Carolina Power & Light Co.
Carbon/Ash Separation

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INTRODUCTION

Carolina Power and Light Company has been selling ash into the concrete market since 1983 averaging over 100,000 tons annually. The largest single producer of ash is the Roxboro Plant located in Person County, North Carolina about 60 miles north of Raleigh. This plant has four steam turbines, six boilers and a capacity of over 2,400 megawatts. Over 6,000,000 tons of coal is burned and it produces over 500,000 tons of Class F fly ash annually. Class F fly ash is classified as a Pozzolin that enhances the properties of concrete. Fly Ash must have a carbon level below 6% in order for it to be marketable into the concrete market in accordance with ASTM C618. The carbon level in the ash sold by the Roxboro Plant was inconsistent ranging from 3% to 6% and this restricted CP&L's ability to market fly ash into the market place. CP&L recognized that there was a strong market for high quality fly ash in the Raleigh area and we were not filling it. Also, it was recognized that with the installation of low NOx burners the ability to market fly ash would decline and in all probability disappear entirely. The handwriting was on the wall and in 1997 CP&L sales of ash dropped to 44,500 tons.

This paper describes the steps taken by Carolina Power & Light Company to meet the challenge of insuring an adequate supply of low carbon fly ash into a growing market.

WHY USE FLY ASH IN CONCRETE

There are many reasons to use fly ash in concrete. These reasons are detailed in the table below:

Increased compressive strength	Decreased bleeding and segregation
Increased workability	Reduced shrinkage
Increased durability	Reduced heat of hydration
Decreased permeability	Reduced cement aggregate reaction
Reduced sulfite attack	Increased flexural strength

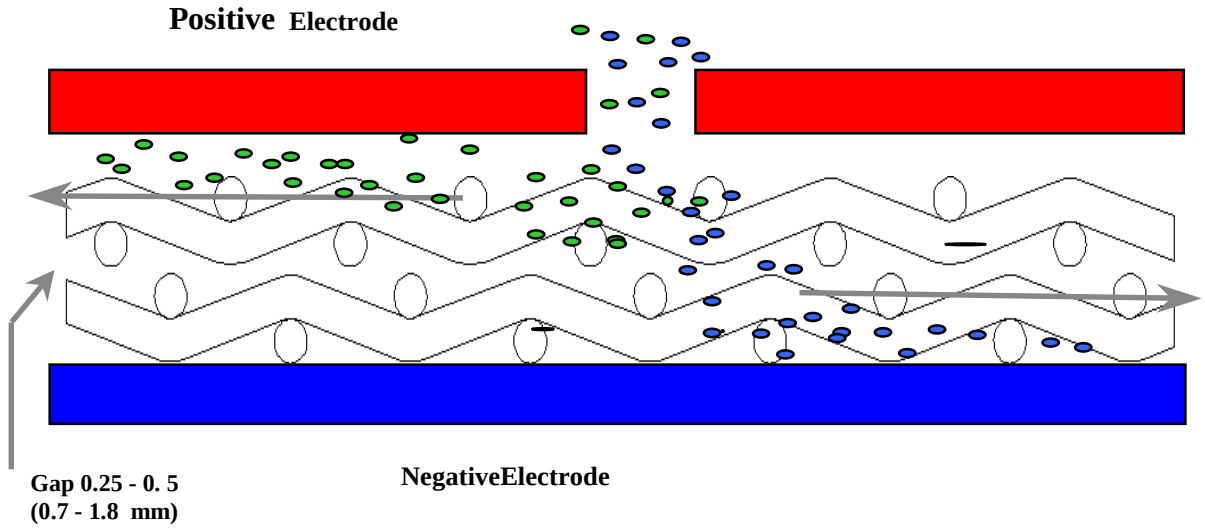
As can be seen, there are many reasons to use fly ash in concrete and there are benefits for both the utility as well as the concrete producer.

AVAILABLE TECHNOLOGIES

Several technologies were investigated that can reduce the level of the carbon in the ash. These were Dry Electrostatic Separation, Froth Flotation, and Carbon Burnout. The Froth Flotation Process was considered first. This technology had a high capital cost, low capacity, no existing installations and a long construction lead time. There were also permitting issues and a poor economic payback. All these factors eliminated this technology from further consideration.

CP&L also looked at carbon burnout as a potential method for reducing the carbon level in the ash. This system also did not have a commercial installation running at the time and the amount ash the system was capable of processing was approximately half of what was needed. In addition, the cost was much higher than other systems we were considering.

The Dry Electrostatic Separation was the STI Process illustrated below.

