ABOUT THE DESIGNING CONDITIONS OF VACUUM INSTALLATIONS OF WELDING CONSUMABLE BOXES

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Abstract*: For the maintenance according to strict limits of humidity in the cover, the consumables are packed in the air-tight boxes from plastics or in foliate with plastics, vacuumed, for the expulsion of the humidity of the existent air from the packing at once of package.*
The collective of the authors were following the methodology for ejectors designing used in the packaging process of the consumables

1. GENERALITIES

The preservation of the basic electrode with the view of using it, requires abidance of some climatic conditions, which must ensure the preservation of their characteristic properties specially the humidity content from the layer.

The water absorption from atmosphere challenges the growth of the content of hydrogen diffusion from the metal deposited and therefore the enlargement of the tendency toward cracking joining welded.

In the aim maintain the humidity of the cover of the in the limits prescribed, the electrodes are packed the in tight boxes, from his plastics or foliate with plastics, vacuum for the elimination humidity contained of the existing air in packing, in the moment package.

Currently there are know two methods for vacuum namely, direct vacuum which is executed using some vacuum pump, grafted on the electrode packages or indirect trought the eject in of the air using a specialized device for this process.

The collective of the authors followed the settlement of the methodology of project the employable throw-outs in the process of pack the electrodes of welding.

2. CONSIDERATIONS CONCERNING THE PRODUCTION OF THE VACUUM THE PARCELS OF MATERIAL FOR WELD

In as part as the section of material production of weld, waves these is packed, exist a meshes of air compressed to the pressure of 4 atm whereat he adapted a plant of ejection the air from compliant next parcels of adding principle ejector.

The calculus throw-out is based on the equations amounts motional to the current blend of ges and to leakages of the gas from nozzle.

The equation amounts motional have form:

$$\frac{G_1}{g} w_1 + \frac{G_2}{g} w_2 - \frac{G_1+G_2}{g} w_3 = S_3 h_p \qquad (1)$$

or

$$M_1w_1 + M_2w_2 - (M_1 + M_2)w_3 + S_3h_p \quad (2)$$

were: $G_1 and G_2$ - the weight amount of injecting gas and inject, in [N]

g - the gravitational acceleration = 9,81 m/s

$w_1 si w_2$ - the speed of the injecting gas and bloodshot, in m/s

w_3 - the speed of the blend of gas and the air, in m/s

S_3 - the section of the neck of the blender, in m^2

h_p - the depression obtained of exhausted prerequisite for mixing overcoming of the resistor encountered in of his way, of the gas inhaled, in mm col. Water

$M_1 and M_2$ - massage the injecting fluid and inject.

If is presupposed as the current blend is finished ante input in loudspeaker and as the volume of the blend makes ones living the volume of which ges is blent, is obtained next formula:

$$n^2v + n(1+v) + 1 - \frac{1}{\varphi} + \frac{1}{2\varphi^2}\frac{h_p}{h_{inj}} = 0 \quad (3)$$

where : $n = \frac{G_1}{G_2}$ - the report of injection, presenting the report among the fluid inject weights [G_2] and the injecting [G_1]

$v = \frac{y_1}{y_2}$ - the report among the specific weights ale of the injecting gas and inject

h_{inj} - the dynamic injecting fluid pressure of the in mm col. water

$2\varphi = \frac{S_1}{S_2}$ - the report among the surface of transversal section of the nozzle and the tube of the blender

$$\varphi = \frac{S_1}{S_2} = (\frac{D_1}{D_2})^2 \quad (4)$$

His value h_p is else little the si rarely passes of 30-50 mm col water. The report $\frac{h_p}{h_{inj}} \approx 0$.

Simplified, the equations can be presented the fit next in:

$$M_1w_1 + M_2w_2 + (M_1 + M_2)w_3$$

$$n^2V + n(1+V) + C = 0 \quad \text{or} \quad (5)$$

$$(1+n)(1+nV) = \frac{1}{\varphi}$$

Which in $C \approx 1 - \frac{1}{\varphi}$ is constant for the respective system of blender.

Forward, there are giving the formulae which underlie the calculation procedure ejectors.

The ejector scheme is presented in the figure 1.

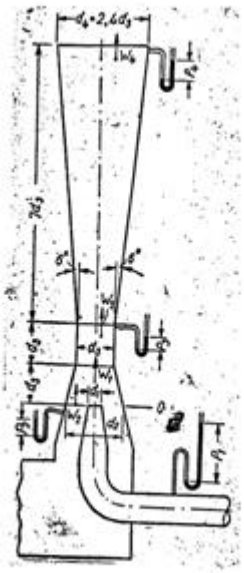

Figure 1 Ejector

The specific weight of the blend (y_3), in kgf/m^3, is caused from the equality:

$$y_3 \frac{G_1 + G_2}{V_1 + V_2} = \frac{y_1 V_1 + y_2 V_2}{V_1 + V_2} \tag{6}$$

