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Impact of Highly Concentrated Milk Droplets with Clean and Fouled Surfaces MIGUEL BALZAN, F. STEVEN WELLS, GEOFF WILLMOTT, The Department of Physics, The University of Auckland — Wall deposition in milk spray dryers occurs due to the repeated impact of milk droplets against solid surfaces. Milk can be characterized as a solution of water with solids. Since there is limited information on the literature about single milk droplet collisions against solid surfaces, our study focuses on exploring this phenomenon by characterizing the effect that the surface properties and solids concentration have on the spreading dynamics. Substrates of varied nature; either clean, chemically treated with acid, and milk-product fouled surfaces, were used, resulting in mean roughness values that ranged from 0.023 to 6.270 μm . Our results indicate that the droplet dynamics are weakly dependent on the surface roughness during the kinematic and spreading stages after drop impact. The effect of solids concentration does play a significant role in the spreading and recession dynamics. The fluid behavior is Newtonian up to solids concentrations approximately equal to 20%. Afterward, the fluid is shear-thinning. We quantified the effect that increasing the solid concentration had on the maximum spreading dynamics, finding that increasing the concentration from 10% up to 40% reduced the maximum spreading diameter after impact by approximately 40%.

Miguel Balzan
The Department of Physics, The University of Auckland

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