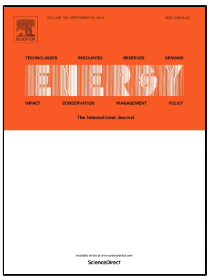
Accepted Manuscript



Evaluating performances of 1-D Models to predict variable area supersonic gas ejector performances

Andrija Petrovic, Milos Z. Jovanovic, Srbislav Genic, Ugljesa Bugaric, Boris Delibasic

PII:	S0360-5442(18)31650-5
DOI:	10.1016/j.energy.2018.08.115
Reference:	EGY 13591
To appear in:	*Energy*
Received Date:	29 May 2018
Accepted Date:	14 August 2018

Please cite this article as: Andrija Petrovic, Milos Z. Jovanovic, Srbislav Genic, Ugljesa Bugaric, Boris Delibasic, Evaluating performances of 1-D Models to predict variable area supersonic gas ejector performances, *Energy* (2018), doi: 10.1016/j.energy.2018.08.115

EVALUATING PERFORMANCES OF 1-D MODELS TO PREDICT VARIABLE AREA SUPERSONIC GAS EJECTOR PERFORMANCES

Andrija Petrovic[1*], Milos Z Jovanovic[2], Srbislav Genic[1], Ugljesa Bugaric[3], Boris Delibasic[2]

University of Belgrade, Faculty of Mechanical Engineering

[1] Department of Process engineering

[3] Department of Industrial engineering

Kraljice Marije 16, 11000 Belgrade, Serbia

University of Belgrade, Faculty of Organizational Sciences

[2] Center for Business Decision Making

Jove Ilica 154, 11000 Belgrade, Serbia

Abstract

The application of supersonic gas ejector with variable area nozzle can be found in different industries. However, due to different types of variable area nozzle, performance prediction is mainly focused on costly numerical simulations. In this paper, one-dimensional models for performance prediction of variable area gas ejector with specially designed nozzle, were compared. Additionally, operational lines and corresponding modes were analyzed. Two different variable area ejectors were experimentally tested. The first ejector used natural gas as motive fluid, whereas in the second one motive gas was the composition of alkane. Six distinct correlations of ejector component efficiencies were evaluated. Sum of absolute relative errors and coefficient of determination were used as goodness of fit criteria. The results showed that best model has coefficient of determination 0.76 and 0.63 in the case of natural and R2 gas as motive fluids, respectively. In order to improve prediction performances of entrainment ratio, the mixture of experts machine learning technique was used. Moreover, the results of obtained conditional probabilities of models are visualized in space spanned by area and pressure ratios. The presented analysis showed that one model is not generally better than others and can be improved by using an ensemble of models.

Keywords: variable area nozzle, supersonic gas ejector, mixture of experts, experimental study, antlion algorithm

Nomenclature

$\dot{m}$, kg/s, mass flow rate

a_{*_x} , m/s, velocities at chocking conditions

* Corresponding author. Tel. +381-62-295-278 E-mail: aapetrovic@mas.bg.ac.rs