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Effect of nozzle pressure ratio and control jets location to control base pressure in suddenly expanded flows (Article) (Open Access)

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Abstract

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In this paper, computational fluid dynamic (CFD) analysis and experiments have been carried out to study the effect of nozzle pressure ratio , i.e. the ratio of inlet pressure to atmospheric pressure , and the pitch circle diameter of the control jets to regulate the base pressure . The variables considered for the analysis as well as the experiments are the nozzle pressure ratio (NPR), the Mach number (M) and the pitch circle diameter (PCD) of the control jets . The area ratio considered for the study is kept constant at 4.84 while thelength to diameter (L/D) ratio of an enlarged duct isset constant at 5. The inertia parameter considered for the study is Mach number. The Mach numbers considered for study are 1.5, 2.0, and 2.5. The nozzle pressure ratio considered for study are 2, 5 and 8. Three different pitch circle diameters of control jets considered for study are 13.1 mm, 16.2 mm and 19.3 mm. From the numerical simulations and the results of the experimental tests, it is found that the control jets are very beneficial to increase the base pressure at higher NPR when the jets issuing from the nozzles are under-expanded . The control jets were able to increase the base pressure value from 160% to 400% at nozzle pressure ratio 8. It is concluded that the parameter D_3 is the most effective pitch circle diameter of the control jets to increase the base pressure . © 2019, Isfahan University of Technology.

SciVal Topic Prominence

Topic: Nozzles | Mach number | Suddenly expanded

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Base pressure | Mach number | Nozzle pressure ratio | PCD of control jets

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References (29)

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1 Asadullah, M., Khan, S.A., Asrar, W., Sulaeman, E.
Active control of base pressure with counter clockwise rotating cylinder at Mach 2

(2018) *4th IEEE International Conference on Engineering Technologies and Applied Sciences, ICETAS 2017*, 2018-January, pp. 1-6. Cited 8 times.
ISBN: 978-153862106-6
doi: 10.1109/ICETAS.2017.8277857

View at Publisher

2 Asadullah, M., Khan, S.A., Asrar, W., Sulaeman, E.
Passive control of base pressure with static cylinder at supersonic flow (Open Access)

(2018) *IOP Conference Series: Materials Science and Engineering*, 370 (1), art. no. 012050. Cited 8 times.
http://www.iop.org/EJ/journal/mse
doi: 10.1088/1757-899X/370/1/012050

View at Publisher

3 Asadullah, M., Khan, S.A., Asrar, W., Sulaeman, E.
Passive control of base pressure with static cylinder at supersonic flow (Open Access)

(2018) *IOP Conference Series: Materials Science and Engineering*, 370 (1), art. no. 012050. Cited 8 times.
http://www.iop.org/EJ/journal/mse
doi: 10.1088/1757-899X/370/1/012050

View at Publisher

4 Asadullah, M., Khan, S.A., Asrar, W., Sulaeman, E.
Low-cost base drag reduction technique

(2018) *International Journal of Mechanical Engineering and Robotics Research*, 7 (4), pp. 428-432. Cited 9 times.
http://www.ijmerr.com/uploadfile/2018/0709/20180709112530996.pdf
doi: 10.18178/ijmerr.7.4.428-432

View at Publisher

5 Baig, M.A.A., Al-Mufadi, F., Khan, S.A., Rathakrishnan, E.
Control of base flows with micro jets

(2011) *International Journal of Turbo and Jet Engines*, 28 (1), pp. 59-69. Cited 17 times.
doi: 10.1515/TJJ.2011.009

View at Publisher

6 Baig, M.A.A., Khan, S.A., Ahmed Saleel, C., Rathakrishnan, E.
Control of base flows with micro jet for area ratio of 6.25

(2012) *ARPN Journal of Engineering and Applied Sciences*, 7 (8), pp. 992-1002. Cited 9 times.
http://www.arpnjournals.com/jeas/research_papers/rp_2012/jeas_0812_754.pdf

