DEPOSITION OF SOLID FABRIC ENHANCERS DURING CLOTHES DRYING: DYNAMICS OF ARTICLE MOTION

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Dryer sheets are used to deliver a solid fabric enhancer, SFE, to fabrics during tumble drying. To improve dryer sheet formulations a mechanistic understanding of SFE transfer to fabrics is required. Fabric and dryer sheet motion within the dryer drum will influence deposition. This work looks into the nature and frequency of collisions between articles to allow bench scale reproduction of interactions.

As the dryer is an opaque system Positron Emission Particle Tracking, PEPT, was chosen to study motion. This technique allows the location of a positron emitting tracer particle to be detected within a system accurately, multiple times per second. The particle was glued to fabrics and dryer sheets and tracked at pseudo steady state for up to an hour. Results were processed to produce occupancy and time averaged velocity profiles.

For all conditions investigated fabrics were found to be cateracting. A bed forms in the drum base and is lifted up the drum wall before fabrics detach and fall through the free space. Above the bed a stagnant region of slow-moving fabrics forms, but both articles spend little time here. While fabrics and dryer sheets were seen to follow the same velocity profiles, dryer sheets were more likely to travel close to the drum wall and detach later. Increasing moisture content was shown to have little effect on the velocity profile but led to a more compressed bed forming, with articles travelling closer to the drum wall. Increased volume fractions limited fabric motion in the falling region, decreasing velocity here.

The dynamics of fabric and dryer sheet motion within a tumble dryer have been characterised using PEPT. Differences in motion show both impacts and abrasive contacts occur. These will be reproduced in future work to further the understanding of SFE deposition.

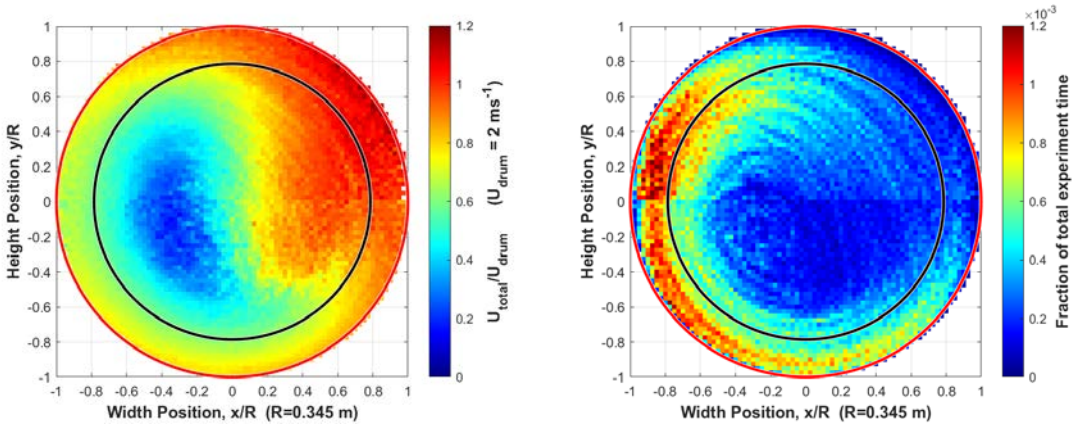

Figure 1. Eularian velocity (left) and occupancy (right) profiles for a fabric sheet in 4.5 kg load of 50x50 cm dry cotton fabric sheets

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