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NOISE MANAGEMENT OF THE UNISOTHERMAL GAS-LIQUID STREAM

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Abstract. *In this paper the noise controllability is analyzed on the base of different beliefs about shaping an unisothermal current. Object of study is determination of a possible levers for management of a moving flow.*

Key words: *noise managment, lever managment, turbulent stream*

1. INTRODUCTION AND MOTIVATION

Turbulent strems, broadly used in different flying machines and gas-dynamic installation are a highly intensive sources of the nosie. So, decision of noise stream problems on the and its reducing reqyuures big attention. This problem stays actual at present in connection with the reinforcement of actions on surrounding ambiance protection and need of satisfaction of all more hardening normative requirements on noise generations.

Free turbulent stream is a main source of the noise for many technological installing a jet irrigation. This noise study is denoted an ensemble of work of the unisothermal stream. According to the Ligthtill's hypothesis is expected that sources of the sound situated in number of compact areas, moving with determined by the velocity to convections, but sizes of areas greatly distinctive wavelength less. Founding on this approach possible to define a relationship of acoustic and turbulent features of stream. However a different sort unisothermal liquid flows exist in most cases. As far as turbulent frontier layer and, in particular, unisothermal turbulent jet streams are a noise generators. Besides, it's necessary to detail of information about space-time structure of turbulence in the area of melange for the determination of sound field.

Problem of reducing a noise of unisothermal current can decide by blanking the pulsations of flow in the output section and to the account of changing the initial

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parameters of outflow. Other possibility is a reduction of intensity and variation by features a radiating to the account of governing parameters of structurization. In this case it is required to take a nature account laminar-turbulent transition and localization of receptivity of stream to external physical and chemical indignations.

In this work the noise controllability is analyzed on the base of different beliefs aout shaping an unisothermal current.

Object of study is determination of a possible "levers" for management of a moving flow.

Mathematically behavior of object is described by equations a hydro-and thermodynamics. They must define a position "levers". Herewith there are events, when controlling parameters can take a border values. This circumstance particularly from applied standpoints greatly as far as, when governing technical object exactly position "lever" "on the stress", often ensures a maintenance of stability of condition. Thereby, it's a twofold problem, which is concluded in the initial condition description and motivation corresponding "levers" radiation management.

2. NOISE GENERATION

There are two types of hydrodynamic processes, ensuring to the radiation.The first type is the hydrodynamic fluctuation, appearing in vortex currents, in which radiation of sound is only side effect. In this case significant influence upon curl motion does not turn out to be.

Moving the particles of liquid and gas can be stipulated by various reasons. One of the main reasons of such motion is a turbulence, accompanying origin instationary on moving a unisothermal gasdrop system. This turbulence is connected with spontaneous radiating a sound by vortexes of different scale.

Other type od aerodynamic generations of sound is a sound-curl. Presence of such feedback vastly intensifies a separation of noise in conditions of dissipate current.

In accordance with the widespread terminology a mechanism to generations a sound includes two types of interactions: turbulence - a turbulence and gradient of average velocity - a turbulence. They characterize the sources "own" and "shift" noise accordingly.

Total intensity of acoustic radiating is valued from data on features of turbulence in the area of melange. Approximate evaluation shows defining a "shift" noise in the total noise of stream. At stream area sttuated beside cut nozzle, radiate ra radio-frequency noise, but when removing from cut nozzle there is a low-grequency noise. Within the initial stream area for this reason, i.e. in the field of the most intensive radiating a sound, exists an area of radio-frequency and broadband noise.

As a whole problem of initial conditions and genrating by the unisothermal stream, in spite of existing theoretical and experimental studies, not revealled.

3. EXPERIMENTAL INVESTIGATION

Conducted experimental studies on the thermovision evaluations of the cavitate streams have shown that with small-scale by the turbulence in dynamic and heat areas of

melange exists a turbulence, having large-scale nearly stationary structure.

Infrared thermograph shown the curl localization in the manner of temporary and spatial distribution. Role of large-scale structure is concluded in that it deines a process of melange of stream with the ambiancve and formation as small-scale turbulence and, as an effect, generations of broadband noise.

Thereby, noise management of the unisothermal liquid stream must be based on modification in her space-temporary sharing the discrete vortexes. It also requires an account of receptivity of current, admissibility a physicst-chemical influences on it as well as specifices of conditions to usages. Herewith, the initial and end conditions of stream elements belong some ensembles of spectrum radiation. So, infrered thermograph structure installed by the method presents iself complex a construction, which is istinguished grom existing beliefs abour him. It consists of the central kernel, some intermediate layers, the isothermal kernel and the peripheral melange layer. The kernel of flow with nearly stationary heat floor is observed from the initial section of spraying before the stream area with intensive curl maxing. In the field of the isothermal currents is observed maximum power of acoustic radiation.

For the event of presenting self-evaporate liquids, often used as the working body in different technologies installed, large-scale winding instant borders of turbulence of stream as well as realized by the thermovision evaluation of initiating and evaluations of periodic curls. The thermogram analysis has allowed to find coherent structures. It's a developing and interacting with each other vortex clot on the background ans small-scale turbulence.

Increasing of thickness melanges layer occurs because of the degeneration of the isothermal kemel in consequence of mating the nearby curls. This brings about significant reducing ejection actions of stream and produced by her radiations. Beside sniffled are generated fine recirculating vortexes, which includes an area of sensations pains.

Further development of three-dimensional vortex structures ends a disintegration on ball formation beside the diffuse front of the kernel. This is accompanied by reducing an acoustic power of radiating and moving its spectrum in low-frequency area.

