Document type
Conference Paper

Source type
Conference Proceedings

ISSN
22147853

DOI
10.1016/j.matpr.2021.01.834

Publisher
Elsevier Ltd

Original language
English

Volume Editors
Yarlagadda P.K.D.V., Karinka S., Vijeesh V., Udaya D., Santhosh G.

View less

Materials Today: Proceedings • Volume 46, Pages 2549 - 2556 • 2021 • 2nd International Conference on Smart and Sustainable Developments in Materials, Manufacturing and Energy Engineering, SME 2020 • Nitte • 22 December 2020 through 23 December 2020 • Code 170455

Influence of microjets on flow development for diameter ratio of 1.6 for correctly expanded nozzles

Faheem M.[a, b], Muneer R.[b], Avvad M.[b], Aneeque M.[b], Khan S.A.[a]

Save all to author list

[a] Department of Mechanical Engineering, Faculty of Engineering, International Islamic University Malaysia, Kuala Lumpur, Malaysia

[b] Department of Mechanical Engineering, P.A College of Engineering (Affiliated to Visvesvaraya Technological University), Karnataka, Mangaluru, India

Abstract

This paper aims to study the microjet's efficacy as a management tool for the duct's flow field. The nozzle was correctly expanded for a diameter ratio of 1.6 (i.e., area ratio = 2.56). The Mach numbers considered were from 1.25 to 2. The investigation shows that the development and recovery of the duct

flow are smooth at lower Mach numbers. At Mach 1.48, jet noise was reduced considerably when the control is initiated. For higher Mach numbers of the study, namely Mach 1.6, 1.8, and 2.0, the flow 's oscillatory nature was noticed. This phenomenon reiterates that the nozzles flow is wave-dominated. For most of the flow , the flowing nature remains unaltered due to control. The flow remained connected with the duct for duct length twice the nozzle exit diameter .

Author keywords

Active control; Area ratio ; Microjets ; Supersonic jet; Wall pressure

SciVal Topics

Metrics

References (23)

View in search results format >

All

Export Print E-mail Save to PDF Create bibliography

1 Viswanath, P.R.

Flow management techniques for base and afterbody drag reduction

(1996) *Progress in Aerospace Sciences*, 32 (2-3), pp. 79-129. Cited 83 times.
doi: 10.1016/0376-0421(95)00003-8

View at Publisher

2 Bashir, M., Khan, S.A., Chaudhary, Z.I., Shinde, V.

Wall pressure measurements beneath the supersonic jets in an abruptly augmented nozzle

(2020) *Journal of Advanced Research in Fluid Mechanics and Thermal Sciences*, 66 (2), pp. 20-31. Cited 3 times.
http://www.akademiabaru.com/doc/ARFMTSV66_N2_P20_31.pdf

View at Publisher

3 Azami, M.H., Faheem, M., Aabid, A., Mokashi, I., Khan, S.A.

Inspection of supersonic flows in a CD nozzle using experimental method (Open Access)

(2019) *International Journal of Recent Technology and Engineering*, 8 (2 Special Issue 3), pp. 996-999. Cited 18 times.
https://www.ijrte.org/wp-content/uploads/papers/v8i2S3/B11860782S319.pdf
doi: 10.35940/ijrte.B1186.0782S319

View at Publisher

4 Faheem, M., Kareemullah, M., Aabid, A., Mokashi, I., Khan, S.A.

Experiment on of nozzle flow with sudden expansion at mach 1.1 (Open Access)

(2019) *International Journal of Recent Technology and Engineering*, 8 (2 Special Issue 8), pp. 1769-1775. Cited 12 times.
https://www.ijrte.org/wp-content/uploads/papers/v8i2S8/B11500882S819.pdf
doi: 10.35940/ijrte.B1150.0882S819

View at Publisher

5 Azami, M.H., Faheem, M., Aabid, A., Mokashi, I., Khan, S.A.

Experimental research of wall pressure distribution and effect of micro jet at Mach 1.5 (Open Access)

