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THE QUESTION OF CALCULATION OF DESIGN PARAMETERS INJECTOR BURNERS

The article provides program and sequence determination of the basic design parameters of injector burners.

In the article the program and sequence of definition of the basic design, data of injection torches is resulted.

Currently, torch-working materials takes a significant place in various industries. Flame treatment covers a number of processes associated in the processing of metal and non-metal with high temperature gas flame [1]. The department "Technological machines and equipment" has developed a program in object-oriented programming environment Delphi 6 for the calculation of the basic design parameters of injector burners.

From the injector-burners given gas fuel into the mixing chamber is produced by sucking its oxygen jet flowing at a high speed from the nozzle holes. Process gas inflow lower pressure oxygen stream that is fed with a higher pressure is called injection. The formation of a gas mixture is carried out in the mixing chamber. The produced mixture of tip tube enters the mouthpiece and exits out into the atmosphere and during combustion it forms welding flame.

Calculation of the design parameters of the burner injection is performed in the following sequence [2,3]

1) In a clockwise flow of the combustible mixture is determined by the diameter of the burner nozzle, mm:

$$d_c = 2{,}37\sqrt{\frac{2{,}8V_{см}}{S_{см}n}}$$

Where in Scm - the flame propagation speed ratio representing the ratio of the flame propagation velocity in the mixture with oxygen to the flame propagation

velocity acetylene-oxygen mixture with a ratio of oxygen and acetylene β=1,1 (for acetylene $S_{CM}=1$; methane - 0.4; hydrogen - 1.2; propane-butane - 0.27)

n - the number of nozzles (for odnosoplovyh burners n = 1, for the multi - n is entered by the user, depending on the area of the treated surface simultaneously)

2) The diameter of the outlet channel of the mouthpiece dm:

$$d_{_M} = d_{_c}\sqrt{n}$$

The resulting size of the diameter output channel nozzles rounded to standard drill sizes.

The length of the output of the cylindrical channel of the mouthpiece is set at the rate of: $l_{_M} \approx (2 \div 5)d_{_M}$ mm.
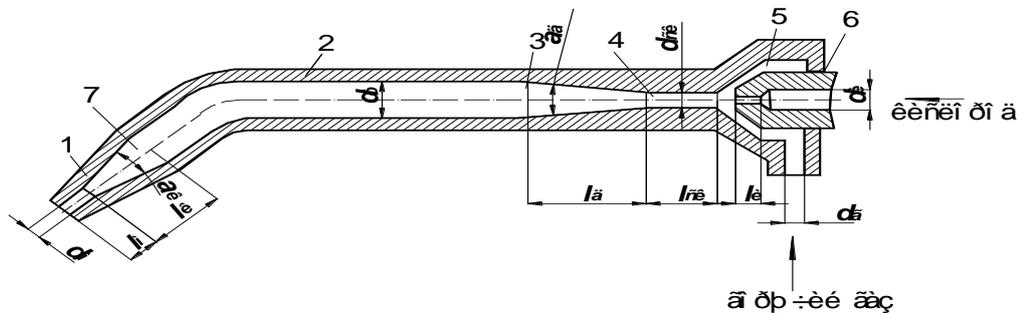
pic. 1. Diagram of injection burner:
1 - mouthpiece; 2 - tip tube; 3 - the diffuser; 4 - mixing chamber; 5 - injector chamber; 6 - injector; 7 - konfuzor.

3) The angle convergent channel (), while maintaining the external shape and dimensions of the mouthpiece affect mainly on the flame stability ($\alpha_{_K}=12°$ when dc < 0,7 мм, $\alpha_{_K}=10°$ when dc= 0,7-1,1 мм, $\alpha_{_K}=8°$ when dc= 1,1 - 3,5 мм, $\alpha_{_K}=12°$ dc>3,5 мм [4].

The length of the convergent channel ($l_{_K}$) is almost equal to: $l_{_K} \approx 10d_{_M}$

4) burners odnoplamennyh equality between the diameters of the cylindrical channel of the mixing chamber and the outlet conduit mouthpiece, since resistance increases $d_{_{CK}} = d_{_M}$ when $d_{_{CK}} < d_{_M}$ the expiration gases from the metering apertures, and reduced dynamic pressure when $d_{_{CK}} > d_{_M}$ the gases in the mixing chamber and the flame can be extinguished. For mnogoplamennyh burners:.

$$d_{_{CK}} = 0,7d_{_c}\sqrt{n} + 0,5$$

The length of the burner mixing chamber:. $l_{ck} \approx 7d_{ck}$

5) The optimal length of the diffuser: $l_{\partial} \approx 10d_{ck}$

The diameter of the output channel with the diffuser is: $l_{\partial} \approx 10d_{ck}$ for the angle

to, and for,. $\alpha_{\partial} = 6^{o}$ $d_{\partial} = 2d_{ck}$ for $\alpha_{\partial} = 8^{o}$ $d_{\partial} = 2,4d_{ck}$ and $\alpha_{\partial} = 10^{o}$

$d_{\partial} = 2,75d_{ck}$

6) The inner diameter of the tube tip the (d_m) injection burner should be slightly larger diameter of the output channel of the diffuser in order to avoid hitting the gas mixture at the entrance to the furnace and the formation of local eddies adversely affecting injection ($d_m \geq d_{\partial}$) .7). For injection injector burners output channel diameter (d_i) can be determined from the simplified formula expiration adiabatic oxygen in the atmosphere from the nozzles with critical velocity:

$$d_u = \sqrt{\frac{V_{\kappa}}{0,44(P_{\kappa} + 1)}} \quad \text{mm.}$$

where V_{κ} - volume of oxygen consumption in m³/h

P_{κ} -izbytochnoe (gauge) pressure of oxygen to the injector in MPa.

Interval oxygen pressure corresponding to the operating range of the power of the burner tip, in which achieved a sufficiently high injection rate, a relatively full utilization of oxygen in the tank and ensures reliable operation of the gas network;

It is P_{κ} = 0.2-0.4 MPa.

The length of the cylindrical channel output injectors can be assumed:

$$. l_u = (3 \div 4)d_u$$

Calculation of passage sections of channels produced by the greatest power on the burner formula:

$$. F_{\varepsilon} = \frac{V_{\varepsilon \max}}{W_{\varepsilon \max} 3600} \mathcal{M}^2$$

Where $V_{\varepsilon \max}$ - the maximum power of the burner flame in m³/h;

 - The maximum permissible speed of the fuel gas in the burner channels $W_{\varepsilon \max}$ in m / s. Diameters D_3 injector chamber and the injector head D_4 are determined from the calculation W_{ε} =20 m / sec by the formula:

$$F_г = \frac{\pi}{4}(D_3^2 - D_4^2)$$

One set with diameters constructively (usually D_4 = 8mm).

LITERATURE

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