Potential Effects of Particulates in Ventilation Air Flows
On Flow-Reversal Reactor Performance

If flow reversal reactors are to be effective in oxidizing underground coal mine ventilation air methane (VAM), it is important to avoid problems such as clogging of the heat exchange medium by particulates entrained in the ventilation air flow. To achieve this, it is desirable that particulate concentrations in ventilation air entering oxidation units be <50 mg/m^3.

CMOP obtained relevant information on dust concentrations from the Mine Safety and Health Administration (Haney, 2000) and from records of the Generic Mineral Technology Center on Respirable Dust at Pennsylvania State University, and on dust deposition from thesis research performed at the Pennsylvania State University (Bhaskar, 1987). Rubow, Cantrell, and Marple (1988) provided data on the likely particle size range of dust in underground coal mines.

Based on the limited available data, following are preliminary estimates of the concentration, size, composition, and disposition qualities of particulates in ventilation air flows.

(1) A reasonable range for the expected dust concentrations in coal mine exhaust shafts is about 0.1 to 0.2 mg/m^3. Concentrations may be higher in mines that employ diesel equipment.
(2) The size of the particulate matter in coal mine shafts is expected to be less than 3 μm in diameter with much of the material below 1 μm if diesels are present in the mine.
(3) The particulate matter in coal mine exhausts is expected to be (a) coal and rock dust in mines without diesels and (b) coal dust, rock dust, and diesel particulates in mines with diesels.
(4) Deposition of dust in a VAM oxidation unit is likely to be primarily a result of impaction on surfaces (i.e., collision of particulates with the reactor structural materials or heat exchange medium). The processing unit could minimize impaction, and thus reduce maintenance and processing problems, if its design involves a minimum resistance path through the unit.

Although the available data are limited, this preliminary investigation indicates that it is <u>not</u> likely that dust entrained in typical VAM flows will pose problems for the safe, efficient, and reliable operation of flow-reversal reactors.

References:

Bhaskar, R., 1987, "Spatial and Temporal Behavior of Dust in Mines--Theoretical and Experimental Studies," Ph.D. Thesis, The Pennsylvania State University, 283 pp.

Haney, R., 2000, Personal communication, Mining Safety and Health Administration, Pittsburgh, Pennsylvania.

Rubow, K.L., B.K. Cantrell, and V.A. Marple, 1988, "Measurement of Coal Dust and Diesel Exhaust Aerosols in Underground Mines," Proceedings of the VIIth International Pneumoconioses Conference, U.S. Department of Health and Human Services, Part I, pp. 645-650.