



Farzie Shelton, chE; REM

Manager of Environmental Affairs

November 14, 2005

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BUREAU OF AIR REGULATION

Ms. Trina Vielhauer, Chief
Bureau of Air Regulation
Florida Department of Environmental Protection
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Attention: Mr. Greg DeAngelo, P.E., Administrator Southwest Permitting Section

RE: C.D. McIntosh, Jr. Power Plant – Pulversizer Enhancements
Title V Permit # 1050004-016-AV; PSD-FL-008
Conditions of Certification PA 81-13

Dear Trina:

Lakeland Electric is requesting that the Department authorize the testing of pulverizer component changes to one of the four 20-25% capacity pulverizers on McIntosh Unit 3. A description of these potential enhancements and effect on emissions from a Professional Engineer is attached. This certification provides additional changes and testing that will be performed. The information from the test will provide information on performance. Based on the successful outcome of these tests, changes to the remaining 3 pulverizers will be made. Authorization will be sought from the Department as necessary.

The attached information will be included in the next Title V renewal application. We intend to perform these tests in ten days, when Unit 3 is in a mini outage, therefore, we appreciate your response at your earliest convenience. As always, we appreciate your cooperation in this matter. Please do not hesitate to contact me if there are any questions or additional information related to this notice.

Sincerely,

Farzie Shelton

Enclosures

City of Lakeland • Department of Electric Utilities

501 East Lemon Street • Lakeland, FL 33801-5050 • 863. 834.6603 • Fax 863. 834.8187 • Cell 863. 860.5998

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November 15, 2005

0537632-0100

Lakeland Electric
501 E. Lemon Street
Lakeland, Florida 33801-5079

Attention: Ms. Farzie Shelton, Manager of Environmental Affairs

RE: C.D. MCINTOSH, JR. POWER PLANT, UNIT 3, FACILITY I.D. #1050004
FINAL TITLE V PERMIT 1050004-016-AV
PULVERIZER ENHANCEMENT

Dear Farzie:

This Professional Engineer's Certification provides a description, estimated effects on emissions, and regulatory evaluation of the pulverizer enhancements proposed for McIntosh Unit 3 pulverizers.

Description of Pulverizer Enhancements: McIntosh Unit 3 is a pulverized coal-fired unit with a heat input of 3,640 million British thermal units per hour (MMBtu/hr). Coal is pulverized using B&W MPS-75 (Roll-wheel)-type pulverizers. Unit 3 has four 25-percent-capacity pulverizers. Lakeland Electric proposes to make enhancements to the pulverizers to improve the combustion process. The enhancements will be designed and manufactured by Sure Alloy Steel Corporation and include the replacement of existing pulverizer components with the following:

- Rotating Throat Assembly,
- Classifier Cone Extension,
- Exterior Adjustable High Spin Classifier,
- Multi-Outlet Diffusers,
- Aero Shields,
- Knife Gate Isolation Valves, and
- Adjustable Venturi Orifice.

A general description of this equipment is attached. The rating of the pulverizers will not change. Additional information can be obtained from the Sure Alloy Corporation's web site: www.surealloy.com.

The enhancements are designed to improve the combustion of coal and petroleum coke through better distribution of coal and air to the boiler while providing sufficient fineness of the fuel to ensure proper combustion. The benefits of improved combustion include a decrease in Loss of Ignition (LOI) of the collected fly ash. Since LOI is basically carbon content, better combustion would slightly improve the heat rate since fuel that would otherwise end up in the ash would be combusted. The improvement will also reduce the amount of power required to operate the pulverizers, thereby saving energy costs. There will be no change in the maximum heat input of the unit.

The testing will be performed in 31 Mill and include air flow, coal flow, air/fuel ratios, velocities and profiles and fuel distribution and fineness. These data will be used to establish baseline conditions for the development of mill capacity corrected for fineness, Hardgrove Grinding Index (HGI), moisture content and fuel distribution. Test methods would follow procedures by the American Society of Mechanical Engineers (ASME) and the American Society of Testing and Material (ASTM).

