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THE RESEARCH OF INFLUENCE OF FUEL FRACTIONS ON EMULSION STABILITY OF OIL WASTE

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The effect on the stability of the emulsion in the presence of the fuel fractions of oily waste, on which an emulsion was prepared. The analysis of the results. Observed negative effect on the stability of fuel fractions emulsion. The recommendations for the practical use of technology in the preparation of an emulsion based on oily areas of waste disassembly units and equipment with the help of shock waves that occur when operating a pneumatic transducer.

During research, it was observed that the presence of the emulsion fuel fractions adversely affects the stability of the latter. This in turn may adversely affect the possibility of using the emulsion prepared on the basis of oil-containing waste as a commodity product introduction. In the production associated with the repair of equipment and machinery, liquid oily waste is generated, it contains the motor and gear oils, greases, fuel fractions, cutting fluids, technical detergents, cleaning fluids, and others. These wastes have a negative impact as on production workers and the environment. The largest share of liquid oily wastes is generated during dismantling of units. These include waste (% of total): 65–90 motor oil, transmission oil 6–10; fuel fractions 2–6, greases 1–2 [1].

Polotsk State University developed a fine emulsion preparation technology of oily exhaust products under the influence of shock waves that occur when operating a pneumatic transducer [1–4]. The emulsion which is prepared with the help of this technology may be used as an additive to fuels mainly for boiler installations or as release coating forms the working surfaces in the manufacture of concrete products [1–3]. due to insufficient stability.

Objective is to find the possible content of the emulsion fuel fractions, allowing an emulsion with the required stability.

The methodology of the study. Stability of the prepared emulsion was evaluated by the number of released water over a period of 1 to 30 days. The bundle of tubes is measured using the height of the liquid column. The technique which determines the effect of water content in its emulsion stability is described in [5].

Various oily wastes, which percentage of fuel fraction is 0, 10, 20%, were taken for the tests.Water was added in an amount of 20, 30 and 40% by volume of the emulsion.

The separation of water in emulsion 30 days did not exceed 2% by volume of the emulsion, and the emulsion used directly for the enterprise - less than 2% by volume of the emulsion for one week.

Results and discussion. The results of these studies are shown in Figures 1–3. Regression equations were formulated for various water content of the emulsion and the composition of the fractions.

The water content of the emulsion 40% (see Fig. 1):

without the presence of fuel fractions

$$y = -\ 0{,}0069t^2 + 0{,}6197t - 1{,}2318; \qquad (1)$$

when fuel fractions content 10%

$$y = -\ 0{,}008t^2 + 0{,}859t - 1{,}1929; \qquad (2)$$

when fuel fractions content 20%

$$y = -\ 0{,}0435t^2 + 2{,}1022t + 2{,}2127. \qquad (3)$$

The water content of the emulsion 30% (see Fig. 2):

without the presence of fuel fractions

$$y = -\ 0{,}0065t^2 + 0{,}5105t + 0{,}5095; \qquad (4)$$

when fuel fractions content 10%

$$y = -\ 0{,}0075t^2 + 0{,}3538t + 0{,}001; \qquad (5)$$

when fuel fractions content 20%

$$y = 0{,}0017t^2 - 0{,}006t + 0{,}0355. \qquad (6)$$

The water content of the emulsion 20% (see Fig. 3):