(2019) *International Journal of Recent Technology and Engineering*, 8 (2 Special Issue 3), pp. 1000-1003. Cited 17 times.
https://www.ijrte.org/wp-content/uploads/papers/v8i2S3/B11870782S319.pdf
doi: 10.35940/ijrte.B1187.0782S319

View at Publisher

6 Khan, S.A., Mokashi, I., Aabid, A., Faheem, M.

Experimental research on wall pressure distribution in C-D nozzle at mach number 1.1 for area ratio 3.24 (Open Access)

(2019) *International Journal of Recent Technology and Engineering*, 8 (2 Special Issue 3), pp. 971-975. Cited 14 times.
https://www.ijrte.org/wp-content/uploads/papers/v8i2S3/B11820782S319.pdf
doi: 10.35940/ijrte.B1182.0782S319

View at Publisher

7 Khan, S.A., Asadullah, M., Fharukh Ahmed, G.M., Jalaluddeen, A., Ali Baig, M.A.

Passive control of base drag in compressible subsonic flow using multiple cavity (Open Access)

(2018) *International Journal of Mechanical and Production Engineering Research and Development*, 8 (4), pp. 39-44. Cited 25 times.
http://www.tjprc.org/publishpapers/2-67-1529991141-5.IJMPERDAUG20185_2.pdf
doi: 10.24247/ijmperdaug20185

View at Publisher

8 Pathan, K.A., Dabeer, P.S., Khan, S.A.

Optimization of area ratio and thrust in suddenly expanded flow at supersonic Mach numbers (Open Access)

(2018) *Case Studies in Thermal Engineering*, 12, pp. 696-700. Cited 35 times.
http://www.journals.elsevier.com/case-studies-in-thermal-engineering/
doi: 10.1016/j.csite.2018.09.006

View at Publisher

9 Khan, S.A., Aabid, A., Ghasi, F.A.M., Al-Robaian, A.A., Alsagri, A.S.

Analysis of area ratio in a CD nozzle with suddenly expanded duct using CFD method

(2019) *CFD Letters*, 11 (5), pp. 61-71. Cited 33 times.
http://www.akademiabaru.com/cfdl.html

10 Aabid, A., Afghan Khan, S.

Determination of wall pressure flows at supersonic Mach numbers (Open Access)

(2020) *Materials Today: Proceedings*, Part 5 38, pp. 2347-2352. Cited 5 times.
http://www.journals.elsevier.com/materials-today-proceedings/
doi: 10.1016/j.matpr.2020.06.538

View at Publisher

11 Aabid, A., Chaudhary, Z.I., Khan, S.A.

Modelling and analysis of convergent divergent nozzle with sudden expansion duct using finite element method

(2019) *Journal of Advanced Research in Fluid Mechanics and Thermal Sciences*, 63 (1), pp. 34-51. Cited 8 times.
http://www.akademiabaru.com/doc/ARFMTSV63_N1_P34_51.pdf

12 Akhtar, M.N., Bakar, E.A., Aabid, A., Khan, S.A.
Numerical simulations of a CD nozzle and the influence of the duct length (Open Access)

(2019) *International Journal of Innovative Technology and Exploring Engineering*, 8 (9 Special Issue 2), pp. 622-630. Cited 11 times.
https://www.ijitee.org/wp-content/uploads/papers/v8i9S2/I11270789S219.pdf
doi: 10.35940/ijitee.I1127.0789S219

View at Publisher

13 Aabid, A., Khan, A., Mazlan, N.M., Ismail, M.A., Akhtar, M.N., Khan, S.A.
Numerical simulation of suddenly expanded flow at mach 2.2

(2019) *International Journal of Engineering and Advanced Technology*, 8 (3), pp. 457-462. Cited 29 times.
www.ijeat.org

