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Explosion Proof Fans

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Testing Explosion Proof Fans

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At the present time many plants of the chemical, Oil refining, coal, and other branches of industry, in the atmosphere of the production areas of which explosive gas-vapor-air mixtures are present o can be formed, are using explosion proof aluminum fans.

However, during the use of these fans, rust, rusted articles, and other strong oxidizers, for example, nitro compounds, etc. can not be permitted to enter the operating chambers of the fans.

The Scientific Research Institute of Sanitary Engineering recommends making explosion proof fans designed for removing the most explosive gases (hydrogen, acetylene, carbon disulfide, carbon monoxide, as well as saturated and aromatic hydrocarbons) from the following materials: brasses, aluminum and its alloys that contain up to 2% magnesium, bronzes, alloy steels containing 2.5-3% silicon and about 3% titanium, and combinations of brass and steel or of bronze and steel (excluding the possibility of the friction of steel on steel).

For the purpose of checking some fans for explosion proof properties suitable tests were carried out at the State Institute for Planning and Investigation of Explosion Proof Equipment. Aluminum Dural fans of the TS series, combination fans, fans made of bronze and steel. As well as from AG-4S plastic and steel were tested.

The fans were tested for explosion proof properties in an explosion chamber by a method developed at the Institute. The impeller of the fan was attached to a shaft introduced into the explosion chamber. A movable table on which the parts of the fan housing were attached was located in the chamber. In case the fan housing was made of steel the samples were subjected to corrosion before hand. An explosive mixture of hydrogen, methane, ethyl ether, code gas with air or the listed explosive substances but with the addition of oxygen was created in the chamber. Friction and impacts between the impeller of housing parts were created with the lever system of the movable table. The tests results are presented in a table 1.

Thus, on the basis of the tests conducted, the following conclusions can be made.

1. Combination fans made of bronze and steel, even when the possibility of steel on steel friction is excluded, are not explosion proof. During friction and impacts of bronze impellers on corroded structural steel air hydrogen mixtures were ignited.
2. Combinations fans made of AG-4S plastic are not explosion proof for some explosive mixtures. For example, during friction of the impeller on a corroded steel housing ignition of hydrogen air mixtures occurred as a result of the origination of sparks and friction of the AG-4S material.
3. During friction or impact of a fan impeller made of aluminum or its alloys on a corroded steel plate all of the explosive mixtures, including the impeller on the fan housing, ignition of the explosive mixtures does not occur. Therefore, all aluminum fans can be used for removing explosive mixtures only in that case when measures are taken to exclude rust, corroded parts, or other oxidizers from the working chamber of the fan.
4. Electric fans designed for removing explosive mixtures should be tested for explosion proof nature at nominal impeller rpm and peripheral speeds.

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Material		No. of Tests	Explosive mixtures concentration				Impeller		Friction Impact Time	Explosion Presence		External picture at friction sites
Impeller	Housing		H2	CH4	Ethyl Ether	O2	Peripheral speed m/s	RPM	Seconds	Main	Control	
Bronze	Corroded St. 3 steel	1	10.7 9-12 9-12	- - -	- - -	27.3 18.2 18.2	70	3000	1 5 4	Yes	-	Glinting
AG-4S Plastic		1	9-12	-	-	18.2	70	3000	3 5 5 5	Yes No No Yes	- Yes Yes -	Band on the rotating blades glows, weak sparks.
		1 2	-	7.0	-	19.0	70	3000	10 5	No	Yes	Sparks, band glows.
		3 4 3	- - -	7.0 6.5 6.0	- - -	26.2 26.5 26.5	70	3000	5	No	Yes	Bright sparks, band glows.
AMg5V-M	AMg5V-M alloy	10	9-12	-	- 2.3	18.2 20.0	88	3000	10	No	Yes	No sparks
	Corroded St. 3 steel	3 2	9-12 -	- 6.5	- -	18.2 19.0	88	3000	1	Yes	-	Bright glinting, bright sparks.

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