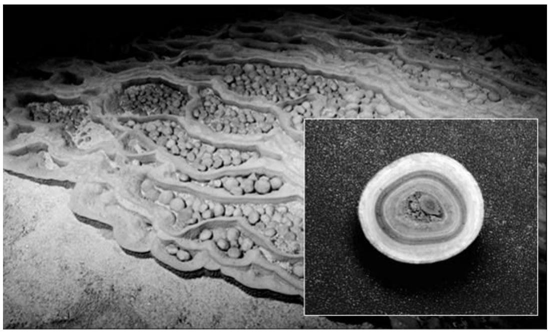

Fig. 3. Cave pearls formed in the stone cages. Each has concentric structure [5]

The cable car ride would allow any visitor to admire Son Doong and other attractions at the park without endeavoring on an adventurous tour. This project has been opposed by most scientists and communities in Vietnam and around the world. Because cable car construction project could lead to cave collapses and will threaten the pristine cave with further development. The cable car will definitely attract tourists in large numbers. But the noise of the engine, the amount of household waste has been found difficult to control in the place of another cable operator is really disturbing environment where biodiversity is high in Phong Nha - Ke Bang. he Phong Nha–Ke Bang (PNKB) karst has evolved since the Paleozoic (some 400 million years ago) and so is the oldest major karst area in Asia. Phong Nha-Ke Bang National Park is one of the world's two largest limestone regions. It should take measures to prevent the development of karst processes to conserve natural heritage and creating a premise towards the first natural heritage of biodiversity.

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CHOICE OF RATIONAL STRUCTURE OF DIESEL GENERATORS FOR AUTONOMOUS ELECTRIC POWER SUPPLY OF OIL DEPOSITS

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Petroleum industry is a large consumer of electric energy. Electric supply of oil deposits is important issue for electric power industry. Quantity of independent power supply sources depends on the possible damage in case of fault. Independent power supply source is a source which continues supply of consumers in case of faults on other sources Diesel electric power stations are often used as independent electric power supply sources for oil deposits.

Advantages of diesel electric power stations:

- high efficiency (0,35-0,4);
- simple technological process;
- possibility of building diesel power plants of modular type.

Voltage on this source must stay in frames for stable work of power consumers. Voltage on independent power supply source must contain 60% of nominal during action time of relay protection devices in case of fault.

The main purpose of this work is developing methods for selecting the quantity and the power of diesel generators.

The most important technical indicators of autonomous diesel power plant which provides decentralized consumers power supply are the quantity and the power of installed power units. These indicators define the reliability of electric power supply and the effectiveness of diesel power plant [2].

The total power of diesel generators should cover the maximum design load taking into account meet generators’ own needs and provide motors start. The quantity of working units is determined in accordance with the schedule of loads and available diesel generators’ nomenclature. Available regulations do not contain specific recommendations and procedures for the selection of the quantity and the power of diesel generators. Meanwhile, the indicators under consideration are extremely important, as technical and economic characteristics of the power plant are largely depend on them.

Rational choice of diesel generators put into operation, providing the best technical and economic characteristics of diesel power plants is associated with the large number of very contradictory factors. Here are the main problems associated with this choice:

1. Diesel generators should be periodically out of operation for the required service, maintenance and major repairs. Electric power supply reliability of customers under given circumstances is lowered. Frequency and duration of maintenance depends on the size of the power unit.

2. Composition of consumers supplied from diesel power plant can vary periodically in power, quantity and operating modes. This inevitably leads to change in power plant's load over a considerable range, both during the day and seasons of the year. It is desirable to provide the load of diesel generators ranging from 25 to 80 % of rated load. The overloading beyond these limits leads to life reduction of the diesel engine. At low loads the specific fuel consumption is significantly increased. Therefore the effect of carbonization caused by congestion of unburned fuel fractions in the cylinders appears. That also adversely affects the life of the engine.

