August 21, 2010

To whom it may concern,

This letter is to advise you, that the Asia Coal Catalyst Company performed a series of tests on our boilers #2 and #3 in November/December 2009. The tests were done to demonstrate the effectiveness of ACCC's combustion catalyst injected into these two boilers for improved combustion efficiency and lower pollution emissions. Our boilers produced approximately 10 tons per hour of steam total.

The tests included the taking of Base Line Data without the injection of the catalyst, a period of sever days the injection of CC-88 at a rate of 0.5 kg/ton of coal and another two periods of several days each of injecting at rates of 1.0 and 2.5 kg/ton of coal.

The determination for the improved efficiency involved the taking of data to determine the average Tsteam/Tcoal for each injection period. These Ts/Tc figures were compared against the Ts/Tc figure from the Base Line and a percent of improvement calculated. The resulting percentages were 8.053% uncorrected and 26% for correcting for a coal change that a lower heat content than the Base Line Case.

Additional measurements were made of the particulate stack emission and it showed a 60% reduction. This was also bourn out from fly and bottom ash analysis where the carbon content of each was reduced some 60% as well as the heat content.

Additional observations also were made that the CC-88 was working properly. These included the flame appearance as well as a reduction of the slag and fouling of tubes.

Sincerely,

Mrs. Gao

EM Technology

Mianyang, Sichuan, PRC

情况属实。

高敏

四川东材科技集团股份有限公司

2010年8月11日.

DEMONSTRATION REPORT OF CC-88 COMBUSTION CATALYST

For

IMPROVED COMBUSTION EFFICIENCY & REDUCED COAL CONSUMPTION

DECEMBER, 2009

At

SICHUAN EM TECHNOLOGY CO. LTD MIANYANG, SICHUAN, CHINA

In Cooperation With

MIANYANG EXAX ELECTRONIC MATERIALS CO., LTD.

And

ASIA COAL CATALYST COMPANY, LLC NEW YORK, NY USA

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EM TECHNOLOGY – DEMONSTRATION REPORT

GOALS

The purpose of this demonstration was to show the effects of using the Combustion Catalyst CC-88 produced by **Asia Coal Catalyst Company (ACCC)** on the combustion of the coal and the emissions to the atmosphere. The assertions of ACCC are that the use of CC-88 will:

- improve combustion efficiency and/or increase steam output
- improve boiler efficiency
- lower SO_2 and SO_3 emissions
- lower particulate emissions
- reduce CO_2 emissions
- lower NO_x emissions
- reduce corrosion
- reduce/eliminate slagging or combustion deposit buildups
- improve fly ash quality

This boiler at Sichuan EM Technology Co. Ltd. (SEMT) was selected because of its size and its coal fired stoker grate design - a typical design for thousands if not millions of boilers throughout China. The performance problems are typical of these types of boilers and include:

- an inability to meet design stream flow
- excessive pollution which needs reduction (mainly particulate)
- cold end corrosion problems
- major slag deposits from burning sub-bituminous coal

The main goals of these tests were to improve the combustion/boiler efficiencies thus reducing the quantity of coal needed to produce the steam, and reduce particulate and possible SO_x and NO_x emissions. The other assertions will be also documented if the data is available. Once the data has been compiled and analyzed, ACCC will consult with Sichuan EM Technology Co., Ltd. (SEMT) and the Environmental Protection Board (EPB) for the optimum injection rate of the combustion catalyst CC-88 which will produce the best return on investment (**ROI - Appendix D**) in consideration of all the issues as well as a solution to the slag.

ORIGINAL PROGRAM PLAN (November 22, 2009)

Phase I - Base Line Data

The initial tests, 3-days, will encompass gathering Base Line Data on the system during its current normal operating procedures. This data will include three methods of determining the coal feed rate, all boiler control room data, photos of the furnace showing the flame color and intensity and photos of the bottom ash and fly ash being collected as well as a photo of the stack emission color. Also, measurements will be made of the amount of bottom ash and fly ash that is collected as well as stack testing for agreed practical and useful composition of which particulate emissions, SO_2, SO_3, NO_x, CO_2 and Hg are to be considered. The coal will be analyzed (Ultimate Analysis plus heat content – Kcal/kg) for its chemical composition as well as heat content. The fan data will be determined, the volume of air being sent to the furnace for combustion and excess air and steam flow, temperature and pressure will be logged.

