Microfibre Release by Washing machines

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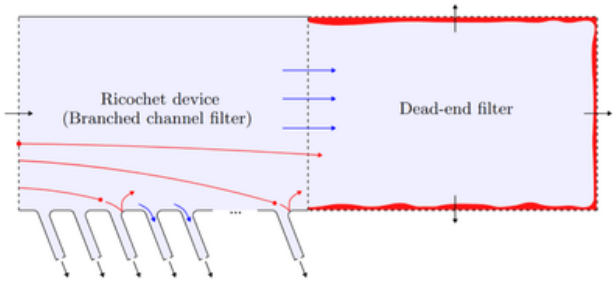
Microplastic fibres from our clothes make up around 35% of ocean microplastics, and it is estimated that each person in the UK produces on average 243g of microplastic fibres annually through laundry.

These tiny particles are infiltrating our bodies, having been detected in organs including the brain, heart, lungs, liver, reproductive organs and placenta, also in fecal matter and even the meconium of newborns.

Though research is ongoing, mounting evidence links microplastic exposure to severe health issues such as dementia, fertility problems, and increased risks of heart attack and stroke. With increasing concern, many countries now require microfibre filters in new washing machines.

The conventional dead-end (mesh) filters have low-production-cost, but clog relatively quickly therefore, working in collaboration with Beko PLC, we consider a new method to increase the lifespan of such filters, coined ricochet separation. Ricochet separation, observed in manta rays, occurs when particle-rich water flows over a series of gill-like, branched channels. Unlike cross-flow filters that capture particles on porous structures, this technique allows water to pass through the branched channels, whilst particles may ricochet back into the free-stream flow. Within a washing machine, this method removes some clean microfibre-free water from the microfibre-rich flow, reducing the pressure drop over the downstream dead-end filter and slowing clogging.

Using mathematical techniques, we derive an analytical solution to describe flow behaviour and a model to predict particle motion in the ricochet device, reducing computation time when optimising the trade-off between minimal particles and maximal fluid flux through each branched channel.



Layout schematic of a branched channel filter preceding a dead-end filter. Microfibre particles, trajectories and foulant are indicated in red and water flow is indicated in blue. The operating directions are indicated by black arrows.