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CFD Analysis Of Steam Ejector With Different Nozzle Diameter

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PRINCIPLE

Thermo compressors and ejectors function at the equal thermodynamic and physical principle: strength contained in high-pressure steam may be transferred to a lower stress vapor or gas to provide a mixed discharge circulation of intermediate strain.
Steam ejectors are designed to transform the strain electricity of a motivating fluid to velocity energy to entrain suction fluid ... and then to recompress the mixed fluids with the aid of converting speed strength lower back into strain power. This is based totally at the theory that a properly designed nozzle accompanied via a nicely designed throat or venturi will economically make use of high strain fluid to compress from a low pressure region to a higher strain.

INTRODUCTION TO EJECTORS

Ejectors are simple portions of gadget. Nevertheless, many of their viable services are unnoticed. They frequently are used to pump gases and vapors from a gadget to create a vacuum. However, they can be used for a excellent range of different pumping conditions. Here are three articles that allows you to assist you answer questions about this form

of system. The first, "ejectors have huge variety of makes use of," shows methods to harness this device to a bonus. It offers a take a look at listing of data needed by the seller. If you may then use the typical steam jet ejector, the second article tells factors to do not forget while you "discern what an ejector will value." The 1/3 article, suggesting "how to get the most from ejectors," gives pointers on hassle-taking pictures and deciding on substances of creation ejectors are employed inside the enterprise in numerous, unique or even once in a while weird ways. They may be used singly or in ranges to create a wide variety of vacuum conditions, or they can be operated as transfer and combining pumps.

Working of ejector

All ejectors operate on a common principle. The unmarried stage ejector, in its simplest shape, consists of an actuating nozzle, suction chamber and a diffuser. The actuating fluid, which may be a gas, vapor or liquid, is increased from its initial pressure to a stress identical to that of the secondary fluid. In the technique of being extended, the actuating fluid is elevated from its preliminary front pace, which is negligibly small, to a high velocity. In the suction chamber, the actuating fluid induces a region of low strain-excessive speed glide which reasons the secondary fluid to come to be entrained and combined with the actuating fluid. During the combination manner, the actuating fluid is retarded and the secondary fluid is multiplied. As the combination enters the diffuser, it's miles

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compressed to the go out pressure with the aid of rapid deceleration. The reason of the ejector is to transport and compress a weight of brought on fluid from the suction stress to the exit strain.

APPLICATION

Designed for managing many solvents, in addition to acids and corrosive vapors steam jet ejectors are crafted from have of numerous kinds. Having resists speedy temperature alternate and may be used continuously with temperatures as high as 265° f. It is long lasting and has remarkable resistance to corrosion

Four-degree ejectors

The four-stage unit consists of a number one booster ejector; a secondary booster ejector; a excessive vacuum ejector; a low vacuum ejector; and usually condensers—one after the secondary booster ejector and the opposite among the excessive vacuum and low vacuum ejectors. The condenser between the excessive and low vacuum ejectors is once in a while omitted, relying upon utility necessities. Direct contact or floor condensers, arranged barometrically or at ground degree, may be used. The 4-degree is just like the three-level unit besides that every other booster ejector is brought. In the four-stage, the number one booster is steam-jacketed to prevent build-up of ice at the diffuser internal bore. In operation, the booster ejectors operate in collection and discharge right into a booster condenser, which removes the running steam and condensable gases. From this factor operation is similar to the two-stage ejector. Final selection and association of four-level gadgets will rely upon specific requirements.


LITERATURE REVIEW

1 Analysis of steam ejector by using computational fluid dynamics

2 Thermal analysis of steam ejector using cfd

3 CFD simulation on the effect of number one nozzle geometries for a steam ejector in refrigeration cycle

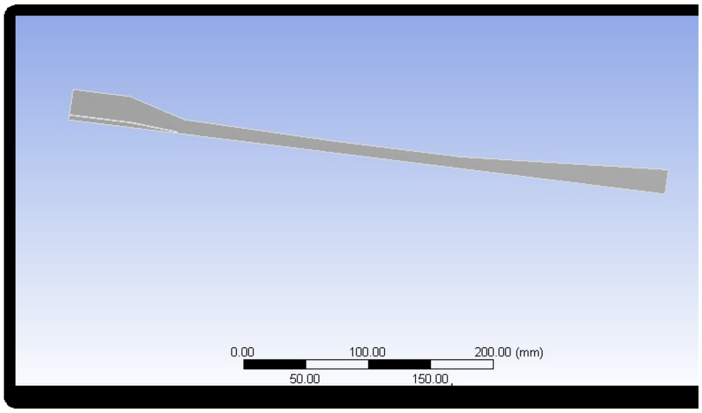
4 A Numerical Study at the Supersonic Steam Ejector Use in Steam Turbine System

