

CALCULATION OF CHARACTERISTICS OF A FIRE-EXTINGUISHING AEROSOL GENERATOR AND HIGH-PRESSURE SPRAY FOR EXTINGUISHING OIL AND GAS FOUNTAINS*

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Abstract: Parameters of the jet of fire-extinguishing aerosol emanating from a high-pressure generator have been studied. The calculation of the exhaust nozzle of the generator using a fast-burning aerosol-forming composition has been performed. The characteristics of the formed supersonic flow with condensation of aerosol particles in it have been calculated and experimentally determined. It is shown that the aerosol jet formed by the high-pressure generator is capable of rising to three times the height than that attained using a device with a slow-burning aerosol-forming composition. This is due to the fundamentally different dynamics of the formed flow and the smaller size of aerosol particles condensing downstream the generator nozzle. Full-scale experiments have shown that the supply of fire-extinguishing aerosol to a height of about 9 m in conjunction with the flow of burning oil or gas provides an extremely short extinguishing time of the fountain of 3–5 s from the moment the generators start working. Extinguishing is achieved when filling the volume of the torch with a fire-extinguishing aerosol and reaching its minimum extinguishing concentration.

Keywords: aerosol; extinguishing; gas; oil; fountain; combustion

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Figure Captions

Figure 1 Operation of the extinguishing-aerosol generator

Figure 2 Particle size distribution of the aerosol obtained by burning a composition based on potassium perchlorate and modified sodium polyacrylate (a) and by burning an aerosol-forming compound SBK-3 (oxidizer — potassium nitrate) (b)

Figure 3 Extinguishing of a gas torch: (a) start of the generators; (b) 3 s after the launch of generators; (c) 4 s after the launch of generators; and (d) 5 s after the launch of generators

Figure 4 Extinguishing an oil fountain: (a) torch ignition; (b) 1.5 s of the generators' work; and (c) 3 s of the generators' work

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