without fuel fractions

$$y = -0{,}0056t^2 + 0{,}3488t - 0{,}0824; \qquad (7)$$

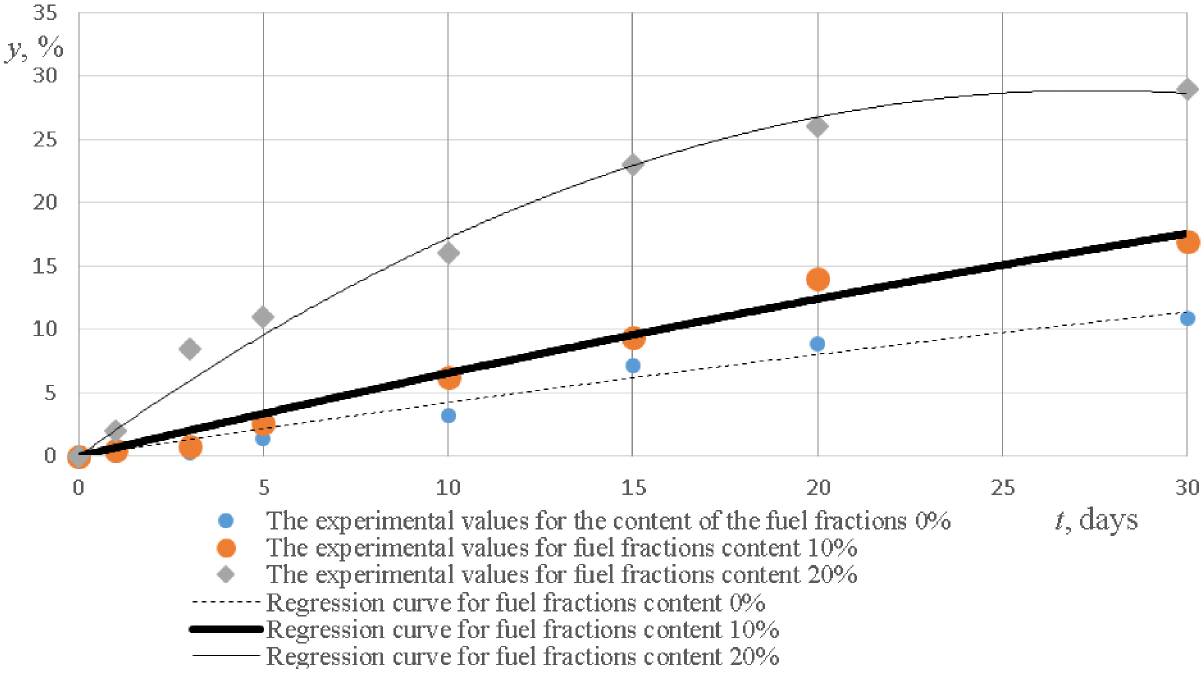

Fig. 1. The dependence of the evolved water *y* from the time *t* when the content of water in emulsion 40 %

