

Two Approaches to Mathematical Modelling of Heating/Evaporation of a Multi-component Liquid Film

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Abstract - Two numerical algorithms for modelling multi-component liquid film heating/evaporation are compared. Both algorithms are based on the solutions of one-dimensional heat transfer/species diffusion equations describing the processes in the liquid film. One of these algorithms is based on the fully numerical solutions of these equations, while the second one is based on their analytical solutions at each time step. The predictions of both algorithms are compared for the case of a 50%/50% hexadecane/heptane film under typical Diesel engine conditions. The agreement between the time evolution of thickness and surface/average temperatures of the film, predicted by both algorithms, appears to be rather close. This allows us to recommend both algorithms for practical engineering applications.

Keywords: Film of liquid; Multi-component; Evaporation; Heating; Internal combustion engines; Numerical solutions