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Lubricated Rolling Over A Pool HATEF RAHMANI, SHELDON GREEN, BORIS STOEBER, Department of Mechanical Engineering, University of British Columbia, NEIL BALMFORTH, Department of Mathematics, University of British Columbia — Film splitting flows are important in many industrial processes, such as the coating of railroad tracks with liquid friction modifiers (LFM). Here, an LFM pool deposited on the track is overridden by an advancing wheel; a liquid film coats both the wheel and rail surfaces, splitting at a meniscus behind the wheel. Lubrication theory is used to predict the meniscus position, wetted length and pressure on the wheel, as a function of the pool depth and wheel load. For 2D flows without side leakage, two solutions exist: below a critical load, steady planing arises in which the minimum gap and wetted length are adjusted to match the incoming and outgoing fluid fluxes. Above that load, flooding occurs with a steady minimum gap, but the incoming flux exceeds that underneath, and fluid is ploughed before the wheel. In 3D, only planing is possible, with leakage to the sides eliminating flooding states. Laser-induced fluorescence and high-speed imaging measure coated film thicknesses in experiments that are within 19% of model predictions.

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