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Suppressing Turbulence and Enhancing the Liquid Suspension Flow in Pipeline with Electromagnetic Fields G.Q. GU, R. TAO, Dept. of Physics, Temple Univ., Philadelphia, PA — Flows through pipes are the most common and important transportation of fluids. To enhance the flow output along pipeline, it requires reducing the fluid viscosity and suppressing turbulence simultaneously and effectively. Unfortunately, no method is currently available to accomplish both goals simultaneously. Fore example, heating reduces the fluid viscosity, but makes turbulence worse. Here we show that the symmetry breaking physics provides an efficient solution for this issue. When a strong electromagnetic field is applied in the flow direction in a small section of pipeline, the field polarizes and aggregates the particles suspended inside the base liquid into short chains along the flow direction. Such aggregation breaks the symmetry and makes the fluid viscosity anisotropic. Along the flow direction, the viscosity is significantly reduced; in the directions perpendicular to the flow, the viscosity is substantially increased. The turbulence is thus suppressed as all rotating motions and vertexes are suppressed. Only the flow along the pipeline is enhanced and the outflow is improved. The method is extremely energy efficient since it only aggregates the particles and does not heat the suspensions. Recent field tests on pipeline fully support the theoretical prediction.

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