Data of anomalies of heights are obtained by means of the gravitational EIGEN-6C2 and EGM2008 models, and by means of a combination of GPS and geometrical leveling. According to these data it is possible to claim that the correct use of these gravitational models yields quite decent results which can be used and without attraction of other data.

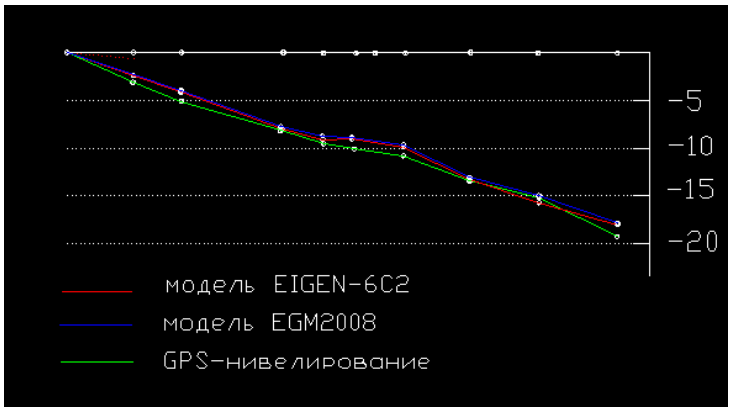

Fig. 3. The schedule of anomalies of heights concerning point 59

The proved EGM2008 model doesn't concede on the accuracy of the latest gravitational EIGEN-6C2 model. These models have very similar characteristics and yield almost identical results. Because the EGM2008 model is long enough used and showed good convergence with results of satellite and leveling measurements in the territory of Belarus, we can't unambiguously recommend the new EIGEN-6C2 model for replacement of the EGM2008 model yet in those works in which the EGM2008 model was used.

The made analysis shows the need of far deeper study of the new EIGEN-6C2 model with attraction of the additional information of bigger volume covering all territory of the republic, and bigger density of data: satellite measurements, high-rise component of the republic, data of gravitation measurementsThe regional model of a geoid of Republic of Belarus of the accuracy of 2 – 3 cm has to be an ultimate goal of such research. As a basis perhaps the EIGEN-6C2 model can also serve.

REFERENCES

1. Garetsky, R.G. Polotsk-Kurzeme belt of breaks / R.G. Garetsky, G.I. Karatayev, V. Astapenko // Reports of NAN of Belarus. – 2002. – T. 46, № 6. – P. 85 – 89.
2. Karatayev, G.I. Monitoring of a gravitational field of the territory of Belarus: results of supervision and interpretation / G.I. Karatayev, Yu.V. Belov // Reports of NAN of Belarus. – 2004. – T. 48, № 4. – P. 83 – 86.
3. Mastyulin, L.A. Not tidal variations of acceleration of gravity on the Belarusian-Baltic geophysical ground / L.A. Mastyulin, V.N. Astapenko, Yu.N. Kuznetsov // Reports of NAN of Belarus. – 1993. – T. 37, № 3. – P. 98 – 100.
4. Sharoglazova, G.A. Gravitation measurements : UMK / G.A. Sharoglazova. – Novopolotsk, 2006. – 195 p.
5. Ogorodova, L.V. Gravimetriya / L.V. Ogorodova, B.P. Shimbarev, A.P. Yuzefovich. – M. : Subsoil, 1978. – 321 p.
6. http://icgem.gfz-potsdam.de/ICGEM/International Centre for Global Earth Models (ICGEM).
7. The report on research work of GPOFI "The Subsoil of Belarus 13" for 2006 – 2010 years "Diagnostics of modern earth movements of Belarus by results of geodetic and geologic-geophysical researches" GB-4026 / G. A. Sharoglazova [et al.].

UDC 697.921.42

PNEUMATIC TRANSPORT OF CRUSHED PEAT

VICTORIA MASLENKOVA, MARIA SELEZNIOVA, TATSIANA KARALIOVA
Polotsk State University, Belarus

Traditional area of peat use as a fuel, which was important in recent years, especially in the post-war period, remains in demand and now. Peat is also unique and often indispensable raw material for the production of a number of high-tech and high import-substituting products (bio-stimulants, growth substances and feed additives, sorption materials for absorption of harmful and toxic hazardous substances, including heavy metals and radio nuclides from water and gases, natural dyes, rust converter, complex biologically active granular and

liquid fertilizer with trace elements, etc. Constantly increasing demands on the culture of production and hygienic working conditions, the need to reduce capital costs and maintenance costs of continuous transport equipment put on the agenda the issue of wider use in industry and agriculture systems, pneumatic conveyance of different granular media. Experience of enterprises in various industries shows promising applications of pneumatic transport to move the dust, granular, fibrous and small piece goods, and the possibility of its use for transporting various media.

