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Indigo Agglomerator Successful at Plant Watson

The Indigo Agglomerator (see PRECIP Newsletter, January 2003) was developed in Australia by Indigo Technologies. Located before an ESP, the Bipolar Electrostatic Agglomeration process used in this device attaches the fine particles, generally smaller than five microns, to the larger particles, which are all then easily collected by the existing ESP. The process was described at the ICCS 12th International Conference on Coal Science, held November 2-6, 2003, in Cairns, Queensland, Australia. Rod Truce, Indigo Technologies, and Wallis Harrison, the Southern Company, discussed the results of testing carried out by the Southern Company on a commercial installation of the Indigo Agglomerator at Watson Power Station in the U.S.A.

In December 2002, the first prototype Indigo Agglomerator was installed at Delta Electricity's Vales Point Power Station, located in New South Wales, Australia. This prototype led to the design of a full commercial installation, which was also installed at Vales Point Station, in November 2002. The second commercial installation was at the Southern Company's Plant Watson located near Gulfport, MS, in March 2003.

The Indio Agglomerator at Plant Watson was installed on Unit 4, a 250-MW opposed wall-fired boiler with two separate exhaust gas treatment and monitoring systems. Each system has an air-heater, an electrostatic precipitator, and an induced draft fan to maintain gas flow into a common exhaust chimney. The Indigo Agglomerator was installed in the B exhaust gas treatment system between the air-heater and the ESP, while the A-side remained unchanged. Extensive testing at the plant has confirmed a large reduction in fine particles exiting from the ESP.

In the Indigo Agglomerator, two key processes are used to reduce fine particle emissions. A bi-polar charger charges half of the dust with a positive charge and half with a negative charge. The bi-polar charger has a series of alternating positive and negative parallel passages that the gas and dust pass through. The second key process is a specially designed mixing system that causes the fine positive particles to be carried by the gas and mixed with the large negative particles emitted from the adjacent negative passage, and vice versa. This results in the oppositely charged particles attaching to each other and forming agglomerates.

The larger particles formed by this agglomeration process are easily captured by the ESP. Although an electrostatic precipitator will collect almost 100 percent of particles larger than 10 microns, collection efficiency falls below 90 percent for fine particles around 1 micron. By attaching the "hard to collect" fine particles to the "easy to collect" large particles, the emission of particles less than 3 microns is significantly reduced.

At Plant Watson the opacity improvement on B Side, with the Indigo Agglomerator installed, as a percentage reduction compared to the A Side, varied somewhat by coal type. B Side opacity was generally between 40 percent and 70 percent lower than A Side. Opacity on A Side averaged about 15 percent, while on B Side it was 4 percent.

Two dust load tests (EPA method 17) were also carried out at full load on both A and B Side during the West Elk (sub-bituminous low calcium) coal operation. The results show a 45 percent reduction in dust load on B Side with the Indigo Agglomerator compared to A Side, even though the 10 percent higher gas flow on B Side should reduce ESP dust collection efficiency. This reduction in outlet dust is consistent with a 70 percent reduction in opacity.

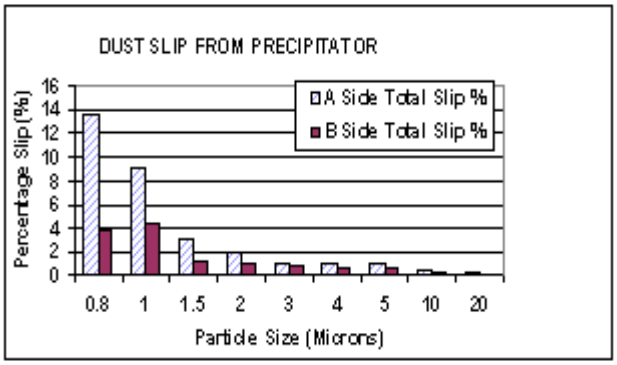
Having shown a major reduction in mass emission of dust, the specific size of the dust being removed by the Indigo Agglomerator needed to be quantified. A Process Metrix Type PMC PCSV-P in-situ analyzer was used to measure the particle size at sample ports located at the air-heater outlet and the ESP outlet.

The results showed:

- The Air-heater outlet particle size distributions for A Side and B Side were almost identical;
- The Fine particle reduction across the Indigo Agglomerator was significant, showing a factor of 6 reduction at 0.8 microns and 5 at 2 microns;
- There is a significant reduction in the fine particles below 3 microns on B Side electrostatic precipitator outlet compared to A Side.

The percentage of dust that escapes to the atmosphere was calculated. The results are shown in Figure 1. This graph shows an increasing improvement in the collection of particles below 5 microns on B Side with the Indio Agglomerator installed compared to A Side. The 2 micron emissions are over 50 percent higher on A Side but at 0.8 microns A Side has increased to over 350 percent higher than B Side.

Figure 1. Percentage of Dust Emitted to Atmosphere



Indigo's Technology division is currently commercializing and promoting the Indigo Agglomerator. The technology now has the additional backing and cooperation of EPRI, Entergy, Cinergy, Ontario Power Generation, First Energy and Duke. Several more U.S. utilities are also considering participation. Indigo (http://www.indigotechnologies.com.au/) is a privately-owned Australian development group, which has diversified interests in property, hotels and technologies.