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Impact of Air Flow Structure on Distinct Shape of Differential Pressure Devices

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Abstract : Energy harvesting from any structure makes a challenge. Different structure of air/wind flows in industrial, environmental and residential applications emerge the real flow investigation in detail. Many of the application fields are hardly achievable to the detailed description due to the lack of up-to-date statistical data analysis. In situ measurements aim crucial investments thus the simulation methods come to implement structural analysis of the flows. Different configurations of testing environment give an overview how important is the simple structure of field in limited area on efficiency of the system operation and the energy output. Several configurations of modeled working sections in air flow test facility was implemented in CFD ANSYS environment to compare experimentally and numerically air flow development stages and forms that make effects on efficiency of devices and processes. Effective form and amount of these flows under different geometry cases define the manner of instruments/devices that measure fluid flow parameters for effective operation of any system and emission flows to define. Different fluid flow regimes were examined to show the impact of fluctuations on the development of the whole volume of the flow in specific environment. The obtained results rise the discussion on how these simulated flow fields are similar to real application ones. Experimental results have some discrepancies from simulation ones due to the models implemented to fluid flow analysis in initial stage, not developed one and due to the difficulties of models to cover transitional regimes. Recommendations are essential for energy harvesting systems in both, indoor and outdoor cases. Further investigations aim to be shifted to experimental analysis of flow under laboratory conditions using state-of-the-art techniques as flow visualization tool and later on to in situ situations that is complicated, cost and time consuming study.

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