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Prospective Use RDF-Raw Materials in Agricultural Technologies and Rubble Concrete

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Abstract

In St. Petersburg and the adjacent territory of the Leningrad region there are about 250 unauthorized dumps, which are placed, according to very rough estimates, from 500 thousand to 1 million cubic meters of garbage. A distinctive feature of illegal dumps is the high concentration of heavy and rare metals in the garbage. The article discusses the possibility of using aerobic waste composting as a fertilizer for soil and a solid building material, or alternative solid binder, highly abrasive granules. The applied research methods suggest that RDF wastes are commercialized and have the prospect of becoming a separate innovative product.

Materials and Methods

Alternative fuel RDF (refuse derived fuel) or solid secondary fuel is a fuel derived from waste. The composition of RDF includes high-calorie waste components such as plastic, paper, cardboard, textiles, rubber, leather, wood, etc. (Figure 1).

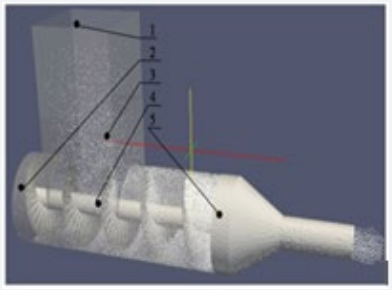

Figure 1: Operation of extrusion of RDF-raw material.

Figure 2: Results of crush-test 1 and 2 examples.

The developed model of the extruder (Figure 1), included a feed hopper 1, building 2, screw 4, interchangeable dies 5, and the incoming particles 3, simulating the particles of peat. The presentation of the material was carried out uniformly, sufficiently for the molding material [1]. It was decided to investigate the granule obtained from RDF-raw materials for uniaxial compression [2]. Press Tinius Olsen is designed to study the breaking point of the pellet and determine the limits of its destruction. At this stage, it was the main equipment for determining the destruction of the granules with the potential use of it later as an additive in building structures. Before starting work, the granules were separated from the composition of the filling formed inside the extruder (Figure 2). Thus, the limit of destruction of the sample came at 4788 N, which proves its use as a reinforcing material. The test schedule is shown in the figure below (Figure 3). So for example, if a batch of brick M100 in strength, the compression ratio should be at least 100 kg / cm2, brick brand M-250 is able to withstand 250 kg, in our case with waste when exposed to the heel of the press on the destroyed sample before its complete destruction was the limit of 500 kg, therefore the sample is strong enough [3,4].

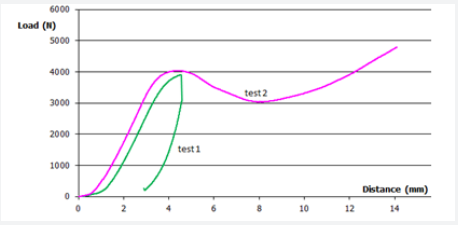

Figure 3: Schedule of tests on the press for uniaxial compression of granules.

Preparation of Blends and Formulations

To assess the possibility of using RDF-raw materials as fertilizer, an experiment was conducted on the pH variation of acidity and evaluation of the germination of shoots of grass “shadow”,

which was added in an amount of 7 g in each container (Table 1), with the resulting mixture and germinated for 10 days (Table 1) (Figures 4-5).

Figure 4: Weighing of samples of RDF-raw materials (a), peat (b), and sawdust (c) to create formulations in containers.

Figure 5: Measurement of acidity and humidity in container.

Table 1: Composition of formulations.

Curing Formula №	RDF, gr	Peat, gr	Wood Dust, gr	H2O, gr	Total Weight, gr
1	53.09	87.7	20	35	195.79
2	30	113	17	35	195
3	75.79	75	10	35	195.79
4	44	102.75	14	35	195.75
5	65	71	24.75	35	195.75
6	80	71.75	9	35	195.75

In consultation with the administration of MPBO-2 "Yani-noN2 in the person of the chief Engineer, where it was taken RDF-raw materials for experiments, it was found that its reserves in the tails of 50 000 tons [5]. During the work the company was doing some attempts of companies to take part in this compost (RDF) for use as fertilizer, however, was complaints about the lack of recommendations for doses of 1 ton of soil for a flowerbed plants and fruit plants. The second observation was related to the smell of decomposing compost, which is a restriction on the storage of RDF raw materials near public places. It to fight these 2 comments were sent 4 of the research works [6,7].

pH Measurement Component and Moisture in the Mortgaged Samples

Table 2: Researching of recipe.