Day 1

- This day we will concentrate on reviewing the operations of the boiler, control room data, determine the coal feed rate to the grate, check out the screw feeder and determine the speed rate to feed the conveyor the required amount of CC-88 for the first injection. Photos will be taken of the complete system, fire box and chimney as well as the bottom ash and fly ash collected. The plant must be running at a constant coal feed rate up to the time we set the steam production and then reduce the coal feed rate. (Phase II)
- We will obtain and review the control room data being produced and analyze it for units and needed factors.
- Data will be derived for computing the amount of coal being consumed. Three methods will be considered:

  (1) knowing the height of the guillotine and the width and speed of the grate we can compute the volume of coal placed onto the grate over a period of time. The weight per volume (kg/m3) will be obtained by weighing a known volume of coal,

  (2) review the operation of the coal crusher and determine if there is a method of calculating the rate of crushing the coal and compute the coal being crushed and fed to the coal bunkers over a set period of time,

  (3) prior to each coal filling of the bunkers, at approximately 8 AM and 4 PM, measure the void volume of the bunker since the last filling and after the fill cycle measure the new void volume, subtract the two and multiply by the kg/m^3 of coal and compute the coal added during the fill cycle. This will be the coal consumed since the last fill cycle.

Day 2

- On Day 2 we will begin gathering data for the Base Operation. It will continue for at least 2-3 days depending on the consistency of data and calculations.
- Commencing with the measuring of the bunkers before the 8 AM bunker filling and after filling at 8 AM, calculate the amount of coal feed during that cycle and burned since the 4 PM cycle the day before. Compare all three coal usage methods. Repeat this procedure before and after the 4 PM coal feed duration.
- Collect control room data on steam, combustion air, air pre-heater temperatures, furnace temperatures, flue gas temperatures, fan data, feed water flow, pressure and temperatures. Obtain new readings every half hour during the day until leaving in the evening.
- If possible, determine the amount of bottom ash and fly ash collected during the day.
- Take photos of stack emissions.
- At end of day, calculate the boiler efficiency for the day.

Days 3 and 4

- Repeat the procedures of Day 2. In addition:
- During Day 4, the local EPB will take the stack emission data which will become the Base Load Conditions against which all following stack emissions data will be compared.
- Take photos of stack and furnace flame.
- At the end of Day 4 data gathering, do computer calculations and determine the boiler efficiency of the day as well as the Phase II period. This will become the Base Line for comparisons of Ts/Tc efficiencies.
- During the 4 PM coal feed to bunkers, begin injecting the CC-88 at the coal feed rate and dosage rate of 0.5 kg/t (1:2000) per ton of coal being consumed. The CC-88 will not reach the furnace for approximately 12 hours with full coal bunkers.

WARNING: When injecting CC-88, it will be necessary to begin watching the steam conditions to make sure the steam production, temperature and pressure does NOT exceed the maximum design of the boiler. This should be checked by the boiler operator every hour, 24 hours per day during the entire time of injecting CC-88 or if it is jointly agreed that it is not necessary. If there is a maximum flame temperature condition this shall also be monitored by the boiler operator. In case any of these conditions occur, the boiler operator is to immediately reduce the coal feed rate to a level that brings the exceeded condition back to an acceptable level, noting the change in settings for us.

Phase II - Fix Coal Feed Rate & Evaluate Maximum Stream Production with CC-88 Injection

Part A

The second test period will be the continuous injection of the combustion catalyst CC-88 at a rate of 0.5 kg/mt for a period of four days. All measurements and tests will be performed in accordance with the procedures listed below. This test will show the changes in combustion/boiler efficiency, emission changes and boiler operating changes compared with the Base Line Data.