Effects on Emissions: The enhancements to the pulverizers are not expected to increase emissions and will likely reduce emissions. The reduction of LOI will reduce the amount of carbon in the fly ash. Carbon has relatively high resistivity, making collection more difficult in electrostatic precipitators (ESPs) than other particles. Although the ESP is capable of handling the current fly ash generated by the McIntosh Unit 3 boiler, decreasing carbon in the fly ash will be beneficial. The improved fineness, air and coal distribution will improve combustion reducing the formation of products of incomplete combustion such as carbon monoxide (CO) and volatile organic carbons (VOC). Improved air/fuel distribution provides better control of the combustion process with improved operation of the low-nitrogen oxide (NO_x) burners, thereby reducing NO_x emissions.

Regulatory Evaluation: Under the Rules of the Department of Environmental Protection (FDEP) as defined in Chapter 62-210 a modification is a physical or operation change that increases emissions. The increase in emission are based on increases in annual emissions with the comparison of past actual and future actual appropriate for electric utility steam generating units like McIntosh Unit 3. While the enhancements to the pulverizers are a physical change, no increases in emissions are anticipated. Indeed, emissions are expected to remain the same or decrease as a result of improved combustion. In addition, because the enhancements will be made initially to only one pulverizer, any change in emissions will likely be masked by the other three pulverizers. Nonetheless, the testing as described above would insight on whether an emission change will occur or not. With information from testing, an appropriate request to the FDEP can be made and a permit obtained if necessary.

Please contact me if there are any questions related to the information contained in this evaluation.

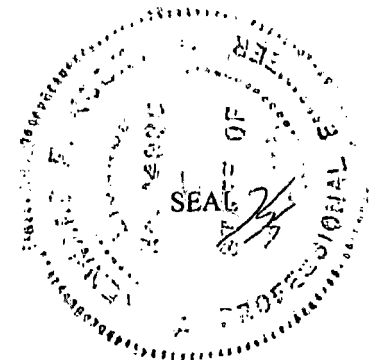
Sincerely,

GOLDER ASSOCIATES INC.



Kennard F. Kosky, P.E.
Principal
Florida Professional Engineer License No. 14996

KFK/nav



Improved LOI through Fuel Pipe Balance

Rick Wark. Presenter

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Summary

It is generally understood that the primary function of a coal pulverizer is to dry, grind, and convey coal to a boiler. Pulverizer performance is typically measured in terms of fineness or capacities. Most power plants, however, often overlook the lesser known effects of the pulverizer on Combustion Performance. It is entirely possible to have a properly performing pulverizer, as measured by fineness and capacity, and still have poor Combustion. The following case study illustrates how one plant, operating with acceptable coal fineness, suffered from high LOI, and the unique solution to fixing the problem.

A Wall Fired Unit in Southeastern United States, operating with three pressurized pulverizers (6 coal pipes each) with dynamic classifiers, had recently undertaken a Low NOx Burner retrofit. After the Low NOx conversion, the LOI climbed to over 16%. At that time, the plant was running with fineness levels about 99% through 50-mesh and 68% through 200-mesh firing western fuel. Plant personnel correctly deduced that they had a large imbalance in their coal pipes. Subsequent testing and mapping of O₂ and CO levels in the boiler confirmed the effects of the imbalance. In an attempt to correct the problem, the plant replaced all fixed orifices with adjustable orifices. After numerous attempts they were unable to make any substantial gains in coal pipe balance. The plant then installed Multi-Outlet Diffuser Systems (A patented product manufactured by Sure Alloy Steel Corp) in all three pulverizers. The result was a 78% improvement in coal-pipe balance and a 56% reduction in LOI; down to 7%.

Boilers operate more efficiently if the coal (and air) delivered to them is properly balanced and ground to the correct fineness. In the above case, the fineness level of the coal was acceptable, yet the coal pipe balance was poor-resulting in slagging and high LOI. Until recently, the most common method used to balance individual coal pipe flows has been fixed or adjustable orifices. Many power plants have tried this approach with very limited success. The fact remains - if orificing is the solution, why do power plants still have poor coal pipe balance?