Curing Formula №	Moisture of RDF, %	pH of RDF	Moisture of Wood dust, %	pH of Wood Dust	Moisture of Peat, %	pH of Peat	Moisture of Total Fertilizer, %	pH of Total Fertilizer	S Germination in Soil, cm2	Height of Sprig, cm
1	98	6	10	8	25	7	5.5	7.8	10	8
2	98	6	10	8	25	7	3.5	8	30,04	11
3	98	6	10	8	25	7	7	7.5	13,53	7
4	98	6	10	8	25	7	5.5	7.5	7,7	12
5	98	6	10	8	25	7	4	7.5	5,25	13
6	98	6	10	8	25	7	3	7.2	3,14	8

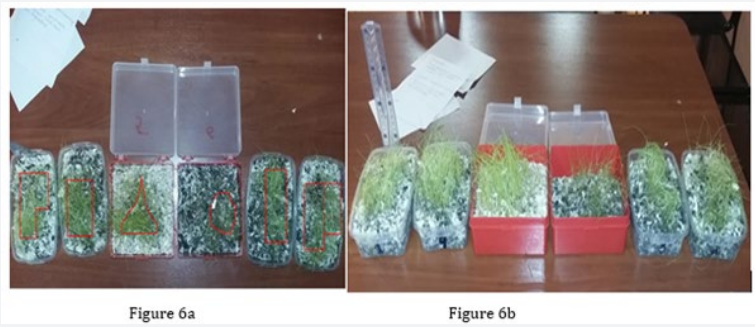

Figure 6a Figure 6b

Figure 6:
a: S germination in soil, cm^2
b: Germination in natural light.

After 10 days, pH analyzer and moisture meter were used to measure these indicators in each of the 6 containers (Table 2), and the germination of lawn grass "shadow" was evaluated (Figure 6 & Table 2). So, based on the results of measurements, we construct a histogram of the dependence of humidity and pH-acidity on the formulation [7] (Figures 7-9).

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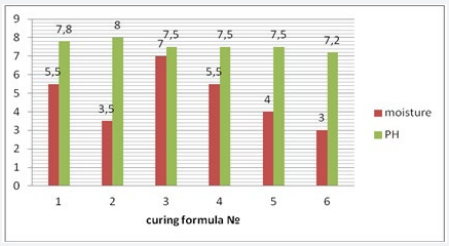

Figure 7: dependence of humidity on pH.

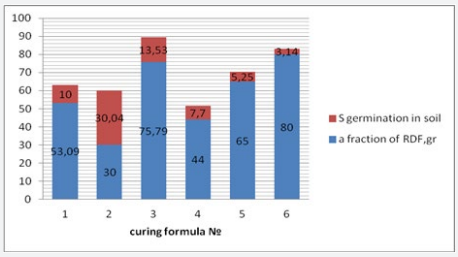

Figure 8: dependence of S germination in on the composition of RDF.

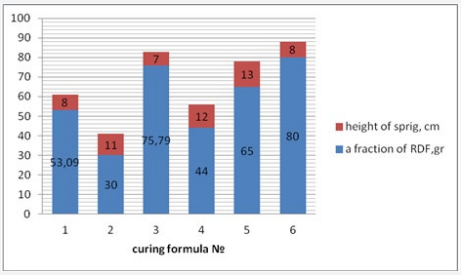

Figure 9: dependence of the height of RDF.