During this test, it is hoped that the boiler system will be controlled to operate the same as during **Phase I.** During this phase, the fuel feed rate must remain constant as in Phase I. It is expected that the steam production will eventually rise to an equilibrium level. This level may be 5% above the level of the Base Line. Measuring the increase in the steam production and quality is the main objective during this phase. As a result of these three different injection rates, an initial optimum feed rate is determined for maximum efficiency improvement and Return on Investment.

Days 1 - 3

- Inject CC-88 at the rate of 0.5 kg/t (1:2000) of coal and record the same data as during Phase I beginning after the 4 PM coal feed cycle and continuing for 4 days providing the data is showing an equilibrium of operations. If equilibrium is not achieved, continue injecting a couple additional days. Continue the computations as during Phase I. **Continually monitor the steam conditions and flame temperature as noted in the Warning under Phase I of Day 4.**
- The reduction in SO_2 may reach 5% for the injection rate of CC-88 at 0.5 kg/t.

Day 4

- Repeat the procedures of days 1-3 and in addition:
- EPB will take the stack emission tests.
- Take photos of the stack emissions and furnace flame.
- At the end of Day 4 data gathering, do computer calculations and determine the boiler efficiency of the days. Compare against the Phase I data and determine the improvements.
- During the 4 PM coal feed to bunkers, begin injecting the CC-88 at the coal feed rate and dosage rate of 1.0 kg/t (1:2000) per ton of coal being consumed. The CC-88 will not reach the furnace for approximately 12 hours with full coal bunkers.

Part B

During this part, the injection rate of CC-88 is to be increased to 1.0 kg/mt for a period of three days.

Days 1 - 3

Repeat Days 1-3 of Part A

Day 4

- Repeat the procedures of days 1-3 and in addition:
- EPB will take the stack emission tests.
- Take photos of the stack emissions and furnace flame.
- At the end of Day 4 data gathering, do computer calculations and determine the boiler efficiency of the days. Compare against the Phase I data and determine the improvements.
- During the 4 PM coal feed to bunkers, begin injecting the CC-88 at the coal feed rate and dosage rate of 2.5 kg/t (1:2000) per ton of coal being consumed. The CC-88 will not reach the furnace for approximately 12 hours with full coal bunkers.

Part C

During this part, the injection rate of CC-88 is to be increased to 2.5 kg/mt for a period of three days.

Days 1 - 3

Repeat Days 1-3 of Part A or B

Day 4

- Repeat the procedures of days 1-3 and in addition:
- EPB will take the stack emission tests.
- Take photos of the stack emissions and furnace flame.
- At the end of Day 4 data gathering, do computer calculations and determine the boiler efficiency of the days. Compare against the Phase I data and determine the improvements.
- Stop injecting at 2.5 kg/mt and proceed with the boiler operation changes and injection changes as described in **Phase III**

Phase III – Fix Steam Production, Evaluate the Coal Feed Rate to Obtain the Set Steam Rate with CC-88 Injection

During this phase of testing the goal is to determine the maximum reduction in coal and emissions that can be accomplished **while holding the steam production at the Base Case condition**. The test will start at the highest level of CC-88 injection, 2.5 kg/t of coal and be reduced every three days until it reaches a nominal injection rate of CC-88 at 0.5 kg/t of coal.

Part A

- From the completion of **Phase** II, continue injecting CC-88 at the rate of 2.5 kg/mt of coal while continually monitoring the steam flow so that it remains at the Base Line point. Once the furnace and boiler have reached equilibrium at the Base Line set point for the steam flow, begin testing for four days starting at the 4 PM coal feed to the bunker. Repeat procedures as in Phase II, Part C, Days 1-4. Start injecting CC-88 at 1.0 kg/mt at the 4 PM coal bunker filling.

Part B

- From the completion of **Part A**, continue injecting CC-88 at the rate of 1.0 kg/mt of coal while continually monitoring the steam flow so that it remains at the Base Line point. Begin testing for four days starting at the 4 PM coal feed to the bunker. Repeat procedures as in Phase II, Part B, Days 1-4. Start injecting CC-88 at 0.5 kg/mt at the 4 PM coal bunker filling.

Part B

- From the completion of **Part B**, continue injecting CC-88 at the rate of 0.5 kg/mt of coal while continually monitoring the steam flow so that it remains at the Base Line point. Begin testing for four days starting at the 4 PM coal feed to the bunker. Repeat procedures as in Phase II, Part A, Days 1-4.