Speed most advantageous the blend of ges in the neck air nozzle is:

$$W_3 = \frac{M_1 w_1 + M_2 w_2}{M_1 + M_2} = \frac{V_1 y_1 W_1 + V_2 y_2 W_2}{V_1 y_1 + V_2 y_2} \text{ [m/s]} \tag{7}$$

Breed the static in a pressure air nozzle with the output ? (? $\approx$ 0,7 – 0,8) is coequal :

$$p_4 - p_3 = \square \frac{w_3^2}{2g} y_3 \text{ [mm col. water]} \tag{8}$$

The pressure p_2 overtakes the pressure p_3 with the dynamic pressure of the ejecting gas to the level of the nozzle, that is:

$$p_2 - p_3 = \frac{w_2^2}{2g} y_2 \text{ [mm col.water]} \tag{9}$$

The speed of flow the ejecting gas from adjustment matching, when his pressure is little, he is coequal:

$$W_1 = \varphi_{vit}\sqrt{\frac{2g(p_1 - p_2)}{y_1}} \text{ [m/s]} \quad (10)$$

φ_{vit} - is an which coefficient depends on for form's sake and the surface of the nozzle and is coequal 0,8 – 0,9.

The necessary pressure of the ejecting gas is coequal:

$$p_1 = \frac{w_1^2}{2g\varphi_{vit}^2} + p_3 \text{ [mm col.water]} \quad (11)$$

3. THE EJECTOR CALCULUS

The fundamental equation for the calculus ejector is:

$$p_4 - p_3 = \frac{\eta(V_1 y_1 w_1 + V_2 y_2 w_2)^2}{(V_1 y_1 + V_2 y_2)(V_1 + V_2)} \quad (12)$$

on the strength of the speeds, they caused the different diameters parts of air nozzle.

The diameter end of out of air nozzle is d_4= 2,4d_3 , the length air nozzle is L = 7 d_3 ,the length of the neck and the distance from as far as adjustment matching the neck is coequal 1,5(d_3-d_2).

The diameter d_2 is caused on the strength of amount and the speed of the ejected gas.

Speed of the ejected gas w_2, in sectional nozzle, is can take on a par with w_2 = 10 m/s.

Then, the dynamic pressure of the ejected gas is coequal:

$$p_2 - p_3 = \frac{w_2^2}{2g} y_2 = \frac{10}{19,62} 0,42 = -2,15 \text{ [mm col.water]} \quad (13)$$

The pressure of the blend of ges, in the neck injector, is coequal :

$$p_3 = p_2 - \frac{w_2^2}{2g} y_2 = -40 - 2,15 = -42,15 \text{ [mm col.water]} \quad (14)$$

Breed the pressure manometric the blend of ges, in loudspeaker, is:

$$p_4 - p_3 = 20 + 42,15 = 62,155 \text{ [mm col.water]} \quad (15)$$

Speed of flow the gas from nozzle, when φ_{vit} = 0,85, he is coequal :

$$W_1 = \varphi_{vit}\sqrt{\frac{2g(p_1 - p_2)}{y_1}} = 0,85\sqrt{\frac{19,62(500 + 42,15)}{1,62}} = 78 \text{ [m/s]} \qquad (16)$$

Substituting the found values in the fundamental equation for the calculus throw-out, is obtained:

$$62,15 = \frac{0,8(V_1 1,62\ 78 + 2,33\ 0,42\ 10)^2}{19,62(V_1\ 1,26 + 2,33\ 0,42)(V_1 + 2,33)}$$
$$1525(1,26V_1\ 0,98)(V_1\ 2,33)$$

Thereof equation discover V_1 = 0,96 m^3/s
The section of the adjustment matching is:

$$f_1 = \frac{V_1}{w_1} = \frac{0,96}{78} = 0,0123 m^2 \qquad (17)$$

The diameter of the adjustment matching d1=0,125 m

$$G_1 = V_1 y_1 = 0,96\ 1,26 = 1,21 \text{ kgf/s}$$

$$G_2 = V_2 y_2 = 2,33\ 0,42 = 0,98 \text{ kgf/s}$$

$$V_1 + V_2 = 0,96\ 2,33 = 3,29\ m^3 \qquad (18)$$

$$y_3 = \frac{G_1 + G_2}{V_1 + V_2} = \frac{1,21 + 0,98}{3,29} = \frac{2,19}{3,29} = 0,66 \quad \text{N/s}$$

$$w_3 = \frac{G_1 w_1 + G_2 w_2}{G_1 + G_2} = \frac{1,21\ 78 + 0,98\ 10}{1,21 + 0,98} = 47,8 \quad \text{m/s}$$

The calculus presented hereinbefore is verified through measurements of flows to approximate 1 m^3/hour (effected on a simple ejector) to a production of 50 boxes/hour.

4. CONCLUSIONS

The effected studies emphasized the possibility of realization efficient throw-outs on the strength of a theoretical calculus, and these were determinate practiced for a production of 50 boxes/hour.

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