7 Ethirajan, R.
(2011) *Gas Dynamics*
Third ed. PHI Learning Private Limited, New Delhi, India

8 Fharrukh, A.G.M., Khan, S.A.
(2018) *Investigation of efficacy of low length-to-diameter ratio and nozzle pressure ratio on base pressure in an abruptly expanded flow*

9 Fharukh Ahmed, G.M., Ullah, M.A., Khan, S.A.
Experimental study of suddenly expanded flow from correctly expanded nozzles

(2016) *ARPN Journal of Engineering and Applied Sciences*, 11 (16), pp. 10041-10047. Cited 11 times.
http://www.arpnjournals.org/jeas/research_papers/rp_2016/jeas_0816_4879.pdf

10 Khan, S.A., Rathakrishnan, E.
Nozzle expansion level effect on suddenly expanded flow

(2006) *International Journal of Turbo and Jet Engines*, 23 (4), pp. 233-257. Cited 20 times.
http://www.degruyter.com/view/j/tjj.2012.29.issue-2/issue-files/tjj.2012.29.issue-2.xml
doi: 10.1515/TJJ.2006.23.4.233

View at Publisher

11 Khan, S.A., Rathakrishnan, E.
Control of suddenly expanded flow

(2006) *Aircraft Engineering and Aerospace Technology*, 78 (4), pp. 293-309. Cited 27 times.
doi: 10.1108/17488840610675573

View at Publisher

12 Khan, S.A., Rathakrishnan, E.
Active control of base pressure in supersonic regime

(2006) *Journal of the Institution of Engineers (India): Aerospace Engineering Journal*, 87 (NOV.), pp. 3-11. Cited 10 times.

13 Khan, S.A., Rathakrishnan, E.
Active control of suddenly expanded flows from overexpanded nozzles

(2002) *International Journal of Turbo and Jet Engines*, 19 (1-2), pp. 119-126. Cited 35 times.
http://www.degruyter.com/view/j/tjj.2012.29.issue-2/issue-files/tjj.2012.29.issue-2.xml
doi: 10.1515/TJJ.2002.19.1-2.119

View at Publisher

14 Khan, S.A., Asadullah, M., Sadhiq, J.
Passive control of base drag employing dimple in subsonic suddenly expanded flow

(2018) *International Journal of Mechanical and Mechatronics Engineering*, 18 (3), pp. 69-74. Cited 11 times.
http://ijens.org/Vol_18_I_03/181303-5757-IJMME-IJENS.pdf

15 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 9 times.
http://www.tjprc.org/publishpapers/2-67-1529991141-5.IJMPERDAUG20185_2.pdf
doi: 10.24247/ijmperdaug20185

View at Publisher

16 Khan, S.A., Aabid, A., Baig, M.A.A.
CFD analysis of cd nozzle and effect of nozzle pressure ratio on pressure and velocity for suddenly expanded flows (Open Access)

(2018) *International Journal of Mechanical and Production Engineering Research and Development*, 8 (3), pp. 1147-1158. Cited 15 times.
http://www.tjprc.org/publishpapers/2-67-1529468467-119.IJMPERDJUN2018119.pdf
doi: 10.24247/ijmperdjun2018119

View at Publisher

17 Khan, S.A., Fatepurwala, M.A., Pathan, K.N., Dabeer, P.S., Baig, M.A.A.
CFD analysis of human powered submarine to minimize drag (Open Access)

(2018) *International Journal of Mechanical and Production Engineering Research and Development*, 8 (3), pp. 1057-1066. Cited 5 times.
http://www.tjprc.org/publishpapers/2-67-1529318360-111.IJMPERDJUN2018111.pdf
doi: 10.24247/ijmperdjun2018111