CFD MODELLING

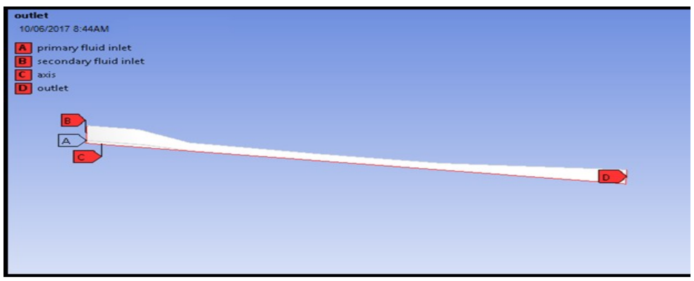
The ejector is modeled as a 2D axi-symmetric version . Grid unbiased research are achieved the use of quadrilateral gird shape with mesh size of 0.65mm by refining mesh after each simulation to acquire grid impartial effects. The wide variety of cells for computations become various from 20,000 to 70,000. The results with approximately fifty two,000 factors have been determined to be impartial of the grid size, considering that essential data become no longer misplaced. The grid density become

CFD ANALYSIS OF EJECTOR

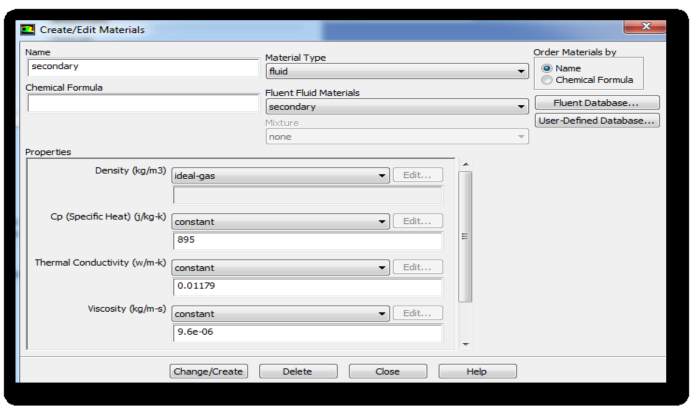
CFD MODEL &ANALYSIS OF EJECTOR WITH NOZZLE DIA. 1.4 AT CONDENSER PRESSURE 20mbar



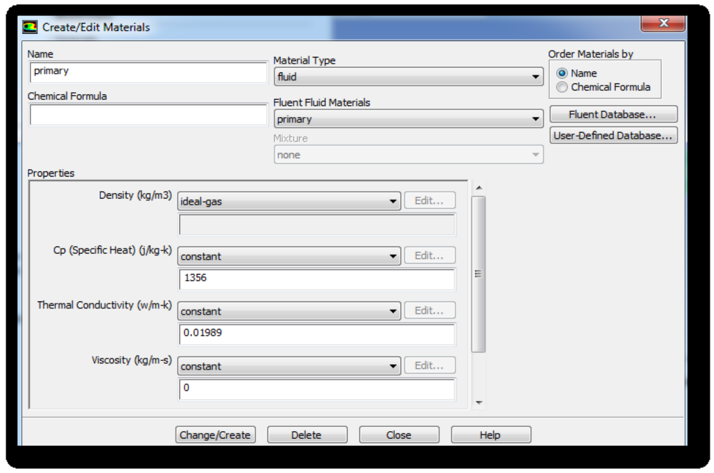
SPECIFYING THE BOUNDARIES FOR INLET & OUTLET



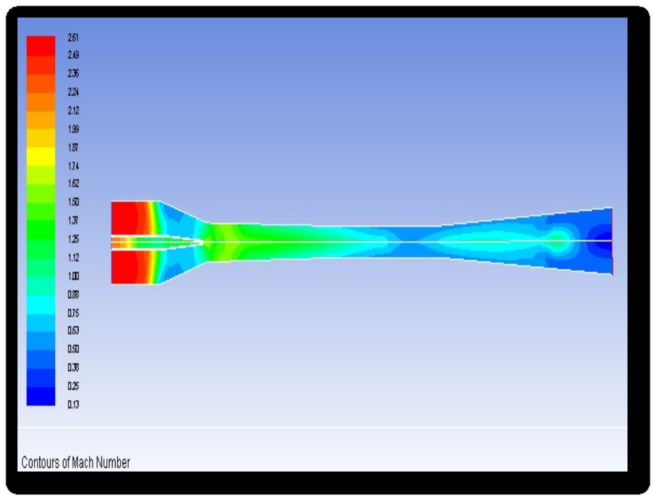
SECONDARY FLUID



PRIMARY FLUID



MACH NUMBER



Mach wide variety: In fluid dynamics, the Mach range (M or Ma) is a dimensionless amount representing the ratio of go with the flow pace past a boundary to the nearby speed of sound.

