

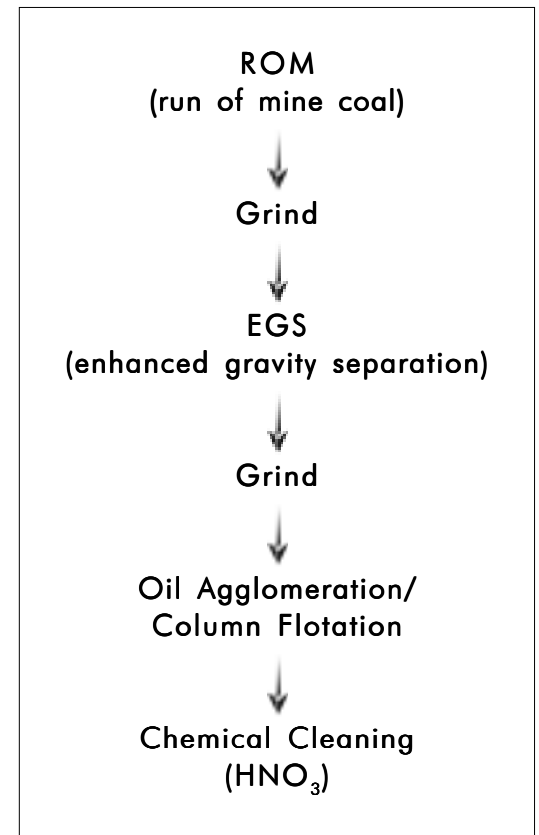
# removing air pollutants before they reach the air

a pre-combustion  
method using advanced  
coal preparation  
techniques

Coal contains measurable amounts of most naturally occurring elements. These elements became bound up with coal before, during and after it was formed. Some of these elements are toxic to plant and animal life, and due to the large amount of coal used by power plants, appreciable quantities of potentially hazardous trace elements are released into the atmosphere each year.

The U.S. Environmental Protection Agency (EPA) has designated 189 potentially 'hazardous' air pollutants (HAPs), of which coal contains at least 16. CAER researchers have completed a five-year study (funded by DoE EPSCoR), which evaluated the efficacy of using a combination of advanced physical and chemical coal-cleaning techniques for removing HAPs. Based on this study, they ultimately created a process flow chart to show the most effective and economical cleaning techniques for use at commercial coal preparation plants ("prep plants"). The process consists of a combination of advanced physical coal cleaning processes, such as column flotation, oil agglomeration and enhanced gravity separation, and a chemical treatment technique to remove the trace elements.

The process consists of the five consecutive steps shown below.



This study was unique in that other researchers have previously studied only individual unit processes. The CAER combined and integrated the different methods and evaluated the combined processes relative to their removal efficiencies.

While laboratory studies are an important step in commercializing processes, they are also significant in determining whether processes are cost-effective. In this study, it was found that while it is economically feasible for a prep plant to use the physical treatment portion of the process, the chemical-treatment portion should be avoided. The latter process proved very costly compared to the

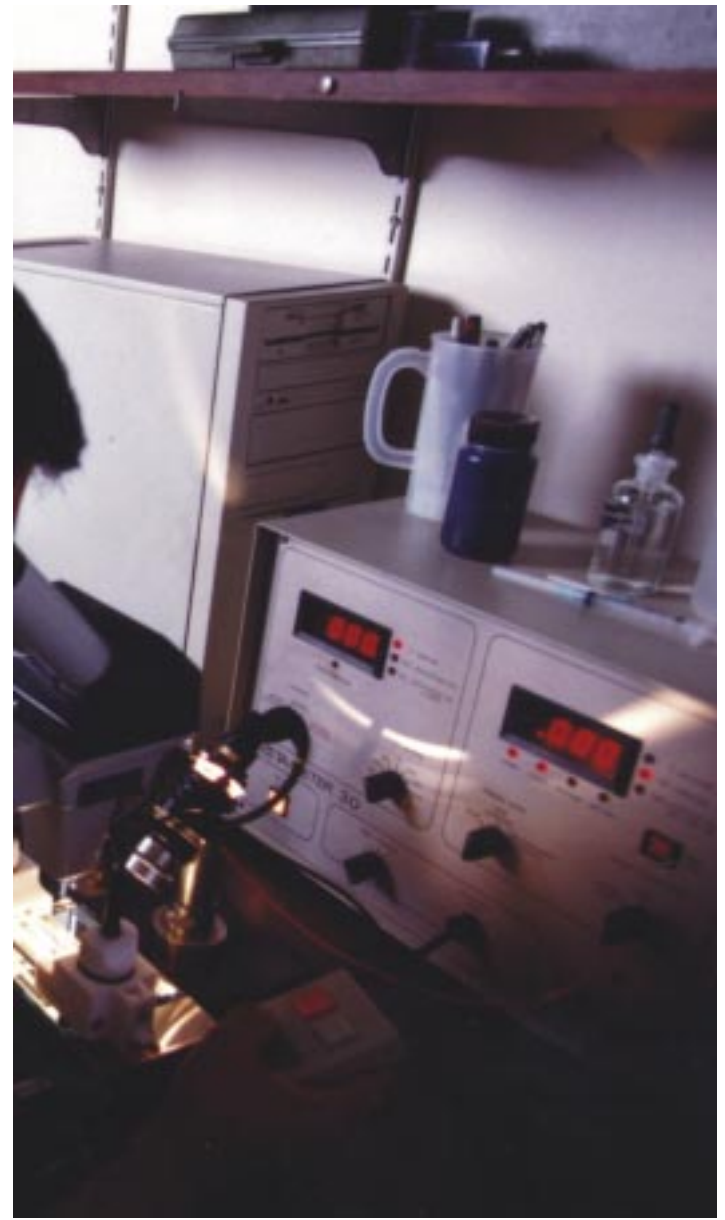


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amounts of impurities removed. At such time as EPA should require the removal of 70 percent of the hazardous air pollutants contained in coal, there will be no choice but to adopt more expensive processes, including potential biological methods that are being developed.

Today, prep plants do some cleaning of the coarse and medium sized coals. However, fine coal is generally sluiced to waste ponds as it is uneconomical to recover because of very high handling costs. This represents sizeable amounts of clean coal that could be recovered and cleaned to remove the hazardous elements from it. This will improve the economics of the overall process.