

Lifetime Assessment of Highly Efficient Metal-Based Air-Diffuser through Accelerated Degradation Test

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Abstract : Degradation of standard oxygen transfer efficiency (SOTE) with time was observed for the assessment of lifetime of metal-based air-diffuser, which displaced a polymer composite-based air-diffuser in order to attain a longer lifetime in the actual field. The degradation of air-diffuser occurred due to the failure of the formation of small and uniform air bubbles since the patterns formed on the disc of air-diffuser deteriorated and/or changed from their initial shapes while they were continuously exposed to the air blowing condition during the operation in the field. Therefore, the lifetime assessment of metal-based air-diffuser was carried out through an accelerated degradation test by accelerating the air-blowing conditions in 200 L/min, 300 L/min, and 400 L/min and the lifetime of normal operating condition at 120 L/min was predicted. It was found that Weibull distribution was the most proper one for describing the lifetime distribution of metal-based air-diffuser in the present study. The shape and scale parameters indicated that the accelerated blowing conditions were all within the acceleration domain. The lifetime was predicted by adopting inverse power model for a stress-life relationship and estimated to be $B_{10}=94,004$ hrs with $CL=95\%$. Acknowledgement: This work was financially supported by the Ministry of Trade, Industry and Energy (Grant number: N0001475).

Keywords : accelerated degradation test, air-diffuser, lifetime assessment, SOTE

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