RB industry produces peat moss, packs it in small packages for sale to the public and for export in large plastic bales. This peat is used as a nutrient soil.

Currently, the movement of peat in the shop and outside is made by the belt conveyor, which is represented in the picture. (Fig. 1).

Fig. 1. Conveyor belt for transporting peat

Disadvantages of this method:

- Loss of transported material;
- Dusty environments and the surrounding area;
- Large size installations;
- High operating costs.

The advantages of pneumatic conveying systems over other types of transport equipment are well-known. They are compact, simple in design, easy to fit into a variety of processes, and are characterized by the absence of waste and waste transported materials, high hygienic conditions of their transporting, the possibility of full automation and improvement of working conditions. The advantage of pneumatic conveying of granular media is that it can be used in conjunction with a variety of mass-transfer and technological processes, such as cooling and drying of transported material, its grinding and separation, purification from all contamination. Pneumatic installations allow the movement of granular media on a complex trajectory, unloading material from a variety of delivery vehicles and picking it up from out of the way places, issuing the material at various points, a reliable weather protection and protection of the environment from excessive dust emissions. Pneumatic conveyor equipment is easy to use and easy to control.

The disadvantages of pneumatic transport include a relatively high specific energy consumption, wear of pipes and other elements of installations in contact with the transported material.

In general pneumotransport installation depending on the functions they perform, can be divided into two groups [1]:

1. Aspiration craft facilities located within the industrial premises, which remove the bulk material from processing equipment, and then transport it inside the plant or outside it. For these purposes, suction and suction-injection installations of low pressure are mainly used.

2. Transport installations operate purely transport functions, i.e. move the two-phase flow inside the plant in the process stream through the territory of the enterprise and beyond. These settings depending on the type of transported material, its concentration and the distance of transporting may range conveying suction, pressure air suction and injection wells. In addition, pneumotransport installation can be stationary and non-stationary. Stationary installations are designed mostly for departments, shops and enterprises in general. For the design of mobile pneumatic systems it is necessary to know basically the same input data as for stationary. However, due

to the fact that the demand is made to move different materials, differing from each other by their physical and mechanical properties all of these units are designed for use in a variety of conditions than stationary.

Pneumatic suction installation type is easy to manufacture and install and can take material from several places.

In pneumatic conveying suction installation gas is sucked together with the material and on the way they are mixed. Next, two-phase flow "air-particle bulk material" moves in the transfer line to the consumer separating apparatus where the material is separated from the carrier medium, which enters the blowers. From blowers carrier medium is released into the atmosphere. Fig. 2 shows a schematic diagram of the pneumatic suction installation type [1]. Separation of material can be carried out by two-step purification of the transported gas from hard particles depending on the initial concentration of impurities.

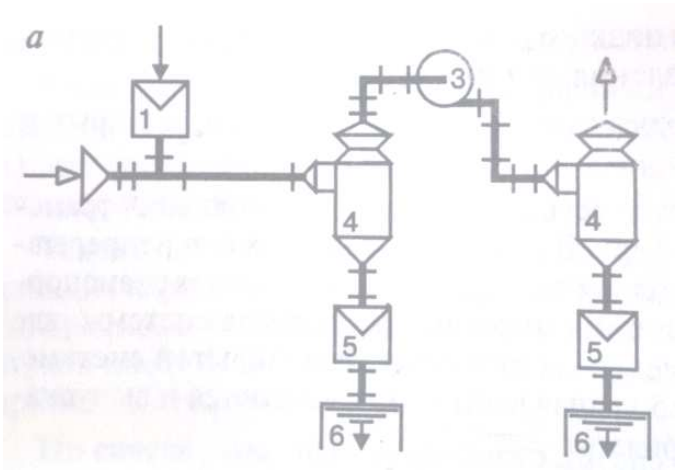

Fig. 2. Schematic diagram of the pneumatic suction installation:
1, 5 – feeder; 3 – blowing machine; 4 – separator; 6 – hopper

In addition to the pneumatic suction action installations with one picking up place and one unloading device, it is possible to use scheme for the material supply in to different places with the installation of various types of switches on the transport pipelines. Such setups are especially justified when you want to feed the conveyed material from multiple locations into one.