Phase IV - Commercial Operation Longevity Test

This Phase will be a longevity test to determine the parameters for the design and implementation of a commercial system for all three boilers. This consistent run period will occur for the remaining days of the demonstration period.

EPB will execute one final stack measuring test on the second to last day of operation.

The system is to operate at a set mode continuously for the entire period of this phase.

Daily readings will be taken and the average Boiler Efficiency computed. This is to be compared to the Base Line Boiler Efficiency and an average improvement computed. This same percent improvement is also the percent reduction in coal feed and thus through one more calculation the actual kg/hr of reduced coal consumption can be determined and a **Return on Investment** (ROI) can be identified.

The plant operation may not be set up to do both reduced coal and increased steam production. This will be determined at the site.

ACTUAL PROGRAM EXECUTED ADJUSTMENTS TO PLANNED PROGRAM (11/29-12/22/2009)

Once at the site on November 22, 2009, it became apparent that the Original Program could not be executed due to the following reasons:

- In the planning phase, we arrived at three possible methods of determining the coal feed rate. There was practically only one method for which the coal feed rates and improvements could be determined. That method known as **Method #1** (**Appendix A**) was to determine the amount of coal filling the coal bunkers twice per day and determining the amount of coal that was burned in the previous time since the last bunker fillings. The feed rate filling the bunkers was determined by weighing one meter of coal on the coal feed belt, determining the speed of the belt and also the density, kg/m^3, of the coal. This gave us the coal feed rate to the bunkers so we could then determine the amount of catalyst CC-88 needed to be placed on the feed belt. The coal feed rate to the boiler was determined by taking the amount of coal it took to fill the bunker and dividing it by the hours the bunker was feeding the furnace. Because of the configuration of the bunkers it would have been very difficult to measure the void space between bunker fills to determine the cubic meters of coal burned between fillings and thus the coal feed rate to the grate. The coal crusher did not have any scale that measured the coal feed rate to it nor did it have any name plate data that gave us the design rate of crushing. The other method, chain grate speed, was also not available as there was no information on the correlation between the motor drive RPM and the speed of the chain grate. **Note that later in this discussion, a method of determining the chain grate speed was developed after the completion of the demonstration and the final data will reflect this method known as Method #2 (Appendices B and C).**

- The only steam measurement was for the combination of two boilers, #2 and #3. Therefore, we needed to treat both of these boilers to obtain the necessary data to determine an efficiency improvement. This caused us to use more CC-88 than originally planned and thus had to alter the original program plan.

- The emissions tests could not be done for the emissions of boilers #2 and #3 individually. The port for taking the emission data in the chimney contained the emissions for all three boilers, #1, #2 and #3. Therefore, our emissions results shown are the emissions for all three boilers and as a result were slightly higher than if we were able to do only boilers #2 and #3.

- There was insufficient instrumentation to measure the necessary parameters (steam heat content, exit flue gas heat content, preheated combustion air heat content, and feed water heat content) to do a boiler heat balance, therefore, this method of determining a boiler efficiency was not available.

- The boilers could not be held to any one steam load or a constant coal feed rate because the plant's demand for steam controlled the amount of steam to be produced and thus the coal feed rate.

- Because the plant purchased coal on the spot market, it was not possible to obtain one coal with the same heat content for the entire demonstration cycle. Not known by us until near the end of the demonstration, there were three or four different coals burned with heat contents ranging from 4446 Kcal/kg down to 3535 Kcal/kg. Unfortunately, the Base Line Data was the highest heat content coal which made obtaining a combustion efficiency greater than the Base Line difficult.

