters:

- Round trip distance from coal pit to crusher: 2 miles
- Number of round trips/hr: 3
- Number of trucks: 30
- Total calculated vehicle miles traveled: 1,569,600 VMT

Q3. I am also looking for capital and annualized cost estimates for chemical spray suppression systems located inside enclosures (the cost of the enclosure is should not be included) for the following operations:

Eastern Bituminous coal preparation plant

150,000 acfm (coal unloading facility (railcar dump))
150,000 acfm (coal product loading facility (railcar loader))
25,000 acfm (crusher house)
25,000 acfm (coal unloading facility (railcar dump))
15,000 acfm (crusher house)
11,000 acfm (transfer tower)
5,500 acfm (crusher house)
5,500 acfm (transfer tower)

PRB coal preparation plant

150,000 acfm (product loading facility (railcar loader))
25,000 acfm (crusher house)
11,000 acfm (transfer tower)

Note: I did not know if there were differences in the costs for these dust suppression systems due to what operation is being controlled so I listed these enclosures flowrates individually.

Q4. Also, can you give me an estimate of the capital and annualized costs on a water (only) dust suppression system on 100 yards of open conveyor (30-36 inch belt width)?

Thank you,

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Cole, Jeffrey D.

From: Shaun P Lendrum [splendrum@nalco.com]
Sent: Tuesday, December 18, 2007 2:23 PM
To: Cole, Jeffrey D.
Subject: Re: Comment Summary
Attachments: NALCO.doc

Jeffrey,

Attached below is your 'draft' with my changes added as requested.

1. Regarding the question about regular maintenance hours per year for a dust suppression system at :-

a. Rotary car dump. Estimate 30 min per week.
b. Crusher house. Estimate 20 min per day.
c. Transfer points. Estimate 10 min per day.
d. Stackout operation. Estimate 1 hr per week.

2. Regarding the cost of chemical dust suppression system at a stackout:

Costs for an efficient chem suppression system could be as low as $20 -30K to as high as $60-80K. It depends on the tph rate and the degree of sophistication and /or complexity of the configuration of the actual stackout system.

Thanks,

Shaun lendrum.

"Cole, Jeffrey D." <colejd@rti.org>

12/14/2007 10:39 AM

To: <splendrum@nalco.com>
cc:
Subject: Comment Summary

Shaun,

Here is my draft comment summary. Please add text, correct, and delete as you see fit. I have turned "track changes" on so that I can see what you edit.

A question I forgot to ask. Could you give me some idea of the hours of labor necessary per year to keep these chemical dust suppression systems operational (regular maintenance hours by process: rotary railcar dump, crusher house, transfer point, stackout). Also what would the approximate installation cost for a chemical dust suppression system on a stackout operation?

Thanks.

Jeffrey Cole

Research Environmental Science Engineer

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NALCO.doc has been removed from this note on December 18 2007 by Shaun P Lendrum

Cole, Jeffrey D.

From: Cole, Jeffrey D.
Sent: Thursday, January 17, 2008 4:43 PM
To: 'Shaun P Lendrum'
Subject: RE: Comment Summary

Shaun,

Have you ever seen any test results of what PM size fractions (i.e., TSP, PM10, PM2.5) are emitted from coal after chemical dust suppression is used? We are trying to compare PM control devices vs. the use of chemical dust suppression. PM control devices transmit a small portion of their uncontrolled PM and we are examining the PM size fraction of these post control emissions. I have been asked to see what fractions are emitted first, second, and so forth after the chemically treated coal is crushed or deteriorates over time.

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From: Shaun P Lendrum [mailto:splendrum@nalco.com]
Sent: Wednesday, January 02, 2008 6:26 PM
To: Cole, Jeffrey D.
Subject: RE: Comment Summary

Jeffery,

Happy New Year !

