“The net zero emission” mantra may prove to become the new “mother of invention” for minerals processing. The need for change is locked in, and rising, providing the ideal platform for creating new opportunities, especially in gravity concentration and classification. The challenge is to identify and deliver what is required.

This paper is concerned with the gravity concentration and classification of particles in a medium of water, involving particles typically finer than 1.0 mm. One of the greatest challenges is in delivering large scale, highly efficient, desliming at ~10 microns to overcome the effects of viscosity, and in turn maximize the value of the resource. This need is most apparent in one of the world’s most significant commodities, iron ore.

There should also be a much greater role for gravity concentration across this full-size range, increasingly in the range below 0.1 mm, the historical preserve of flotation. If the particle density can deliver sufficient selectivity, then in principle gravity concentration should be considered. This is especially true in reverse flotation which requires a multi-stage flowsheet, very large foot-print, and chemicals to deliver what could be achieved in a single physical stage of gravity concentration. Mechanisms for amplifying segregation forces, including G forces and inclined settling, need to be exploited to deliver the necessary solids throughput.

Classification will be challenged by the emerging requirements for both gravity concentration, comminution, and coarse/fine particle flotation circuits in straddling the size range from 1.0 to 0.1 mm through 0.1 to 0.01 mm. While in principle mechanical screens offer the ideal classification, the hydrodynamic approach may ultimately deliver the robustness, control, throughput, and efficiency despite the variation in separation size with particle density, provided synergy can be realised by integrating correctly within the overall circuit.