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Heuristic Shape Optimization of Baffled Fluid Distributor for Uniform Flow Distribution

Lingai LUO^{a*}, Min WEI^a, Yilin FAN^a and Gilles FLAMANT^b

^a *Laboratoire de Thermocinétique de Nantes, UMR CNRS 6607, Polytech' Nantes – Université de Nantes, La Chantrerie, Rue Christian Pauc, BP 50609, 44306 Nantes Cedex 03, France*

^b *Laboratoire Matériaux, Procédés et Energie Solaire (PROMES), UPR CNRS 8521, 7 rue du Four Solaire, 66120 Font-Romeu Odeillo, France*

Abstract

This paper presents a CFD-based, heuristic evolutionary algorithm for shape design and optimization of baffled fluid distributor. In this algorithm, the baffle surface is firstly divided with numerous identical control areas (volumes), each control area having an orifice in the middle. Under the constraint of constant global porosity of the baffle, the algorithm adjusts the size distribution of orifices so as to approach identical mass flowrate passing through every control area. An automatic program is processed iteratively so that the baffle configuration evolves toward the optimized shape, providing a uniform flow distribution among parallel outlet channels.

To illustrate the principles and procedure of this algorithm, a 2D example of baffled fluid distributor is introduced and tested. Numerical results show that this algorithm can successfully reach uniform flow distribution with a small pressure drop increase. Sensibility analysis also shows that this algorithm is robust, effective, general and flexible compared to traditional arbitrary or empirical

* Corresponding author. Tel.: +33 240683167; Fax: +33 240683141. E-mail address: lingai.luo@univ-nantes.fr

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