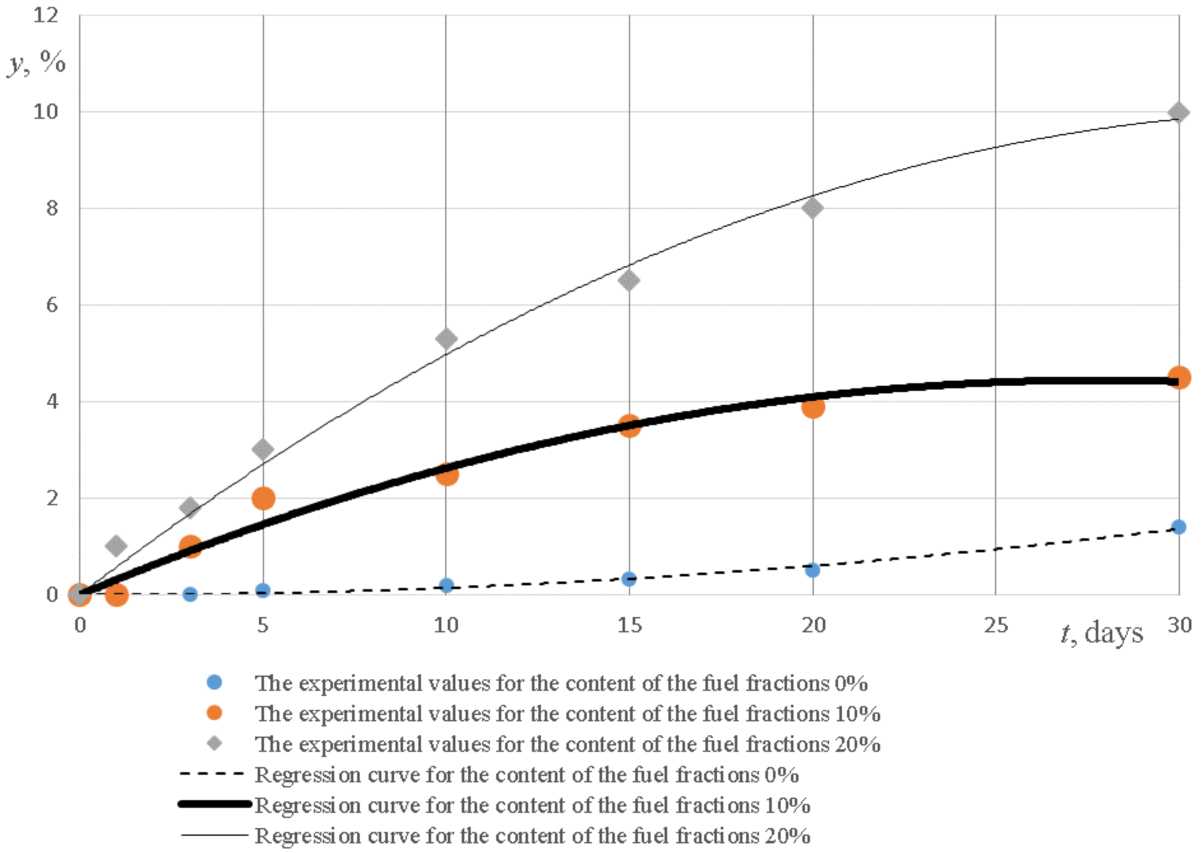

Fig. 2. The dependence of the evolved water *y* from the time *t* when the content of water in emulsion 30 %