Thus, the area of convergence of the grass «shadow» optimal was 2 and 3 formulation, optimal humidity and pH-5 formulation, height of shoots-2, 4 and 5 For most parameters are not applicable for agriculture (ornamental plants) 2 formulation. The root effect is the selected ratio of humidity to pH 3.5 to 8. On fecundity influenced acidity. At " pH " equal to seven, the reaction of the solution is neutral (the number of H+ ions and IT is the same), if the value is below seven, then the soil is acidic, if above seven, then alkaline [7]. The medium in the 3rd formulation was alkaline, but this did not prevent to give high rates of convergence and length of sprouts. Added peat to the mixture increased acidity, and in turn sawdust neutralized harmful impurities of silicates in the form of fine dust of glass, which abounds in RDF raw materials. Also 2 of the formulation ratios of the composition of RDF to sawdust 50 to 50. The worst recognized 6 formulation, it has a maximum ratio of RDF in relation to sawdust and peat.

Conclusion

As a result of the experiments, the limiting threshold values for the creation of products from waste were found out. Thus, the chain of Waste processing landfill is realized-research laboratory of new composite materials GUAP-Buyer (enterprise). The main result is the creation of trade turnover in the environment of waste processing and environmental protection of urban areas [8-9]. The development of products for the cluster of fertilizers and reinforcing materials is being implemented in parallel in the form of a pilot project at the IBO-2 "Yanino". Economic benefits in cheap materials that can be sold at a lower cost, unloading the territory of the BCH from the accumulated waste of biothermal composting [10-13].

As a result of the software product of the field experiments on the extruder MN-4, tinius Olsen press, it became possible to prove the applicability of aerobic composting products for processing in screw machines with appropriate automated control. The possibilities of their applicability as a building material (hardness up to 500 kg/cm2). In experiments with formulations of soil for germination of grass "shadow" turned 2 the optimum formulation, at the optimum moisture content and the pH 4 formulation, at the lowest odor thresholds of 1 and 2 recipe. For most parameters are most applicable for agriculture (ornamental plants) 2 and 3 formulation.

References

1. Yinlin J, Ting R, Peter W (2016) Comparative study of dust control practices in Chinese and Australian longwall coal mines. International Journal of Mining Science and Technology 26(2): 199-208.
2. Furman E (2005) Measurement of thermal conductivity on it-λ-400 (Educational-electronic text edition prepared at the Department of foundry and hardening technology). Ekaterinburg, p. 10.
3. Tuan LV (2016) The use of LABVIEW environment for the study of SAR. Proc. of the VI all-Russian sc.-prac. Conf. Scientific initiat. of foreign stud. and postgrad. in Russian university, pp. 265-267.
4. Nikulin AN, SV Kovshov, KV Epifancev, GI Korshunov (2014) The research of possibility to use the machine for biofuel production as a mobile device for poultry farm waste recycling. Life Science Journal 11(4): 464-467.
5. Benbow J, Bridgwater J (1993) Paste Flow and Extrusion (Clarendon Press Oxford) UK, pp. 425.
6. Bogatov BA (1985) Managing peat bog development Minsk.
7. Epifancev K, Nikulin A, Kovshov S, Mozer I, Brigadnov I (2013) Modeling of peat mass process formation based on 3D analysis of the screw machine by the code YADE. American Journal of Mechanical Engineering 1(3): 73-75.
8. Epifancev K (2018) Modernization instruments for technical diagnostics mashines. Adv in Civil Engin & Technol 1(2): 1.
9. Epifancev K, Mishura T (2018) Research defects of fatigue failures of screws in Solid Works instrumentation. Open Access journal of science 2(3): 208-210.
10. Qingqing H (2016) Recent trends in rock dust modifications for improved dispersion and coal dust explosion mitigation. J of Loss Prev. in the process Ind. ed R. Honaker 41: 121-128.
11. Qingqing H (2016) Optimized reagent dosage effect on rock dust to enhance rock dust dispersion and explosion mitigation in underground coal mines. Powder Technology. Honaker R (Eds.), 301: 1193-1200.
12. Lindenau NI (1977) Origin, Prevention, and Suppression of Spontaneous Fires in Coal Mines.
13. Kocserha I, Kristály F (2010) Effects of Extruder Head's Geometry on the Properties of Extruded Ceramic Products. Materials Science Forum 659: 499-504.

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