Leading total considered questions of structurization, physical model of generating a noise by the unisothermal jet stream can be presented as follows. So, the spatial instability is formed under the intitial laminar frontier layer on cut sprayer in the area of melange. It contributes low-frequency fluctuations in the initial radio-frequency noise. The most further track record of structure of current and, as an efect, radiating defines an initiating an azimuthal spottiness in consequencve of arising the large-scale recirculating vortexes. The discrete component of radiation distinctive for this stage. Final evolution stage of acoustic mode is stipulated by the collective interaction of curl forming a different scale that sharply reduces a share of the radio-frequency noise in the total spectrum of radiation.

4. "LEVERS" OF MANAGEMENT

Thereby, the space-temporary changing a structure of stream are a base of announcing acvoustic, vortex and energy modes. This mutual influence define of noise generating factors. Such a action directed on the reduction of intensity of noise is concluded in

reducing a velocity of motion, density of ambiance in him as well as diameter cut sniffled. Specified parameters define extant and nature of current of the unisothermal stream. Consequently, "levers" management must ensure variation a forming a structure in the area of current of the isothermal flow. Herewith, end condition should consider a generation of noise with the level of intensity of soyund less at most-possible values, but radiating frequency should support a pain sensation uotside of the threshold of.

For realization putted purposes it is necessary to value receptivity of acoustic cvharacterstics of stream with respect to the physicist-chemical idignations. With provision for effects from stated above physical models of transforming the heated stream stand out two channels of exicitement: the first connected with the area of fluid kernel with the minimum vortex surface, the second chabnnel is distinguished of the area of the isothermal kernel. Extent last channel concludes intensive radiation area in itself. The area with rolling ends forms discrete forming in the spectrum of noise unites both first excitement channels.

Such zoned fission allows to classify "levers" management on two groups. Factors of variation by the compact fluid surface the ellipsoid form beside cut sniffled fall into first group. Second group concludes controlling outraging a axial symmetry stream. As a result, the discrete component is a reason of feedback in respect of the whole area of outraging, management by her must include both groups "levers".

Thereby, coming from desired end conditions of forming a noise a mechanism of physicist-chemical influence must be cvlinging to the area of generation of radiation. Such indignation requires combninations of two mutual rival actions is a forming of turbulence of stream and conservations of efficiency of its action in the technological process.

Under the additional action of turbulence on the frlow a changing of a structure occurs in the melange area regardless of its natures. So, increasing an initial outraging a current brings about increasing an intensity of pulsations of velocity in the melange area and reducing a stream area length with the most intensive radiating a sound. This is explained by changing a sharing the pulsations and average temperatures and velocities and, as an effect, appearance of instability of flow.

Sound fluctuations render a similar action.They move a frontier layer in vortexes, i.e. create a hydrodynamic instability. Reinforcement of curls to the account of kinetic energy of flow brings about the reinforcement of interaction between them and following their destroying, i.e. crushing on more small vortexes. This process is siilar laminar-turbulent transition in streams and leads to the reinforcement turbulent disturbing. The stream vortex suppresion must bring about the weakening of mixing in the initial stream area and delaying a process of relignment of current. Consequently, imposition of acoustic field can promote or promote or reinforcement to generations a noise and its weakening. Leaving a system from the balance an energy of outraging is consumed on completion of work against acoustic field power and indignation does not increase. So, root part of streams must be ensured by acoustic influence to the first receptivity channel. At the choice of influence frequency by the sound should take its correspondence into account own fluctuation frequency in the stram.

5. VARIATION OF INTENSITY

One of the main factors of governing noise of stream is an intensity of action on its sound. In the event of the absence of the inverse influence of acoustic outraging, generated by turbulent flows, on currents themselves an intensity of artificial acvoustic outraging must greatly exceed an intensity of natural noise of source current. This position disagrees a problem management. So, for reducing a noise it is necessary to conduct an acoustic inflence with else greater intensity. For eliminationg this contradiction is required have acousticoutraging with inverse will or artificially create them in the manner of the additional physict-chemical "lever" management. It must be accompanied by other nature of the influence.

In real conditions the unisothermal strams noise is kept low and radio-frequency components. The joint influence presents this interest on the formation low-and radio-frequency sound of different intensities. Effects to characteristic each exicitement can will be realized simultaneously. Prevalence of effects are guaranteed both of the variation of intensity of irradiating, and of the directivity of its action on the concrete excitement channel. This variation is reached periodicity of initial outraging, brought about greater sequencing and increasing a time lifes of curls, forming because of the development of waves of instability or interactions of acoustic fluctuations with the edge nozzle. Influence on frequencies, sufficiently removed from own frequencies the melange layers, obstructs forming the coherent structures of the melange layers. This causes reduce of the azimuthal spottiness and, as an effect, intensities narrow-band forming spectrum of noise.

6. CLOSING REMARKS

Influence study of acoustic fluctuations on the noise of unisothermal streams creates interest bouth for theoretical studying the processes of development of turbulence, and for practical using this effect for the reinforcement a heat a mass of exchange processes. Besides, at present the control of the influences should use in that events, when acoustic energy can be recieved without additional expenseses practically. For instance, this can be used in the devices of getting the cavitate stream, where part of energy is used on excitement of sound fluctuations in the heatexchanger.

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MENADŽMENT BUKE GASNO-TEČNIH STRUJA

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U ovom radu je analizirana mogućnost kontole buke na osnovu različitih uverenja o obliku turbulentnih struja. Cilj proučavanja je određivanje mogućih "levera" menadžmenta pokretnih tokova.