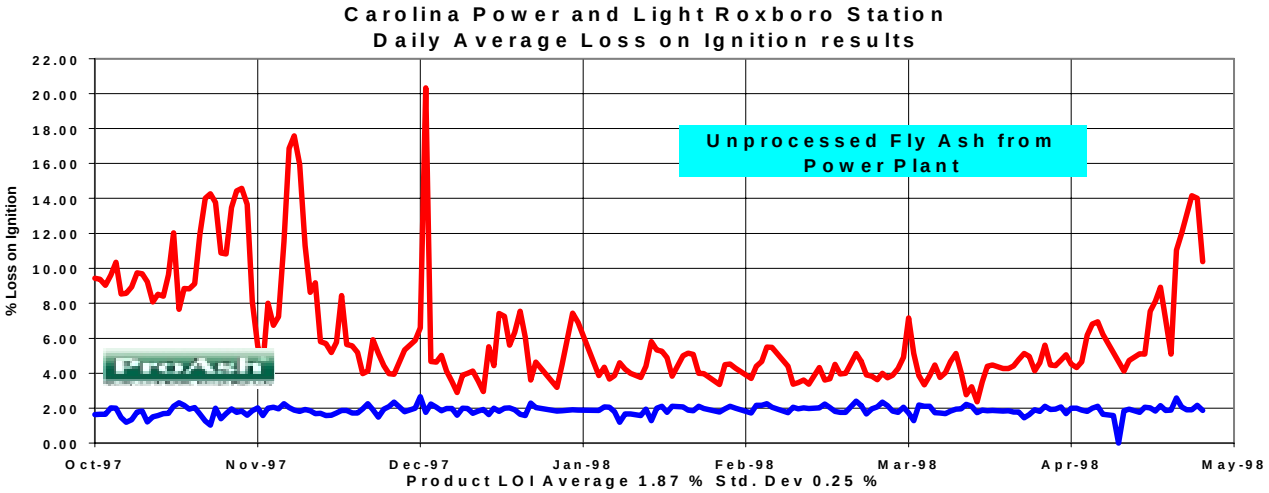


The feed ash enters the machine at one of three feed points and the carbon and ash are separated using the electrostatic fields. The belts move the material away to opposite ends of the machine. This equipment is compact, has low power consumption (1 to 2 kW for each processed ton), does not generate emissions, has high capacity (up to 40 tons per hour) and can reduce the carbon content in the fly ash from 30% down to 2.0% +/- 0.5%. There were already successful installations at the New England Power Company's Salem Harbor and Brayton Point Plants. The overall cost was lower with greater processing capability and faster construction time than other technologies available at the time.

INSTALLATION

Two separators were installed at the Roxboro Plant. These separators are located beneath silo number 2. There are four silos located at the ash processing area. Silo's 1 and 2 store processed ash, silo 3 stores processed ash and high carbon ash is stored in silo 4.

The first separator went into service on September 24, 1997 and the second separator became operational in July 1998 to meet increased demand for processed ash. Both separators operating together will process up to 450,000 tons of ash annually.

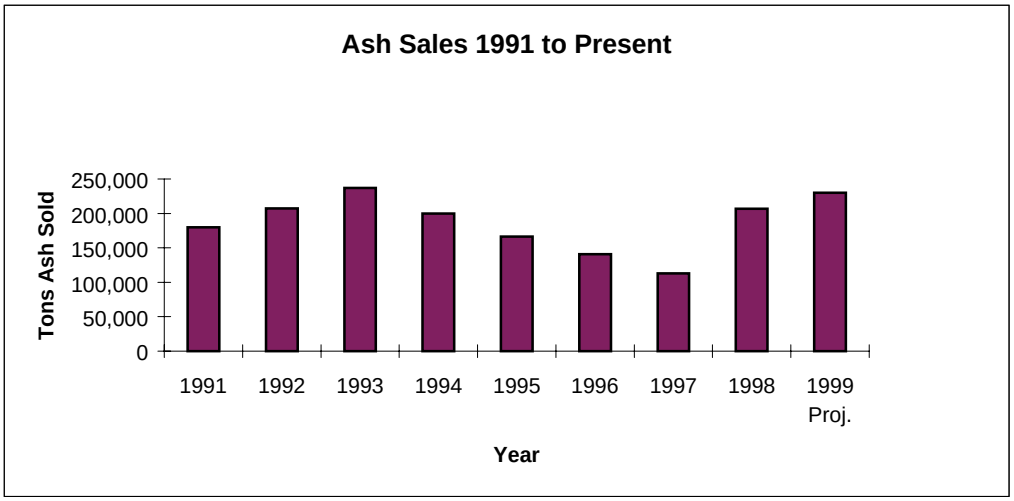


The graph below illustrates the effectiveness of the processing capability of the separator. Feed ash enters the separator with LOI's as high as 20% and the processed ash exits the processor at 2.0%+/- .5% LOI.

The equipment and installation is owned by ProAsh that is a partnership between STI and Roanoke Cement. STI provides the technical and operating background and Roanoke Cement Company does the marketing.

The advantage to this installation is there is now a reliable, quality ash provided to concrete plants. It allows CP&L to recycle a large quantity of material, the air entrainment problems associated with carbon in ash is virtually eliminated, the life of the ash landfill is extended and it also provides a good public image.

The end result of this project is illustrated by the graph below. This graph shows the ash sold by CP&L from 1991 to the present. There was a steady decline in sales from the high year in 1993 until 1997. At that time, the first separator went in service and ash sales are increasing.



In conclusion, this project has resulted in increased ash utilization, reduced cost and a higher quality ash to our customers.