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Deviations in Polymer Drag Reduction Performance with Mechanical Degradation[1] ZEESHAN SAEED, YASAMAN FARSIANI, DR. BRIAN ELBING, Oklahoma State University — Polymer drag reduction studies, although show great promise in flow control applications, are significantly limited by a problem; mechanical degradation of polymers in shear flows. Insights into this problem were made by comparing the drag reduction performance (slope increments on Prandtl-Karman (P-K) plots) of Polyethylene oxide (PEO) samples with and without degradation. The molecular weights of PEO samples-a measure of the extent of their degradation-were determined by matching the onset of drag reduction i.e. the intersection of the polymeric curve with the Prandtl-von Karman law on the P-K plots. Range of mean molecular weights (0.6 – 8 million g/mol) of PEO samples were included in the test matrix. Higher molecular weight samples were mechanically degraded to lower mean molecular weights that matched the molecular weights of available non-degraded samples (e.g. 4 million g/mol was degraded to 0.6 million g/mol). Comparisons of resulting slope increments determined from P-K plots of the degraded and non-degraded samples were then scaled with a function based on their mean molecular weights to show how polydispersity is central in determining the flow characteristics. This presentation reports the findings from the experiments and analysis mentioned above

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