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Design of an INVELOX based wind delivery system for low wind speed application.

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Features such as the omni directional intake, the nozzle-diffuser section as well as the diffuser section of the Increased velocity (INVELOX) wind delivery system augment incident air to a cut in wind speed of most small-scale wind turbines systems. Despite these properties, the INVELOX delivery systems suffers from adverse pressure gradient leading to flow separation within the throat section. This significantly reduces the suction capacity of the intake thus diminishing aerodynamic performance of the system. Amid other scholars that have researched to improve it, this study modified the original INVELOX setup by employing a multi-element diffuser section. The aim is to improve the expansion area and subsequently avoid flow separation on the diffuser wall. The geometry was developed and simulated in an OPEN FOAM environment where the effect to the performance of the INVELOX system as well as the extractable power is then observed. The results show an improved pressure gradient leading to the flow attaching for longer periods within the diffuser. A good value of H/D was shown to improve the speed up ratio of the throat thus emphasizing the importance of a careful design of the diffuser vanes.

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