Because of these obstacles listed above, the program had to be completely changed and over the first three days at the site, changes were instituted as follows:

- The bunker coal feed belt weighing system**, Method #1**, was instituted in lieu of the others and measurements began on 11/29/09 to obtain the amount of coal consumed in each hour of each day for a period of 6 days. Corresponding steam consumptions, chain grate drive RPM's, were recorded from the plant's operators Data Sheets for boilers #2 and #3. Copies can be found in Appendices **H and I.**

- Because of many interruptions in the coal feed, incomplete bunker filling, and steam demand changes, we only obtained one very short period of reliable information on 12/02/09. This was to be our Base Line Data and it was felt this was not sufficient. However, because we were running out of demonstration time, we decided to start injecting the CC-88 catalyst at 0.5kg/t of coal on 12/05/09 and operate continuously for 4-days and use this one data period for a Base Line..

- Following the completion of the demonstration, additional information was made available to us by Mrs. Gao, which enabled us to use the chain grate speed, depth of coal on the grate, grate width, and the density of coal, to more accurately obtain the coal feed rate. This became known as **Method #2**. This would provide us with more accurate comparisons of the steam produced to the amount of coal to produce that steam, Ts/Tc. It also allowed us to utilize more of the data collected. For example, the Base Line Data period was now 6-days instead of a few hours.

- Following the 0.5kg/t injection period, we tested at 1.0 kg/t of coal for the next 6 days and then 2 plus days at 2.5 kg/t, ending on 12/16/09 with all the allotted CC-88 consumed. These tests were to determine if the Ts/Tc efficiency improvements could be increased with greater CC-88 feed rates and maximizing the SO2 removal.

- The 1.0 and 2.5 kg/t test showed little or no further improvement in combustion efficiency above the 0.5 injection mode. This data is recorded in **Appendix M** but has not been included in the Summary for determining the improved combustion efficiency.

- Photos were taken the last day of each phase as well as stack emission tests and fly ash and bottom ash analysis with heat content. Photos are shown in **Appendix E** but the camera quality is not good and the contrast in the flame intensity and brightness is difficult to see compared to our visual observations.

- Observations were also made of the slag on some of the tubes we saw in the boiler and it appeared this slag was beginning to be reduced toward the end of the demonstration.

- The screw feeder, supplied by the MEEM Company, worked very well except for a brief period when we were injecting at 0.5 kg/t due to product hang-up in the hopper. We believe this was caused by several rather large pieces of CC-88 creating a bridging effect and the very low feed rate. A screen was installed by EM Technology that caught the large pieces and the plugging did not occur during any further operations. The unit was easily programmable and maintained the required feed rate very well.

- The remaining steps outlined in the Original Plan were not performed due to time constrainst and lack of sufficient supply of CC-88.

- Following the demonstration, it was recommended that the Base Line Data be re-done using a lower heat content coal. However when this was undertaken**, Method #2** was not yet developed and the results using Method #1 were inconclusive and the data was inconsistent. This was similar when **Method #2** was applied. It appeared a higher heat content coal was burned causing a higher Base Line point and lower percent increase in Ts/Tc change. No coal analysis or fly ash and bottom ash analysis were provided. This data is in **Appendix F.**

SUMMARY OF RESULTS USING METHOD #2

A. Summary of Results Uncorrected Using Method #1 (See Appendix A):

- During the entire demonstration period, this method was the only method we had to determine the coal feed rate in order to obtain the tons of steam to tons, Ts/Tc, of coal ratio. This method involved the weighing and timing of the coal feed to the coal bunkers and comparing this quantity of coal to the time the bunker was last filled in order to determine the coal feed rate per time, usually per hour. This was then compared to the amount of steam produced during the same time period to obtain the Ts/Tc. The percent change in the Base Line Average Ts/Tc is compared to the 0.5 kg/t feed rate Ts/Tc to determine the percentage increase. This percentage increase is equivalent to the savings in coal. The recorded data and calculations are presented in **Appendix A**

B. Summary of Results Uncorrected Using Method #2 (See Appendix B):

- A bar graph was developed to show the resulting Percentage Change in the Tons of Steam to the Tons of Coal (Ts/Tc) to produce that steam for an injection rate of 0.5 kg/t of coal compared against the Ts/Tc of the average Base Line Data. The blue bars indicate the four days of injecting the 0.5 kg/t against the Base Line Data. These improvements ran from 2.48% to 10.49%. The average improvement for this period is shown in green and is 8.053%. The following red bars are the average improvements based on a) eliminating the data from 12/06, a very low improvement (with no explanation on cause) results in an improvement of 9.91%, b) eliminating the high and the low days, 12/8 and 12/06, results in a an improvement of 9.62% and c) eliminating the high and low data from the Base Line Data and 0.5 injection results in an improvement of 9.31%.

