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Prediction of damaging factors and environmental risk management for transportation of petroleum products by road

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Assessment of the threat to the life and health of people as well as environmental risks caused by the emergency spills of road-transported petroleum products is of great importance and should be conducted with correct substantiation of the initial parameters for the formation of the accident damage effects. Thus, the area of the petroleum product spill is determined not only by the amount of flammable liquid that has leaked out, but also by the physical and chemical infiltration properties of the underlying surface. Scenarios of accident escalation and the level of possible environmental threats depend even more on these factors. The literature analysis of the issue has shown that the empirical initial data is often highly uncertain and the experimental values obtained need preliminary processing when used in in full-scale tests to assess input factors for the formation of the oil spill damage effects [1, 2]. The following tasks were set out in this work:

1. Study of the main parameters of formation of damaging factors taking into account the physical and chemical properties of petroleum products, the underlying surface structure, environmental parameters, scenario diversity of transport routes and elements of the theory of similarity and scaling theory.

2. Development of a model of action/inaction of road users as an accident escalation factor. The object of the study was the situation with road transportation of petroleum products on the route Moscow Oil Refinery – Zhukovsky Airport.

Two hazardous sites were selected; thermal and pressure damage factors were calculated for the emergency spill of TS-1 kerosene and AI-95 gasoline from a fuel truck taking into account possible soil penetration and weather conditions [3–5].

Conclusions: 1. The existing methods for calculating the damaging factors have been developed on the basis of empirical data obtained in experiments with much smaller quantities of substances than those involved in the accident. Simple extrapolation of these data results in a discrepancy between the calculated and actual accident consequences data. It is reasonable to assume that applying the similarity theory to calculations of this type avoids deviations in the results; this area requires further research.

2. It has been shown that the type of underlying surface of a spill affects the final value of the accident damaging factor but this effect requires further investigation. 3. The value model of the impact of road users’ action/inaction on the escalation of a tank accident has been proposed.

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