3. Specific fuel consumption for generation of 1 kW·h of electricity depends on the unit size. High power diesel generators usually have lower specific fuel consumption. It changes during operation of diesel generators in partial modes. With decreasing the load it increases.

This paper proposes a method of optimizing the quantity and power of diesel power generators of autonomous diesel power plant, which is used as the main power supply for decentralized consumers.

Minimum reduced annual cost for a given level of customers' electric power supply reliability is used as the optimization criterion, equation 1:

$$C = E_N \cdot I + C_{OM} + C_{INT} \Rightarrow \min , \quad (1)$$

where E_N – normative coefficient of capital investments effectiveness (in the calculations it was taken equal to 0.15; which corresponds to the payback period of 6.5 years) [1];

I – capital investment in diesel power plant, rub;

C_{OM} – annual cost of the plant's operation, rub;

C_{INT} – economic damage from power interruption of consumers, rub.

Nominal powers of generators and power plants are determined from the state standards and correspond to the general industrial stationary power units and three-phase alternating current diesel power plants. The average cost of diesel power plant is defined on basis of the price lists and catalogs of famous domestic manufacturers and suppliers of diesel power plants.

To determine the annual operating costs for diesel power plant maintenance it is convenient to use a typical cost structure for each individual enterprise, equation 2 [3]. Significant share in the structure of these costs is the cost of fuel:

$$\mathbf{C_{OM} = C_F + C_M}, \textbf{ rub}, \quad \mathbf{(2)}$$

where C_F – annual fuel costs (price plus shipping), rub;

C_M – maintenance costs (staff salaries, supplies, etc.), rub.

If the share of fuel costs in the total cost is defined, then it is possible to determine the annual operating costs for diesel power plant maintenance according to the known fuel costs, equation 3:

$$\mathbf{D_F = C_F / C_{OM}} \quad \mathbf{(3)}$$

where D_F – the share of fuel costs in the total cost of diesel power plant operation and maintenance.

Taking into account the cost of one ton of equivalent fuel (21.0 thousand rub.), and the share of fuel costs in the total cost of diesel power plant maintenance (D_F = 65%), according to expression (2) it is possible to define the annual operating costs for diesel power plant maintenance COM.

Cost of power interruptions to electricity consumers is defined by the expression 4:

$$\mathbf{C_{INT} = \Delta M \cdot y_0}, \textbf{ rub} \quad \mathbf{(4)}$$

where y_0 – specific damage from power interruptions in electric power supply, rub / kW·h;

ΔM – expectation undersupply in electric power supply per year due to lack of power.

To determine the material damage from possible sudden interruption in electric power supply of consumers it is necessary to know specific indicator of damage y_0, which generally depend on the structural composition of consumers (their share in industry, household and service sectors, agriculture, transport and building engineering) and the extent of their limitations[4].

The cost of damage is recommended at 40 – 100 rub./kW·h. These data are averaged and can be used for a rough estimation of the damage in case of accidental interruption of electric power supply in the mains with a different composition of consumers.

In order to perform the choice of the quantity and power of diesel generators it is necessary to solve the optimization problem by choosing the diesel generators of a stationary diesel power plant intended to supply of autonomous consumer.

Choice of the quantity of power generators is performed with the following provisions:

1. According to the expression 5, total power of power units should be 25% higher than daily peak load power:

$$\mathbf{P_{Total} \geq 1.25 \cdot P_{Max}} \quad \mathbf{(5)}$$

This condition will provide the loading of diesel generators at maximum load mode by not more than 80 %.

2. For the convenience of maintenance of all diesel generators they must be of the same size.

3. Maximum quantity of power units of diesel power plants should not be greater than 8.

If the capital investments in diesel power plant I, the annual cost of operation and maintenance of the plant C_{OM} and economic damage from power interruption of consumers C_{INT} are known, the reduced annual costs for all variants of diesel power plants are defined according to expression 1. Then the variant which requires the minimum of costs is chosen. Cost structure is shown on Figure.