when fuel fractions content 10%

$$y = 0{,}0013t^2 + 0{,}0149t - 0{,}0665; \quad (8)$$

when fuel fractions content 20%

$$y = 0{,}0013t^2 - 0{,}0243t + 0{,}0625. \quad (9)$$

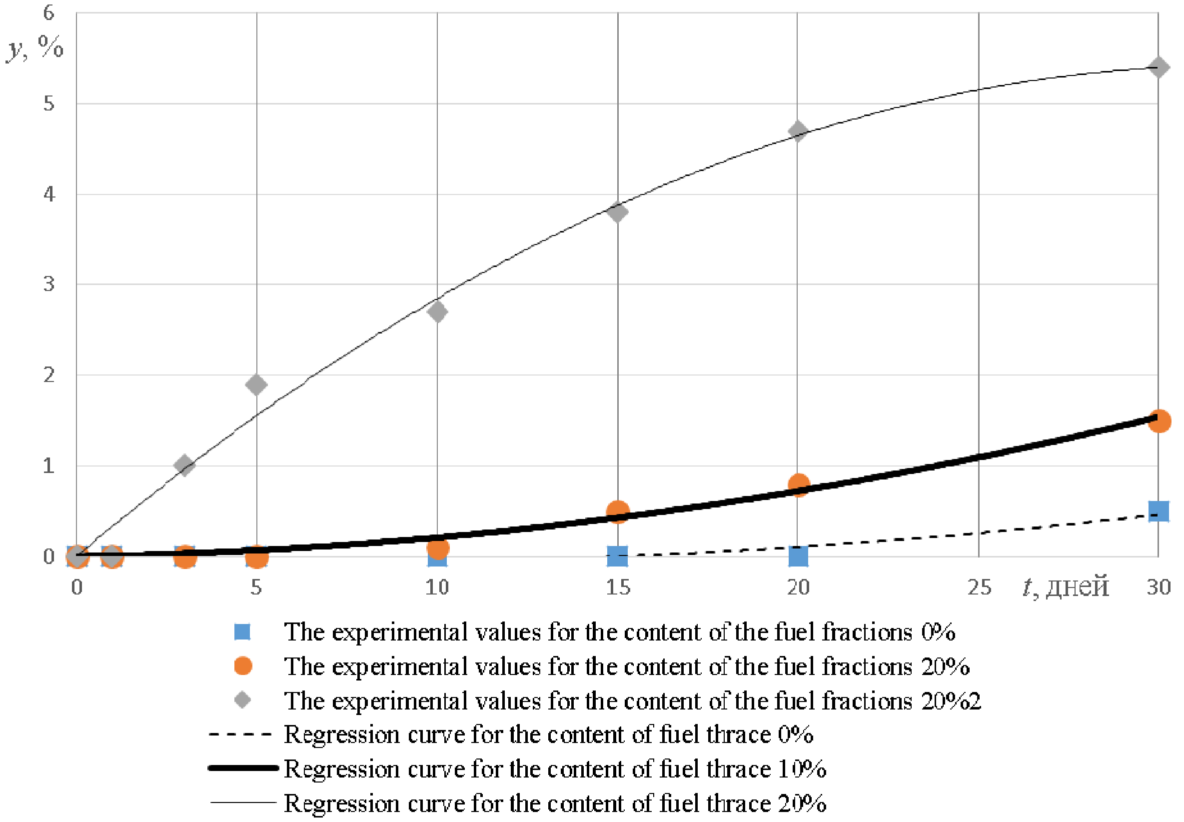

Fig. 3. The dependence of the evolved water *y* from the time *t* when the content of water in emulsion 20 %

The adequacy of the regression equations (1)–(9) was tested using Fisher's exact test with a significance level of 5% [6]. Design values of $F_т$ criteria were calculated in the equations. Significance test was carried out for all the coefficients of the regression equations, which showed that all coefficients are significant. All equations are considered adequate and can be used for interpretation.

When the content of water in emulsion 40% (see. Fig. 1) 2% emulsion of water released without fuel fractions 7 days storage. The same amount of water released from the emulsion containing 10% of the fuel fractions, for 3 days. When the content of the emulsion fuel fractions 20% do not get a stable emulsion. The above leads to the conclusion that any number of fuel fractions at a water content in the emulsion of 40% does not allow to obtain an emulsion suitable for practical use.

When the content of water in emulsion 30% (see. Fig. 2) provides the required stability of the emulsion without fuel fractions. When the content of the fuel fraction 10% volume of emulsion precipitated in water for 30 days storage is 4.0%, which does not allow its use as a commercial product, but allows for the use of factory-emulsion. When the content of the fuel fractions of 20% in the emulsion after 4 days the amount of released water is more than 2%, calling into question the possibility of the practical use of such an emulsion.

Figure 3 shows that at a water content of 20% in the emulsion satisfy the required stability of the emulsion: 1 – no fractions of fuel (amount of released water for 30 days is 0.5%); 2 - fuel fractions content 10% (the amount of released water for 30 days of storage of the emulsion was 1.5%). 20% is not obtained with the required emulsion stability of the emulsion content of the fuel fractions. The closest result to the desired stability is obtained when the content of the fuel fractions in the emulsion close to 10%.

The storage time of the emulsion with the release of the normative amount of water can be calculated by using the regression equation (1)–(9). The resulting regression equations enable us to determine the amount of released water for a certain period of time at different water content in the emulsion, and fuel fractions in the emulsion and thus give an opinion on the suitability of the use of certain party emulsion without resorting to fractional analysis in the laboratory.

Conclusion. Research has shown that it is possible to obtain a stable emulsion even if fuel fractions. However, in order to more accurately determine the maximum possible fuel fractions content in the emulsion, wherein the amount of released water from a water emulsion does not exceed the permissible values, it is necessary to carry out pilot studies with the contents of the fuel fractions of 1-15% by weight of waste oil in 1% increments at a content and water 20 to 30%.

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