  Dropping out the data of 12/06 results in a very consistent data, Ts/Tc for the remaining days. The data for this day has been reviewed carefully for errors and none have appeared to this date. I suspect there is some wrong information because all the other data is very constant. It is possible one of the boilers was shut down for a period and we were not advised.

- Page 2 shows the data that went into making the Bar Graph.

- Page 3 shows the results of the Fly Ash and Bottom Ash Analysis developed by the Chemistry Department of EM Technology. These show the change in the concentrations of carbon and heat content (Kcal/kg) of the fly ash and bottom ash taken the last day of each phase of the demonstration. It is important to note the significant amounts of carbon and in heat values that were reduced by the dynamic action of the catalyst CC-88 in the furnace. These reductions in carbon in the fly ash make it a more desirable by-product for the concrete industry. Also, the heat values of each had been significantly reduced indicating more heat was produced within the boiler for steam production.

- Page 4 shows the results of the Emission Testing by the EPB. Here the significant information is the tremendous reduction in particulate being emitted from the stack. These emissions are for three boilers although we were treating only two of the boilers. Had we been able to test for the two treated boilers only, the reduction in particulate would have been greater. However, a 69% reduction of the three combined boilers is still significant. It has enabled the plant to meet a <200 Mg/Nm^3 level. Please note that the data shown for the SO_2 and NO_x reductions should be discounted due to excess air contaminating the results. It is unknown what the actual excess air level was but according to the EPB official, this data is incorrect.

- The remaining pages are the daily computations for the Base Line and 0.5 kg/t injection period. Formulas for determining the calculation columns are also shown. These pages take the input data and the calculated data to obtain the daily average Ts/Tc based upon **Method #2**.

C. Summary of Results Corrected Using Method 2 (See Appendix C):

- The corrected method is a method we used to correct for the different coal burned during the injections phases of the demonstration. The Base Line Case burned a coal having a heating value of 4446 Kcal/kg while during the 0.5 kg/t injection period the coal was changed at least once which had a heating value of 3804 Kcal/kg. The theory employed for this correction is we assumed that when burning the lower heat value coals, it would take more coal to burn to equal the heat released to the steam than the Base Line Coal. Taking the ratio's of the heating values of Coal B to Coal A provides a factor of 0.8556 Multiplying these factors times the coal feed rates during the time Coal B was burned will equate to the heat release of Coal A. From out notes and the information from Mrs. Gao, it is most likely that Coal B began to be burned when we started the 0.5 kg/mt injection rate and continued thru the entire 0.5 injection period. The other two coal changes happened some time during the 1.0 and 2.5 kg/mt injection periods. Since we are only using the 0.5 period to determine the improved efficiency, corrections have not been made to the 1.0 and 2.5 injection periods. These two later periods were meant more for determining the improvement in particulate and SO2 emissions using a higher rate of injection.

- The results of making these corrections to the feed rates for the 0.5 kg/t injection period resulted in higher efficiency improvements. Please note the **Summary of the Corrected data in Appendix D**. **The average improvement for this test phase corrected is 26.31% as compared with 8.05% for the uncorrected data.**

- Based on other factors such as; the improvement in particulate emissions, reduction in carbon and heat content of the fly ash and bottom ash it is reasonable to deduce that the percent improvement is somewhat higher than the 8.05% uncorrected but we cannot quantitatively prove this without a test where the identical coal is burned throughout the Base Line and injection periods.

- **<u>Caution:</u> Although these results are very encouraging, this method has not been verified as a legitimate procedure and in addition, it is not certain the exact dates and times that coal B began to be burned. These two issues need to be verified before a final corrected Report is issued and approved by all parties. This will become an addendum to this report.**

Other:

- A new Base Line Data test done in January 2010 was completed to obtain a consistent one coal operation and data to compare the 0.5 kg/t data taken in December. The goal was to obtain another Base Line Data to compare the 0.5 kg/t injection data taken in December to see if our Method #2 was consistent with the December calculations. Unfortunately, during this period the coal must have been changed, although no notification was g given as such, and therefore there is no consistency of coal being fired and the data is not beneficial.

