4. COAL TREATING

The Meyers process, being developed by TRW, Inc., is the only coal treating process examined in detail in this study. The description of the process, effluents, and alternatives are discussed in this section.

4.1 Description of the Meyers Process

In the Meyers process, the pyrites in ground coal are removed by leaching with ferric sulfate according to the equation

$$FeS_2 + 4.6Fe_2(SO_4)_3 + 4.8H_2O \longrightarrow 10.2FeSO_4 + 4.8H_2SO_4 + 0.8S$$

The ferric sulfate is regenerated with oxygen and sulfuric acid according to the equation

$$9.6FeSO_4 + 4.8H_2SO_4 + 2.4O_2 \longrightarrow 4.8Fe_2(SO_4)_3 + 4.8H_2O$$

The sulfur formed in the reaction is dissolved in a light hydrocarbon solvent and removed from the solid coal product by filtration. The sulfur is subsequently recovered by solvent evaporation. A portion of the iron sulfates is removed as a solution from the solid product by filtration and is subsequently precipitated and filtered and then leaves the plant as solids.

The solvent and some water are removed from the product which is then ready for use as a solid fuel.

The total treating complex is self sufficient with respect to steam, oxygen and electricity. Such facilities have been discussed in previous sections of this report.

For a more detailed description of the Meyers process, the reader is referred to Appendix C or to the original process report (44).

4.2 Feed, Products, Utilities and Effluents of the Meyers Process

Table 51 shows the analysis of the feed coal and coal product in the Meyers process. The inputs and outputs of the plant are shown in Table 52. Utility requirements of the process are shown in Table 53. Product coal is burned to provide steam.

Table 51

Analysis Of Feed Coal And Coal Product Of The Meyers Process

	Feed Coal (Dry)[1] (Lower Kittanning)	Product Coal (Dry)[2]
Proximate Analysis, wt %		N.S.
Fixed C	58.48	
Volatile Matter	20.66	
Air	20.86	
Ultimate Analysis, wt %		N.S.
C	68.53	
H	3.85	
N	1.20	
S	3.92	
O	1.56	
Cl	0.08	
Ash	20.86	
Sulfur Forms, wt %		
Pyritic	3.21	0.17
Sulfate	0.04	0.03
Organic	0.67	0.71
Elemental	-	0.04
HHV, Btu/lb (Dry)	12,140	12,748

N.S. = Not specified

(1) Feed Coal assumed to contain 10% moisture

(2) Product Coal contains 16.62% moisture

Table 52

Inputs And Outputs Of The Meyers Process

	Input[1], lb/hr	Output[1], lb/hr
Coal	220,000	210,318[2]
Air		
To Process	31,556	-
To Boiler	141,229	-
To Cooling Tower	12,700,000	-
From Cooling Tower		12,700,000
Solvent	200	-
Water	153,850[3]	135,560[4]
Flue Gas	-	154,570
Sulfur	-	2,438
Iron Sulfates	-	16,258
Nitrogen	-	24,050
Ash	-	2,541
Vents	-	1,100

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(1) Does not include inputs and outputs of flue gas scrubbing
(2) Includes moisture
(3) As liquid water
(4) From cooling tower

Table 53

Utility Requirements Of The Meyers Process

Steam, lb/hr	120,000[1]
Electricity, kW	4,530
Product for Fuel, (Dry), lb/hr	13,234
Water, lb/hr	
Raw water required	153,850
Boiler feed makeup	6,000
Cooling water makeup	135,560
Cooling tower drift loss	14,160
Cooling tower blowdown	21,400

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(1) High pressure steam. Also uses 120,000 lb/hr extracted steam.

Major effluents from the plant that could cause problems include the iron sulfates, cooling tower blowdown, vents and flue gas. It was assumed that the iron sulfates would be impounded permanently and that the cooling tower blowdown would be evaporated in a holding pond. For the specific coal used in the study, the product coal contained more sulfur than allowed under Federal regulations and flue gas scrubbing was assumed. The vents, containing small amounts of solvent, would be incinerated.

Major process alternatives involve methods of separation of the various phases in the process. The reader is referred to the original process report for details.