The major disadvantage that limits the use of pneumatic systems, is large power consumption in comparison with other types of continuous transport. This is largely due to the arbitrary choice of the air flow rate, the concentration of fuel mixture and pipe diameter.

For all the pneumatic lift (vertical pnevmotransport) air velocity and diameter of the pipeline can be selected, in which power consumption is the lowest. Wherein the selected predetermined speed v and the performance Gm of the pipeline material diameter D is determined from concentration aeromixture μ.

The energy consumption of pneumatic transportation depends on the air flow and pressure loss. In order to reduce the air flow it is advisable to choose the largest possible concentration. However, with increasing μ the pressure losses rise. Consequently, the choice of the value μ must be adequately justified. Considering the above, to determine the optimal values (from the condition of the least power consumption) v, D and μ must have dependencies $p_{cm} = f(v, D, \mu)$ and the data about pipeline blockage boundary.

There have been several experiments on the separation of peat in the vertical collector-reservoir and the cyclone in a pilot setup, which is located in the ventilation laboratory of EE "PSU".

For the experiment, a nutrition soil on the basis of high-moor peat produced by the enterprise UE "Vitebskoblgas" was used. A portion of peat without separation into fractions was passed through a vertical collector-reservoir [2] and the cyclone and it was found that the cyclone collects fines and the collector-large fraction respectively. I.e. peat separated in the cyclone is a better quality (no sticks, debris and virtually no fiber connections). Capture efficiency coefficient of such an installation is: in the collection-reservoir $\eta = 78\%$, and in the cyclone $\eta = 67{,}1\%$. The overall installation efficiency is $\eta = 92{,}7\%$.

By reducing the loading time increased concentration of sample was obtained and there was a higher collection efficiency in the collection reservoir, $\eta = 86{,}9\%$, while in the cyclone $\eta = 70\%$. The overall efficiency of the setup turned $\eta = 96{,}2\%$.

When the sample passes only through the separation cyclone $\eta = 98\%$ entrapment was obtained. The experimental results are presented in Figure 4 histogram.

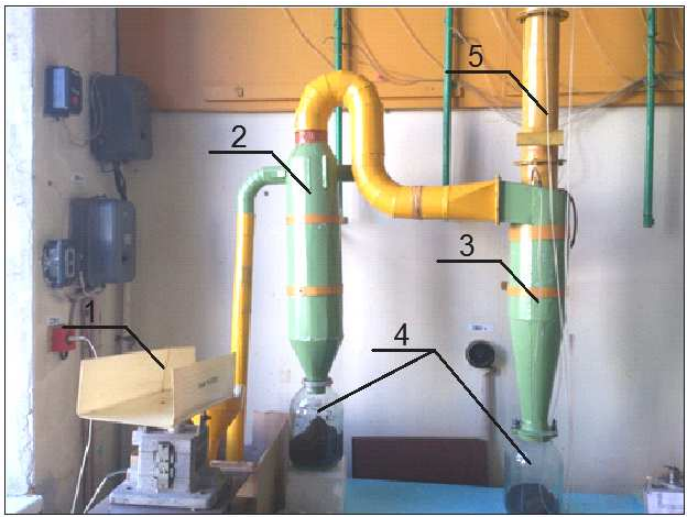

Fig. 3. Experimental setup:
1 – feeder; 2 – vertical collector-reservoir; 3 – cyclone; 4 – bunker; 4 – exhaust pipe

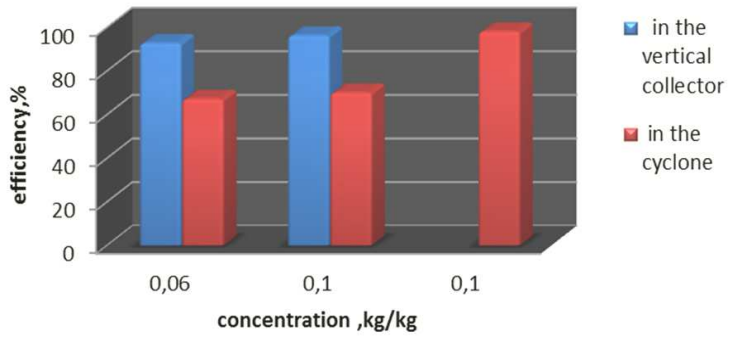

Fig. 4. Material separation efficiency in the experimental setup

A portion of peat was sifted through a sieve and 6 fractions of different diameters were obtained. Each fraction was passed through the setup, and the mass of the particles of each fraction separated in the collector-reservoir and in the cyclone was determined.