14 Khan, A., Aabid, A., Khan, S.A.
CFD analysis of convergent-divergent nozzle flow and base pressure control using micro-JETS

(2018) *International Journal of Engineering and Technology(UAE)*, 7 (3.29 Special Issue 29), pp. 232-235. Cited 28 times.
https://www.sciencepubco.com/index.php/ijet

View at Publisher

15 Asadullah, M., Khan, S.A., Asrar, W., Sulaeman, E.
Low-cost base drag reduction technique (Open Access)

(2018) *International Journal of Mechanical Engineering and Robotics Research*, 7 (4), pp. 428-432. Cited 28 times.
http://www.ijmerr.com/uploadfile/2018/0709/20180709112530996.pdf
doi: 10.18178/ijmerr.7.4.428-432

View at Publisher

16 Faheem, M., Khan, A., Kumar, R., Khan, S.A.
Experimental Study of Supersonic Multiple Jet Flow Field
(2019) *In 32nd International Symposium on ShockWaves (ISSW32)*, pp. 2725-2731. Cited 9 times.

17 Faheem, M., Khan, A., Kumar, R., Afghan Khan, S., Asrar, W., Sapardi, A.M.
Experimental study on the mean flow characteristics of a supersonic multiple jet configuration (Open Access)

(2021) *Aerospace Science and Technology*, 108, art. no. 106377. Cited 7 times.
https://www.journals.elsevier.com/aerospace-science-and-technology
doi: 10.1016/j.ast.2020.106377

View at Publisher

18 Khan, A., Kumar, R., Verma, S.B., Manisankar, C.
Effect of cross wire tab orientation on twin jet mixing characteristics

(2018) *Experimental Thermal and Fluid Science*, 99, pp. 344-356. Cited 13 times.
doi: 10.1016/j.expthermflusci.2018.08.005

View at Publisher

19 Faheem, M., Khan, A., Kumar, R., Afghan Khan, S., Asrar, W., Sapardi, A.M.

Experimental study on the mean flow characteristics of a supersonic multiple jet configuration (Open Access)

(2021) *Aerospace Science and Technology*, 108, art. no. 106377. Cited 7 times.
https://www.journals.elsevier.com/aerospace-science-and-technology
doi: 10.1016/j.ast.2020.106377

View at Publisher

20 Khan, A., Akram, S., Kumar, R.

Experimental study on enhancement of supersonic twin-jet mixing by vortex generators

(2020) *Aerospace Science and Technology*, 96, art. no. 105521. Cited 16 times.
https://www.journals.elsevier.com/aerospace-science-and-technology
doi: 10.1016/j.ast.2019.105521

View at Publisher

21 Afzal, A., Aabid, A., Khan, A., Afghan Khan, S., Rajak, U., Nath Verma, T., Kumar, R.

Response surface analysis, clustering, and random forest regression of pressure in suddenly expanded high-speed aerodynamic flows

(2020) *Aerospace Science and Technology*, 107, art. no. 106318. Cited 17 times.
https://www.journals.elsevier.com/aerospace-science-and-technology
doi: 10.1016/j.ast.2020.106318

View at Publisher

22 Aabid, A., Khan, S.A.

Investigation of High-Speed Flow Control from CD Nozzle Using Design of Experiments and CFD Methods

(2021) *Arabian Journal for Science and Engineering*, 46 (3), pp. 2201-2230. Cited 4 times.
https://link-springer-com.ezlib.iium.edu.my/journal/13369
doi: 10.1007/s13369-020-05042-z

View at Publisher

23 Anderson, J.S., Williams, T.J.
Base Pressure and Noise Produced by the Abrupt Expansion of Air in a Cylindrical Duct
(1968) *J. Mech. Eng. Sci.*, 10 (3), pp. 262-268. Cited 46 times.

Khan, S.A.; Department of Mechanical Engineering, Faculty of Engineering, International Islamic University Malaysia, Kuala Lumpur, Malaysia;
email:sakhan@iium.edu.my