View at Publisher

18 Khan, S.A., Rathakrishnan, E.
Control of Suddenly Expanded Flows with Micro-Jets

(2003) *International Journal of Turbo and Jet Engines*, 20 (1), pp. 63-81. Cited 35 times.
http://www.degruyter.com/view/j/tjj.2012.29.issue-2/issue-files/tjj.2012.29.issue-2.xml
doi: 10.1515/TJJ.2003.20.1.63

View at Publisher

19 Khan, S.A., Rathakrishnan, E.
Active control of suddenly expanded flows from underexpanded nozzles

(2004) *International Journal of Turbo and Jet Engines*, 21 (4), pp. 233-253. Cited 30 times.
http://www.degruyter.com/view/j/tjj.2012.29.issue-2/issue-files/tjj.2012.29.issue-2.xml
doi: 10.1515/TJJ.2004.21.4.233

View at Publisher

20 Khan, S.A., Rathakrishnan, E.
Control of suddenly expanded flows from correctly expanded nozzles

(2004) *International Journal of Turbo and Jet Engines*, 21 (4), pp. 255-278. Cited 27 times.
http://www.degruyter.com/view/j/tjj.2012.29.issue-2/issue-files/tjj.2012.29.issue-2.xml
doi: 10.1515/TJJ.2004.21.4.255

View at Publisher

21 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 9 times.
http://www.journals.elsevier.com/case-studies-in-thermal-engineering/
doi: 10.1016/j.csite.2018.09.006

View at Publisher

22 Pathan, K.A., Dabeer, P.S., Khan, S.A.
CFD Analysis of the Supersonic Nozzle Flow with Sudden Expansion
(2016) *International Organization of Scientific Research-Journal of Mechanical and Civil Engineering (IOSR-JMCE)*, 4, pp. 05-07. Cited 9 times.

23 Pathan, K.A., Khan, S.A., Dabeer, P.S.
CFD analysis of effect of area ratio on suddenly expanded flows

(2017) *2017 2nd International Conference for Convergence in Technology, I2CT 2017*, 2017-January, pp. 1192-1198. Cited 16 times.
ISBN: 978-150904307-1
doi: 10.1109/I2CT.2017.8226315

View at Publisher

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

CFD analysis of effect of flow and geometry parameters on thrust force created by flow from nozzle

(2017) *2017 2nd International Conference for Convergence in Technology, I2CT 2017*, 2017-January, pp. 1121-1125. Cited 12 times.
ISBN: 978-150904307-1
doi: 10.1109/I2CT.2017.8226302

View at Publisher

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

CFD analysis of effect of Mach number, area ratio and nozzle pressure ratio on velocity for suddenly expanded flows

(2017) *2017 2nd International Conference for Convergence in Technology, I2CT 2017*, 2017-January, pp. 1104-1110. Cited 18 times.
ISBN: 978-150904307-1
doi: 10.1109/I2CT.2017.8226299

View at Publisher

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

An investigation to control base pressure in suddenly expanded flows

(2018) *International Review of Aerospace Engineering*, 11 (4), pp. 162-169. Cited 6 times.
www.praiseworthyprize.com/irease.htm
doi: 10.15866/irease.v11i4.14675

View at Publisher

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

An investigation to control base pressure in suddenly expanded flows

(2018) *International Review of Aerospace Engineering*, 11 (4), pp. 162-169. Cited 6 times.
www.praiseworthyprize.com/irease.htm
doi: 10.15866/irease.v11i4.14675

View at Publisher

28 Srikanth, R., Rathakrishnan, E.

Flow through pipes with sudden enlargement

(1991) *Mechanics Research Communications*, 18 (4), pp. 199-206. Cited 12 times.
doi: 10.1016/0093-6413(91)90067-7

View at Publisher

29 Rehman, S., Khan, S.A.

Control of base pressure with micro-jets: Part I

(2008) *Aircraft Engineering and Aerospace Technology*, 80 (2), pp. 158-164. Cited 19 times.
doi: 10.1108/00022660810859373

View at Publisher

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