ANALYSIS OF A 100 KG CAPACITY GALAM LEAF ESSENTIAL OIL DISTILLATION REACTOR USING COMPUTATIONAL FLUID DYNAMICS (CFD)

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ABSTRACT

This study analyzes the performance of an essential oil distillation reactor for galam leaves (Melaleuca leucadendra) with a capacity of 100 kg using the Computational Fluid Dynamics (CFD) method in SolidWorks Flow Simulation. The simulation was conducted with two variations of inlet steam pressure, namely 2 bar and 4 bar, using saturated steam with a mass flow rate of 0.0556 kg/s and a raw material porosity of 0.81. The parameters analyzed include outlet temperature, outlet pressure, and outlet velocity. The results show that at 2 bar inlet pressure, the average outlet temperature was 102.8 °C, the outlet velocity was 325.4 m/s, and the outlet pressure was 0.854 bar. At 4 bar inlet pressure, the average outlet temperature was 104.8 °C, the outlet velocity was 327.3 m/s, and the outlet pressure was 0.853 bar. These findings indicate that increasing the steam pressure slightly increases outlet temperature and velocity but has no significant effect on outlet pressure. This provides a technical reference for selecting the optimal operating pressure to improve the performance and efficiency of the galam leaf essential oil distillation reactor.

Keywords*: galam leaves, essential oil, steam distillation, CFD, SolidWorks*