Sure Alloy Steel Corporation has developed a practical solution to the coal pipe balance problem by addressing it at its source – within the pulverizer itself. Sure Alloy's Multi-Outlet Diffuser System (Patented and Patents Pending) promotes proper coal distribution from pressurized pulverizers. The usage of orifices to match individual pipe resistance is much more effective with the coal evenly distributed exiting the pulverizer. Improvement in coal *and* air to fuel ratio balance across all of each mills' coal pipes are the end results of the SAS Multi-Outlet Diffuser System. SAS has successfully used this technology to balance pulverizers with 3 to 8 coal pipes.

Many plants fine tune their boilers with secondary and tertiary airflows to compensate for imbalanced coal and primary airflows. A balanced fuel delivery system would allow engineers to make more subtle adjustments, have fewer side effects and allow more precise boiler tuning. Other applications of SAS Patented Diffusion Technology include pre-riffle distributor and/or riffle elimination, one-to-x splitters and pre-burner (SAS Patented In-Line Diffuser) applications.

The SAS In-Line Diffuser would be a separate and final step in a Fuel Delivery System Upgrade after mill performance and balance are achieved. The In-Line Diffuser is used just upstream of the burner nozzles, typically oriented in a horizontal position inside of the barrel. Stratified fuel and primary air (roping) are 'diffused' just as they enter the nozzle tip and exit into the boiler creating an ideal mixture for combustion. This diffused mixture helps many problems associated with burner performance including: flame instability/detachment, eyebrows, increased LOI, fuel impingement on boiler walls, imbalance in CO and O₂, excessive slagging, and problems adjusting low NOx burners.

The first step in boiler optimization initiatives such as Low NO_x Burners, Over Fire Air, Reburn Fuels or SCR projects, etc. should be a complete evaluation of the pulverizer fuel delivery system. Many large scale projects end up in litigation which could be easily avoided by spending money upfront verifying and correcting pulverizer performance and balance first. Some projects may not even be needed with a properly performing and balanced fuel delivery system!

SAS Patented Rotating Vane Wheel

The proven benefits of our Rotating Vane Wheel have been experienced by many Power Plants in North America, with nearly 300 kits installed to date. Most plants, after installing and evaluating their first kit, have immediately scheduled all remaining mills to be converted to SAS Vane Wheels. Although not every plant has the same needs, here are some of the reasons for installing a SAS Rotating Vane Wheel in your MPS mill, CE Deep Dish, or CE Shallow Bowl Pulverizer.

- Lower mill motor amps. Typical reductions have been 10 to 18
- Lower primary air flows. The SAS design has adjustable airports, allowing throat air velocities to be adjusted to match the required primary air mass flow.
- Increased fuel drying capabilities. The SAS design vane/deflector arrangement dries the coal faster by providing a more evenly supported coal bed around the periphery of the bowl.
- Quicker mill response time. An evenly supported coal bed and improved circulation/mixing of the hot primary air provide smoother and quicker ramping of the pulverizer.
- Increased mill capacity. Having extra capacity is beneficial should a pulverizer be removed from service during peak generation times.
- Lower maintenance costs. Even coal flows at lower velocities will improve the life of internal mill components.
- Easy to install and maintain. The SAS design is modular and requires very few hours to completely assemble.
- Complete customer support. SAS provides numerous products and services to assist in operational and maintenance aspects of the mill from coal pipe flow testing to bowl/roll overlays.

We strive to serve the operations side, with performance, and also provide maintenance with a product that has wear resistant material options. Which, can also be tailored to the particular fuel the plant is burning.

SAS Patented Two Piece Coal Nozzle

Sure Alloy Steel's patented design is simple and user friendly. The outer and inner housing, which contain the splitter plates, are not attached. This is a crucial aspect of our design that allows both components to expand and contract independently.

Mathematical calculations allow for a tapered fit that permits the inner housing to slide into the outer housing. Locking tabs secure the inner housing and prevent any forward movement.