Regarding your queries, I can comment as follows:-

The $440,000 per year example I shared with you represents Chemical cost only for the 22 mile x 120' wide road being treated. (i.e. 116,160 x 120 = 13,939,200 ft2)
I do not know what their water cost is but assume it to be very low as the operation owns the own wells etc. where they get their water from.
Assuming identical road base material conditions, climatic conditions and traffic volumes and patterns, one can pro-rate the treatment costs accordingly :-
i.e. 10 miles vs 22 miles = $440, 000 -:- 22 x 10 = $200,000

Regarding water only. This company did try but simply could not control their road dust satisfactorily with water only. (Utilized water spray trucks on a continual basis).

Typical reductions in water usage range from 30% - 50% when using chemical road treatment programs. This in turn reduces the application requirements (spray trips and associated costs) accordingly.
But again, a number of factors will always influence the results one can achieve i.e. road base material make-up, traffic patterns and volume, climatic conditions.

Thanks,

Shaun.

"Cole, Jeffrey D." <colejd@rti.org>

01/02/2008 04:10 PM

To: "Shaun P Lendrum" <splendrum@nalco.com>
cc:
Subject: RE: Comment Summary

Shaun,

Hope you had a nice holiday season. In describing that haul road chemical dust suppression effort (i.e., $440,000 annualized cost) having a 44 mile round trip, could you let me know what portion of the $440,000 is chemical cost? Water cost? If I had needed to scale down this haul road to a 10 mile (round trip) with the same width what would this reduce the $440,000 cost to? If the company tried to control fugitive dust from the same road with water spray only, how much, approximately, would that increase their frequency of trips? Water cost?

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From: Shaun P Lendrum [mailto:splendrum@nalco.com]
Sent: Tuesday, December 18, 2007 2:23 PM
To: Cole, Jeffrey D.
Subject: Re: Comment Summary

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Thanks,

Shaun lendrum.

"Cole, Jeffrey D." <colejd@rti.org>

12/14/2007 10:39 AM

To: <splendrum@nalco.com>
cc:
Subject: Comment Summary

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Thanks.

Jeffrey Cole

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NALCO.doc has been removed from this note on December 18 2007 by Shaun P Lendrum

Appendix 4. Email contacts with representatives of Arch Environmental Equipment, Inc.

Cole, Jeffrey D.

From: Cole, Jeffrey D.
Sent: Monday, November 05, 2007 11:15 AM
To: 'mikea@aeec.com'
Subject: Cost of controls on Coal Prep plants

Mike,

It was nice speaking with you. Hope the rest of your Monday goes smoother. I am looking for a $/ton cost of controlling fugitive dust emissions for these different locations at coal prep plants. Also please include details on the costs of constructing enclosures at points below on plants with throughputs of 30, 200, and 800 ton/hr.

1. Raw material receiving: (rotary car dumps or dropping coal from the bottom of railcars; usually inside enclosures): We have seen water spray control efficiencies of around 60% without enclosure; 90% with a full enclosure). I'm note sure if the number quoted (90%) includes a water spray system inside the enclosure. Let me know your thoughts on the normal practices.
2. Transfer points: Similar to raw material receiving, we have seen water spray control efficiencies of around 60% without enclosure; 90% with a full enclosure). I'm note sure if the number quoted (90%) includes a water spray system inside the enclosure. Let me know your thoughts on the normal practices.
3. Conveying operations: We have seen water spray control efficiencies of around 60% without enclosure; 75% with a partial enclosure [3 sides], and 95% with a fully enclosed conveyor). I'm note sure if the numbers quoted (75 and 95%) include a water spray system inside the partial or fully enclosed conveyor. Let me know your thoughts on the normal practices.
4. Coal storage piles: we have seen water spray control efficiencies of around 60%. Let me know the different water spray control efficiencies (i.e., non-working and working piles).
5. Crushing (both primary and secondary): we have seen water spray control efficiencies of around 90% using partial enclosure and water sprays.
6. Screening: we have seen water spray control efficiencies of around 90% using partial enclosure and water sprays.
7. Product loading: we have seen water spray control efficiencies of around 60% without enclosure.

Thanks for you help on this.

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