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SALTATION THRESHOLD REDUCTION DUE TO THE ELECTROSTATIC AGGLOMERATION OF FINE PARTICLES

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Particles between 80 and 110 microns in diameter are the most easily moved by the wind. As the particle size decreases below 60 microns they are increasingly more difficult to move by surface winds and a number of experiments have been performed in an attempt to reduce the required wind velocity. These include (1) the bombardment of a bed of fine particles by particles near the optimum size, the larger particles kicking the fine particles into the windstream where they are entrained and (2) the electrostatic agglomeration of fine particles into sizes more easily saltated.

Particles have been formed into large agglomerates (up to 700 microns in diameter) electrostatically in an erosion devise that moves the particles at high speed in a low pressure environment by means of a rapidly spinning paddle wheel. It has required relatively long times to form such agglomerates, 10 to 20 minutes. Once formed these agglomerates will last for months, and if physically broken apart will readily re-form. These long-lasting agglomerates are more easily moved by the wind than the fines from which they are formed, but these agglomerates have not yet been produced in a wind tunnel probably due to the short duration of particle interaction time in the wind tunnel. If another method of agglomeration is verified, such as their formation in the atmosphere after a dust storm, this may be a valid process for the entrainment of fines at low to moderate windspeeds.

What has been observed in the wind tunnel is that fine particles cling electrostatically to larger, more easily moved particles, and thus are carried along when optimum sized particles are moved by the wind. This process would enhance the number of fine particles, removed from a bed of fines by method (1) above, but would not necessarily cause such fine particles to be entrained into the atmosphere unless some mechanism is discovered to remove the fines from the larger particles. In fact, it may be causing a reduction of the number of fines entrained in the atmosphere as they are electrostatically captured by the impinging larger particles.