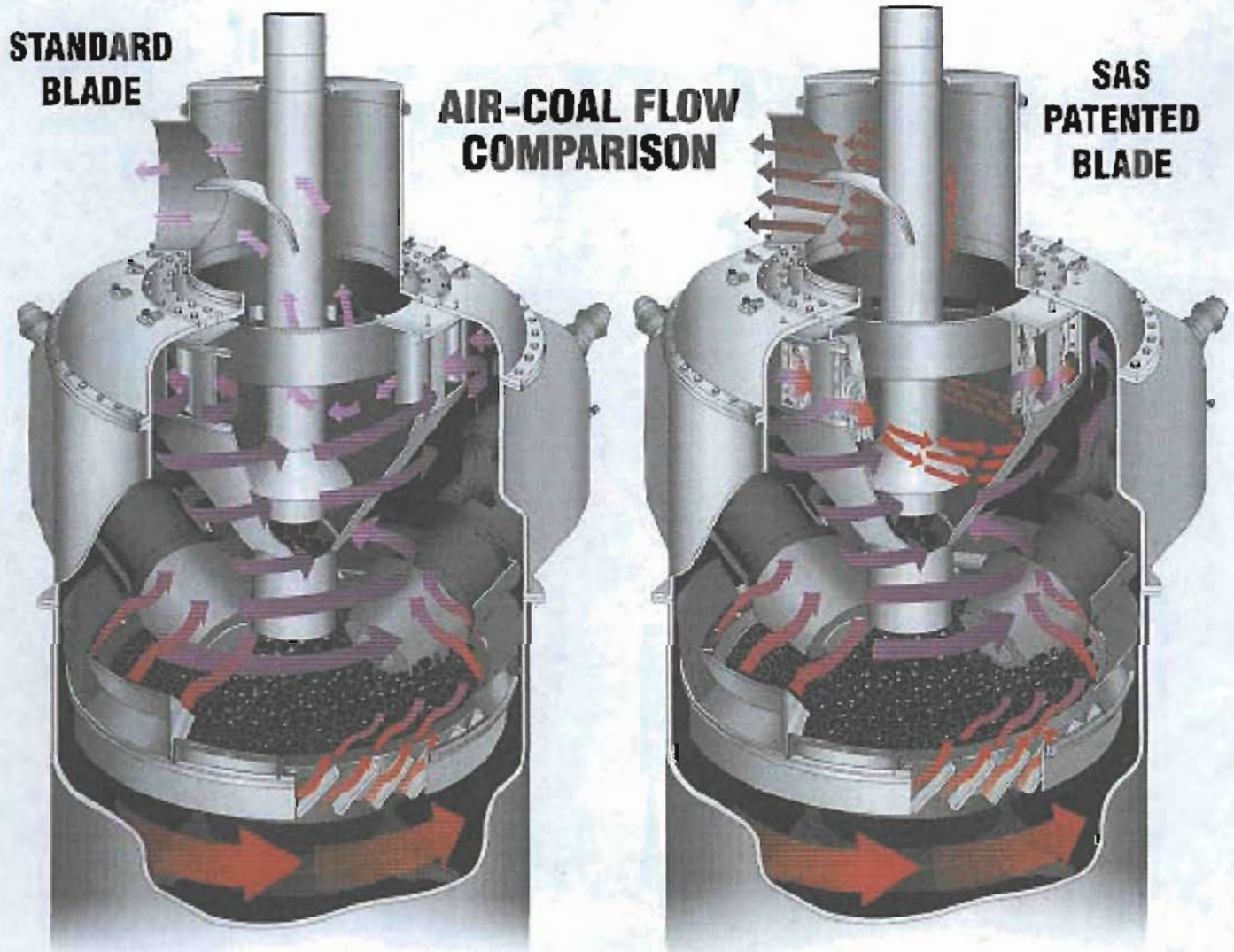
The outer housings are available as either a casting or a fabrication. SAS engineers can work with you to determine which material will work best for your application. The cast outer housings are made of a highbred HN stainless steel, which is known for its ability to prevent thermal cracking caused from sigma phase precipitation.

Sure Alloy has a wide variety of materials that resist wear. The inner housing and splitter plates are normally fabricated using a 310 series stainless steel. SAS manufactures it's own Chromium Carbide Alloys, which we have found to be the most reasonable choice for extended wear life and final manufacturing price. Materials such as tungsten carbide and complex carbides are available. All areas exposed to wear are protected to provide a long and uninterrupted service life.