- All data was also taken during the 1.0 kg/t and 2.5 kg/t periods of injection but these tests were mainly for determining what amount of SO_2 and NO_x could be reduced with added CC-88. The Summary of this data is shown in **Appendix M.** The improved combustion efficiency (reduced coal consumption percentage) was not able to be obtained do to the several changes in coal quality burned during these periods. Therefore, there is no information on the coal savings available. Normally, from past experience, we would not expect to obtain much more improvement in combustion efficiency for these CC-88 feed rates.

- As explained by EPB engineers, the emission reports for the concentrations of SO_2 and NO_x for all tests are not reliable because of the extreme amount of excess air being used in these boilers. Therefore please disregard the reported data. The reported particulate emissions are acceptable because the excess air does not affect their emissions.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions:

1. The data obtained using the coal feed belt to the bunker, **Method #1**, ended up to be data that was not accurate as well as large time periods that were not able to be obtained do to incomplete filling of the bunkers each time, the over lap of the time of coal filling and not filling, resulted in a very shot period of reliable time to determine the average tons of coal for the Base Line and 0.5 kg/t injection. Not having sufficient continuous information, it was determined that the data obtained did not give a reliable Base Line Ts/Tc. Hence we obtained the traveling grate speeds, **Method #2,** and were able to obtain long runs of data which provides more accuracy than **Method #1.**

2. Based upon the original BRICC (Beijing Research Institute of Coal Chemistry), laboratory tests on the EM Technology coal done in June 2009 (**Appendix J**), it was probable that the full scale operations would produce an improved combustion efficiency (or reduced coal quantity) around 6%. Our findings, uncorrected for coal changes **Appendix B**, show an improvement of 8.053%.

3. Correcting the data for the coal changes indicates a much higher improvement however, at the writing of this report the method used to correct for the coal changes has not been verified by experimentation. The only way to provide the backup would be to re-test EM Technology using the **same coal** throughout the Base Line Data and 0.5 kg/t injection period. Once this is verified, a revision to this report will be officially written. The preliminary results of the corrections can be seen in **Appendix C.**

4. The **Return on Investment (ROI)** for Sichuan EM Technology Co., Inc., **Appendix D,** resulted in a 1.5% (uncorrected case) and 14.9% (corrected case, most likely) annually in net coal cost savings is significant to the plant's bottom line. Please refer to **Appendix D** for details.

5. The reduction of carbon and heat within the fly ash and bottom ash indicates an excellent reaction of the CC-88 catalyst with the coal in the furnace and provides backup to the percent improvements in combustion efficiency and reduction in coal demand. See **Appendix G**

6. The lowering of the particulate emission is very significant in having the plant meet a >200 Mg/Nm^3 particulate emission and in helping to clean the atmosphere of particles forming acid rain and causing the constant haze over the City of Mianyang.

7. Observations of the slagging within the boiler indicate that the CC-88 was beginning to remove the slag at the end of the demonstration cycle. If this is proven, the combustion efficiency and reduced coal consumption will improve further. Slag is an insulator and when it forms on the boiler tubes it reduces the rate of heat transfer from the hot furnace through the tube metal making steam inside the tubes.

Recommendations:

- EM Technology perform a 60 day longevity demonstration of slag removal test simultaneously on all three boilers. While this is occurring, obtain the same data as needed **in Method #2** as backup to the December 2009 demonstration and confirmation of the assumptions and results from the December 2009 demonstration. It is imperative that **a single Kcal/kg coal** be burned during the Base Line period and the 0.5 kg/t injection period. To remove the slag, a feed rate of 1.0 kg/t of coal is recommended. Following the 60 day period, the feed rate can be reduced back to the nominal rate of 0.5 kg/t and this will maintain a clean boiler free of slag and provide the optimal combustion efficiency over all types of coal burned. EM Technology's annual coal saving will improve over the amount reported herein and it will allow them to burn lower value coals, such as sub-bituminous, without slagging. ACCC recommends this approach and to treat all three boilers at the same time.

