

Title            A bioyield tester for measuring apple fruit firmness  
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### **Abstract**

Meat & bone meal (MBM), a product of the rendering industry, is a potential feedstock for numerous bio-based applications. Design of processing equipment for MBM is difficult due to MBM's cohesiveness; it flows less easily than many other granular materials, and it tends to foul the surfaces of processing equipment. This study examines the major factors contributing to MBM's poor bulk behavior, including moisture content, fat content, particle size distribution and temperature, and the relative importance of these factors. Potential methods for improving MBM's bulk properties, including use of an anti-caking agent, dehydration, fat extraction, milling and refrigeration are also studied. The effects of these factors were determined by standard laboratory measurements, including angle of repose and Hausner index, as well as by the rate of surface-fouling and dust generation using a pilot-scale aspirator. Contrary to many past studies with granular materials, moisture content was shown to have an insignificant effect on bulk behavior. The results, however, show that MBM fat is a major contributor to the cohesiveness between MBM particles and consequently to the bulk behavior of the MBM. Reduction of fat content resulted in a major change in MBM's bulk behavior, by all measures used. Less dramatic changes were achieved though refrigeration to solidify the fat and/or treatment with an anti-caking agent.