Reduced amounts of acid rain will protect the pH of soil and water and prevent damage to the environment and man-made structures.

Sulfur dioxide from burning coal reacts in the atmosphere to produce acid rain.

As an added bonus, coal quality for coke making is increased and stronger steel can be produced.

### Coal Desulfurization:

**Design of Coal Desulfurization Processes to Improve the Environment**

**Objective:**
Choose and design a desulfurization method to conform with EPA regulations and economically remove sulfur from coal.

**EPA Standard:** 81% total sulfur removed
**Our Design:** 86% of total sulfur removed

**Costing Basis:**
- 554,400 tons of coal processed / year
- Buying Price: $29.00 / ton of coal
- $18.68 / ton of lime
- Sale Price: $90.58 / ton of cleaned coal
- $23.00 / ton of gypsum

**Profits:**
- Expenses: $88/ton
- Total Sales: $98/ton
- Net Profit = $10/ton = $5,167,879 / year

**Coal Composition**

### Organic Sulfur Model

Thiophenic compounds such as this represent over 60% of the Organic Sulfur in Coal.

**71.76% Organic Sulfur Removed.**

**Pyritic Sulfur Reactions**

- FeS$_2$ + 2O$_2$ → FeSO$_4$ + S
- FeS$_2$ + $\frac{15}{4}$O$_2$ + $\frac{3}{2}$H$_2$O → $\frac{1}{2}$Fe$_2$O$_3$ + 4H$^+$ + 2SO$_4^{2-}$
- S + $\frac{3}{2}$O$_2$ + $\frac{5}{2}$H$_2$O → 2H$^+$ + 2SO$_4^{2-}$

**Carbon Loss v. Time**

**99% Reduction of Pyrite.**