- Conduct a demonstration on a second boiler within Mianyang to verify the effectiveness of the catalyst CC-88 where the coal feed rate and quality can be maintained throughout the entire demonstration cycle.

- EM Technology should consider installing some instrumentation to better control the boiler operation such as excess air (O_2 sensor). It appears there is too much combustion air passing through the combustion chamber and as such a lot of wasted heat is going to the atmosphere. This can be demonstrated during a de-slagging test.

SYSTEM DESCRIPTION OF BOILER AND NORMAL OPERATING PROCEDURES

Photos of most of the boiler system are shown in **Appendix E**
In general the steam production system consists of:

- Two package boilers producing approximately 13 tons of steam on 5 tons of coal per hour. A Ts/Tc ratio of 2.06. There is a smaller package boiler also.

- Coal is purchased on the spot market, generally from the same coal seam but the coal heating value ranges ranged from 4440 to 3600 Kcal/kg.

- The coal is picked up by a clam shell and put into a hopper which feeds it to a traveling belt to the crusher and from there by another traveling belt to the coal bunkers.

- From the bunkers the coal is delivered to the furnace traveling grate by a wheel above the grate and is limited by the speed of the grate and a guillotine plate that sets the coal depth upon the grate.

- Combustion air is fed to the furnace from underneath as well as over the grate. The combustion gases pass upward at the grate drive end to a tube bank, turns 180 degrees, comes back down thru more tubes and then exits thru a heat exchanger that heats the feed water. The gases then pass through a cyclone separator for fly ash removal and then exit the stack with all three boilers going up one stack.

- There is a forced draft fan as well as an induced draft fan per boiler.

- The age of the boilers is unknown.

The following necessary items are recorded on the hourly EM Technology log sheets, **Appendices H and I**:

- Steam produced per hour
- Depth of coal on grate
- Chain grate RPM motor speed

Other data recorded:

- Steam and water pressures
- Water in and out temperatures
- Combustion air out temperatures
- Furnace temperatures
- FD and ID fan amps

PERSONNEL ASSISTING

Many thanks to all the people that helped in making this a successful demonstration. Without their dedication to the project we never would have completed this project within the twenty-eight days. A special thanks go to my interpreters, Huang Lei and Zhou Jade, two very talented young college students who were dedicated enough to the project to learn the technology and boiler operations.

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写这封信的目的是为了让您证实亚洲煤催化剂公司于 2009 年 11 月到 12 月之间在东材集团的 2 号和 3 号锅炉上做了一系列的实验。本实验的目的是验证使用由 ACCC 发明的 CC-88 燃烧催化剂对提高锅炉煤燃烧效率的效果及降低因燃煤而产生的排放。两个锅炉每小时的蒸汽产量大约为 10 吨。

整个实验包括基础数据采集阶段（未加入催化剂）、几天的催化剂 0.5kg/t（0.5 千克催化剂/1 吨煤）加入量阶段、分别为几天的 1.0 kg/t 与 2.5 kg/t 两个加入量阶段。

决定效率提高率的方法是通过采集数据计算每个阶段的平均汽煤比（每小时产汽量/每小时用煤量），用加入催化剂后的汽煤比与基础数据的平均汽煤比做比较就可以计算出燃烧效率提高率，最后的结果为：未考虑煤质变化时的百分比提高率为 8.053%，考虑煤质变化的百分比提高率为 26%，考虑煤质变化是因为在加入催化剂的阶段时使用的煤的低位发热量要比基础数据阶段的低。

另外，还对烟囱排放物中的烟尘进行了测试，加入催化剂后烟尘平均减少率为 60%，飞灰和底灰中的含碳量和低位发热量的平均减少率也大约为 60%。

除以之外，催化剂 CC—88 加入操作非常顺利，实验中还对火焰外观和管道污垢进行了观察。

最诚挚的问候

高敏

东材集团

中华人民共和国四川省绵阳市

情况属实。

高敏

四川东材科技集团股份有限公司

2010年8月11日