

A Criterion for Low and High-Speeds Slot Coating Processes of the Newtonian Fluid.

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Slot coating processes can be classified by whether it uses a vacuum or not. The vacuum is essential for slot coating processes with the high speed of the web on which coating liquid is applied. At the same time, many successive cases are reported for a low-speed process without a vacuum. However, there are no theoretical criteria reported which classify the speed of slot coating processes so that engineers may not be clear about when they should use high speed or low speed.

In this study, steady-state analysis is used to find a governing equation of the web speed for a stable process. Then, it is verified by the graphical method that the solution has a range. This range tells when a vacuum is not applied, the maximum web speed is bounded while a process with vacuum enables any high web speed as large as the amount of vacuum applied. Therefore, we can find the criterion for the web speed when the use of a vacuum is essential or not for that amount of web speed. Moreover, this criterion depends on fluid properties and operating conditions so that it plays the role of a step in a workflow that engineers can choose between low and high-speeds processes.