Even though our internal parts are protected, they won't last forever. Predictive maintenance will give you the approximate cycle time to either replace or repair in inner housing and splitter plates. This is the genius of our design, just remove the locking tabs and slide out the inner housing for replacement or repair. This can all be done safely from inside the boiler *without throwing away the entire outer housing.*

**SURE ALLOY ANNOUNCES PATENTED PERFORMANCE IMPROVEMENT
FOR PULVERIZERS AT VERY LOW RETROFIT COST!**

**HIGH SPIN STATIC CLASSIFIER
BLADE MODIFICATION**



Sure Alloy Steel Corporation conceptual design and engineering practices have yielded yet another pulverizer enhancement! Our practical approach to performance optimization without major retrofit has resulted in an efficient, economically attractive, and dynamic product.

Our High Spin Static Classifier Blade Modification is a proven and reasonable alternative to making the substantial capital commitment required for Dynamic Classifiers. SAS customers have achieved 6% to 15% capacity improvements while concurrently reaching 99.8% thru 50 mesh and 76.2% thru 200 mesh fineness levels...grinding 42 HGI coal!!

The physical shape and downward extension of the SAS blade makes full utilization of the kinetic energy and rotational flow produced in the grinding section of the pulverizer. As the circumferentially propelled coal particles reach the classifier inlet, flow is accelerated into the cone and a vacuum condition is developed from the continuously increasing centrifugal acceleration. This phenomenon effectively turns your classifier into a cyclone separator.

The Patented SAS Classifier Modification relies on existing forces within your pulverizer to provide you with: An economically attractive means to efficiently optimize the fineness and the capacity of your pulverizer!

SAS HIGH SPIN BLADE

- **NO STRUCTURAL MODIFICATIONS**
- **NO ELECTRICAL INVOLVEMENT**
- **NO CONTROL OR OPERATIONAL MODIFICATION**
- **NO MOVING PARTS TO MAINTAIN**

THE SAS CLASSIFIER KIT CAN BE INSTALLED IN YOUR ORIGINAL CLASSIFIER HOUSING *WITHOUT REMOVING THE PULVERIZER TOP*. The existing blade post holes and indexing components are also used. Depending upon the size and condition of your mill the SAS Classifier Blade Modification can be installed in the same amount of time required to reblade your existing classifier!

When installed in conjunction with our patented or patent pending pulverizer optimization products, such as the:

**"Silver Bullet Turbo Exhauster"- High Efficiency Fan
Vane Wheel Conversion
Exhauster Discharge "Imploder"
Course Cut Riffle Elements**

*We can "Fine Tune" and "Maximize Combustion".
The resulting benefits are:*

**Improved "Heat Rate".
The option to burn cheaper fuels.
Reduced "L.O.I." and boiler emissions.
Full load with less mills.**



SURE ALLOY STEEL CORPORATION

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CLASSIFIER CONE EXTENSION

The Clean Air Amendment has been in effect for several years now. Improvements made in the area of pulverizing have helped reduce emissions at Power Plants. Sure Alloy Steel has contributed many new and innovative ideas in this area. Our Rotating Throat has provided significant increases in fineness control for pulverizers. Computerized air flow modeling was used to aid in designing the Rotating Throat. Data from this project indicated that the Flapper Valve Assembly on the MPS-89 can cause problems with fineness control.

The Flapper Valves on the MPS-89 are designed to catch coal that has been rejected at the classifier level. The weight of the accumulated reject coal trips the Flapper Door and releases it for regrind.

