

Abstract Submitted  
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**A Novel Pressure Compensating Valve for Low-Cost Drip Irrigation** AMOS WINTER, ALEXANDER WIENS, Massachusetts Inst of Tech-MIT — Nearly one billion people are currently living as subsistence farmers in the developing world. Irrigation could drastically increase quality of life for these individuals by enabling them to grow more and higher value crops. However, current irrigation technologies are too costly for this economic sector, particularly in off-grid applications. The cost of an off-grid irrigation system is primarily driven by the power required to pump the water at a relatively high pressure ( $\approx 1$  bar). We propose a novel pressure compensating drip emitter design which allows these systems to operate at 1/10 the pressure of current products, making them economically viable in developing markets. Our proposed solution is inspired by the resonating nozzle of a deflating balloon. We use a reduced order model to understand the physical principles which drive the cyclic collapse of the balloon nozzle. This knowledge is applied to propose a pressure compensating drip emitter consisting of a simple compliant tube in series with a rigid conical diffuser. A scaling analysis is performed to determine the ideal geometry of the system and the model is applied to demonstrate that the proposed design is capable of pressure compensation in the required operation range. Preliminary experiments are presented.

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