Gravity filtration of suspensions: permeability effects TEJASWI
SOORI, MENGYU WANG, THOMAS WARD, Department of Aerospace Engineering, Iowa State University — This paper examines the filtration rates of mono-modal
suspensions as a function of time and a cake layer builds up through theory and experimentation. Darcy's Law, which describes fluid flow through porous media, was
applied along with the Kynch theory of sedimentation, which provides the basis for
analyzing low concentration ($\phi \leq 20\%$) cake formation. Experiments were performed
to study the effects of varying particle sizes (45 μm $\leq d \leq$ 1400 μm) and total solid
concentration ϕ on both the formation rate of the cake layer and its flow permeability (k) in conjunction with the filter media. A CCD camera was used to capture
images of the cake formation and fluid drainage processes, and subsequent image
and theoretical analysis found the fluid flow experienced a constant pressure loss
due to the permeability of the filter media, whereas the experienced pressure loss
due to the cake formation varies as a function of time, ϕ and d. The rate of cake
formation was also found to be independent of ϕ but dependent on d which can be
attributed to a change in porosity affecting permeability. Studies on similar systems
with multi-modal suspensions are in-progress.

Thomas Ward
Department of Aerospace Engineering, Iowa State University