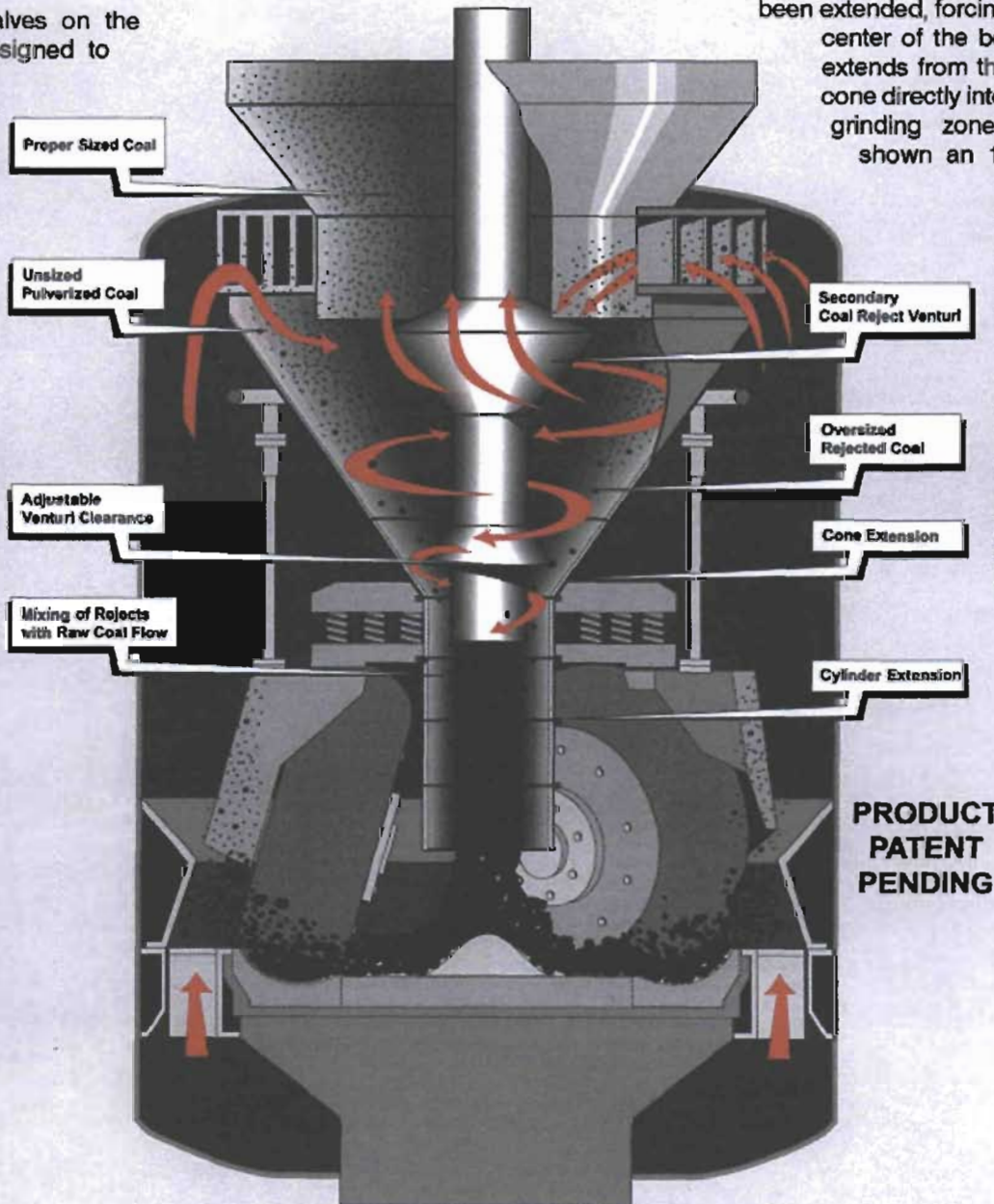
Air flow studies show that coal released from the Flapper Assembly falls into the air stream and can

be carried back through the classifier to be rejected again, thus short circuiting the classifier process. In some cases the Flapper Door sticks open allowing coal to blow back through the door.

Sure Alloy Steel has designed a replacement kit that will eliminate the Flapper Assembly and problems associated with it. We call it the Classifier Cone Extension for MPS Series Pulverizers.

The illustration shows the cone has been extended, forcing the coal to the center of the bowl. A cylinder extends from the bottom of the cone directly into the heart of the grinding zone. Tests have shown an 11-12% improvement in fineness over mills using old style Flapper Assemblies.

The Classifier Cone Extension can be installed in one 10 hour shift with three men. Installation does not require removal of roll wheels.



SURE ALLOY STEEL CORP.

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