To determine a sustainable transport velocity of the particles terminal velocities of peat particles of different diameters were determined in a pilot setup in the ventilation laboratory of EE "PSU".

Dependence of the terminal velocity of particles on the fraction diameter is shown in Fig. 5.

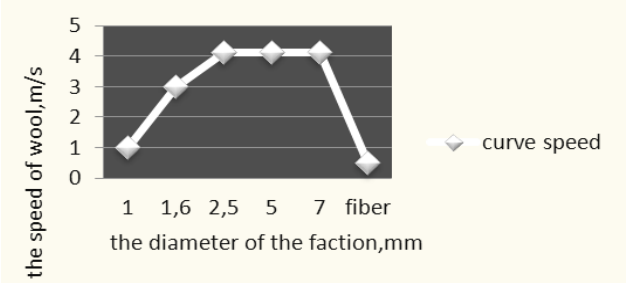

Fig. 5. Dependence of the terminal velocity on the fraction diameter

1. The use of two-stage separation of the two-phase fuel mixture of peat by means of a vertical collector and a cyclone leads to a separation of the material and sedimentation in the reservoir-collector of large fractions and debris, and the cyclone gets fine fraction. Total separation efficiency is around $\eta = 92 – 96\%$.

2. When using only a cyclone for peat separation the cleaning efficiency is about η = 98%. The two-stage separation may be due to the need to obtain high-quality granular fractions of peat without dust and fiber connections used, for example, for growing seedlings of plants and other purposes.

3. The terminal velocity of particles increases sharply with increasing their diameter from 1 mm to 2.5 mm It remains constant from 2.5 to 7 mm and drops sharply for fiber connections.

REFERENCES

1. Хрусталёв, Б.М. Пневматический транспорт / Б.М.Хрусталёв, Н.В. Кислов. – Минск : Информационная служба недвижимости, 1998. – 452 с.
2. Аспирационный вертикальный коллектор-сборник : пат. 365 Респ. Беларусь: МПК B 08B 15/00 / Т.И. Королёва ; дата публ. 30.09.2001 // Офиц. бюл. Гос. патентного ведомства Респ. Беларусь. – 2001. – № 3.

UDC 620.97

ALTERNATIVE ENERGY SOURCES

MIHAIL MIHAILOV, INNA YELSHINA
Polotsk State University, Belarus

Human life is unthinkable without energy. We are all accustomed to the use of fossil fuels, such as coal, gas and oil as sources of energy However, as we know, their reserves in nature are limited. And sooner or later they will run out. The answer to the question "what to do in anticipation of the energy crisis?" has already been found: it is necessary to look for other energy sources – alternative, non-traditional, renewable [1]. What are the main alternative energy sources available currently?

Scientists warn of possible exhaustion of known and available oil and gas reserves, depletion of other essential resources such as iron ore and copper, nickel, manganese, aluminum, chromium, etc. Today the world energy is based on non-renewable energy sources. Great hopes in the world are pinned on the so-called alternative energy sources, the advantage of which is that they are renewable and environmentally friendly [2].

Such sources may include [3]:

- solar energy,
- wind energy,
- the energy of tides,
- the inner heat of the Earth,
- biomass fuels.

Let us consider the most relevant types of alternative energy sources for the Republic of Belarus.

Solar energy

The method of generating electricity from sunlight has been known for over a hundred years. The phenomenon of PV was first observed by Edmond Becquerel in 1839. Conducting a series of experiments on electricity, he plunged two metal electrodes in a conductive solution and subjected the setting to sunlight. Some electrical voltage occurred between the electrodes. The development of solar cells in Bell's laboratory in the early 50-es revolutionized the electronics industry. Space industry would be almost helpless without them. Light solar energy generators allowed to approach the problem of creating artificial Earth satellites in a completely different way. In addition, solar energy can be used in solar houses [4].

Solar installations can be designed for heating and hot water supply of residential houses. Solar power systems can save expensive mineral fuel through judicious use of solar energy.

The idea of the solar house (the house in which heat supply, cooling and hot water supply are carried out with the help of solar energy) has become widely known. Perhaps the perfect example of such a house is a traditional Japanese house. Both in summer and in winter it has an acceptable temperature for living. However, real solar houses with a fully developed system of heating and cooling are still relatively few. It is not easy to make them economically viable. However, it is evident that the natural reserves of oil and coal in the world are not enough for the long term and further technical program is inextricably linked with the need to conserve energy.

Wind energy

Apparently, for the first time wind energy was used to move sailing ships, and later – for lifting water and grinding grain. It is believed that the first wind turbines were built in China, Japan and Tibet more than