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We consider the maximum flow problem in a network where each arc has a time varying capacity: a univariate polynomial of fixed degree. We seek time varying polynomials representing instantaneous flow on each arc such that the total flow into the sink between times 0 and 1 is maximal. Nonnegative flow should not exceed capacity at any instance between 0 and 1. This problem can be solved by semidefinite programming. We also consider the case where there are time delays on each arc. We consider the possibility extending classical results based on augmenting paths to this case (Received January 26, 2014)