EJECTOR WITH NOZZLE DIA. 1.7 AT CONDENSER PRESSURE 20mbar MACH NUMBER

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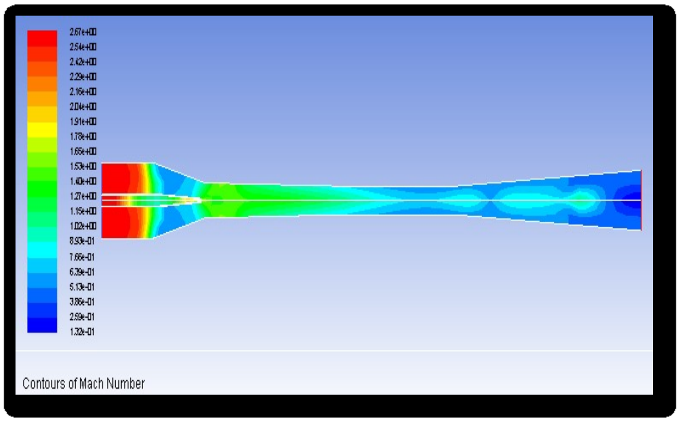
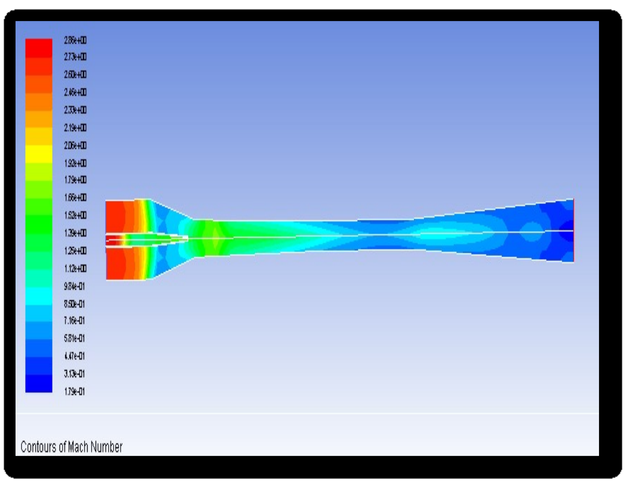


According to the above contour plot, the most Mach variety at steam ejector nozzle and secondary fluid inlet because the making use of the boundary conditions at inlet of the steam ejector nozzle and minimal static stress at the steam outlet.

EJECTOR WITH NOZZLE DIA. 2.0

AT CONDENSER PRESSURE 20mbar

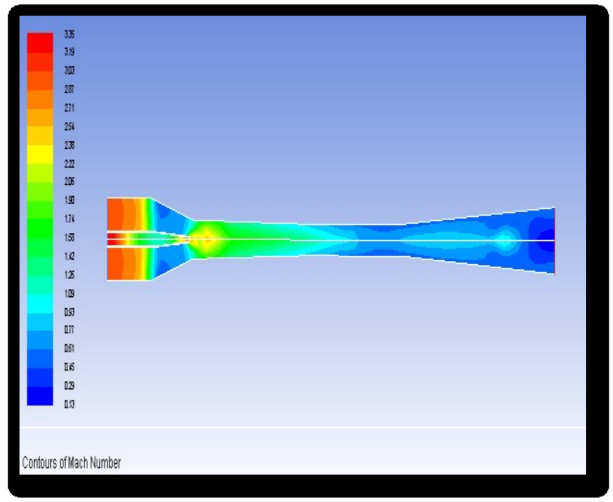
MACH NUMBER



According to the above contour plot, the most Mach variety at steam ejector nozzle and secondary fluid inlet because the making use of the boundary conditions at inlet of the steam ejector nozzle and minimal static stress at the steam outlet.

AT CONDENSER PRESSURE 80mbar

MACH NUMBER



According to the above contour plot, the most Mach variety at steam ejector nozzle and secondary fluid inlet because the making use of the boundary conditions at inlet of the steam ejector nozzle and minimal static stress at the steam outlet.

CONCLUSION

The effects on the primary fluid pressure, mass flow rate and Mach number were observed and analyzed. The Mach number contour lines were used to explain the mixing process occurring inside the ejector.

In this thesis, we modeled steam ejector changing with different nozzle diameters and Analyzed the steam ejector with different mass flow rates to determine the pressure drop, Mach number, velocity and heat transfer rate for the primary fluid by CFD technique.

By observing the CFD analysis the Mach number, pressure drop, heat transfer rate and mass flow rate increases by increasing the diameter of the nozzle and condenser pressure. So it can be conclude the steam ejector nozzle diameter 2.6mm is better model.

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