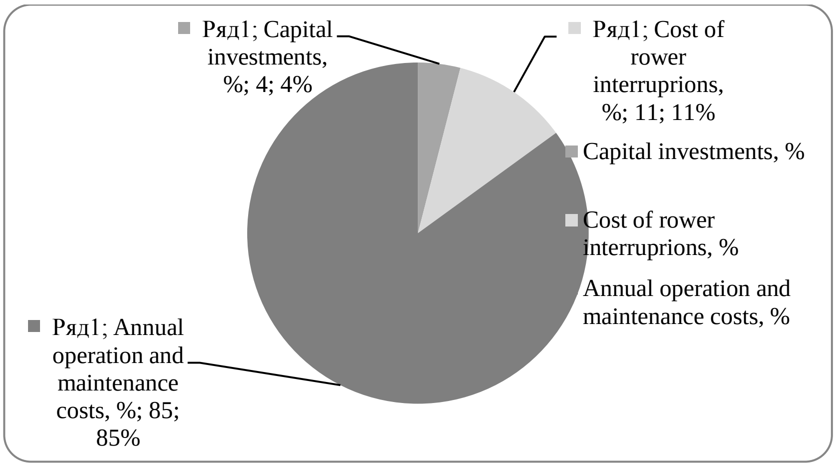

Fig. Cost structure

The method proposed in this paper is quite versatile and can be recommended for optimizing the structure of autonomous diesel power plants operating in specific conditions.

Energy efficiency of diesel power plant can be increased by reducing the consumption of diesel fuel. This is achieved by optimizing the required sizes and the quantity of power units of diesel power plant. The result of this work is choosing the optimal quantity and power of diesel generators according to given load diagram.

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PROGNOSTIZIERUNG DER SCHWEFELSÄUREALKYLIERUNG VON ISOBUTAN MIT OLEFINEN MIT MATHEMATISCHEN MODELLEN

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Die Qualitätskennziffer für Kraftstoffe ist die Oktanzahl, die die Klopffestigkeit des Benzins charakterisiert. Deshalb ist eine der wichtigen Aufgaben der erdölverarbeitenden Industrie die Herstellung des Hochoktanbenzins mit reduziertem Gehalt keiner aromatischen Kohlenwasserstoffe – Alkylbenzin. Dieses Zielprodukt wird durch die katalytische Alkylierung von Isobutan mit Butenen hergestellt. Alkylat besteht aus isoparaffinischen Kohlenwasserstoffen – Isooctanen und enthält keine aromatischen Verbindungen. Die Alkylatoktanzahl bildet 92-96 Punkten nach der F1-Methode. Dank seinen Antiklopfeigenschaften und physikochemischen Parametern ist Alkylat die beste Komponente für die Herstellung von Hochoktanbenzin [1].

Das Ziel der vorliegenden Arbeit ist die mathematische Untersuchung der Schwefelsäurealkylierung von Isobutan mit Olefinen. Das Forschungsobjekt ist die Anlage der Schwefelsäurealkylierung bei OAG «Gaspromneft – Omsk Erdölraffinerie».

Das mathematische Modell der Schwefelsäurealkylierung von Isobutan mit Olefinen war am Lehrstuhl der chemischen Technologie von Brennstoffen und der chemischen Kybernetik Tomsker polytechnischen Universität entwickelt. Dieses Modell ist als Computermodellierungssystem realisiert, mit dessen Hilfe die Prognostizierung der industriellen Anlagearbeiten möglich ist.

Für die Berechnung des Alkylierungprozesses von Isobutans mit Olefinen mit Hilfe dieses Computermodellsystems werden die Ausgangsangaben in Microsoft Excel Format verwendet: der Verbrauch der Rohstoffströme, die in den Alkylierungsreaktor eintreten, ihre Zusammensetzungen und die Daten der technologischen Arbeitsbedingungen der Apparate. Bei Berechnungen waren dabei aktuelle Industrieanlagedaten verwenden, was die Zuverlässigkeit der durchgeführten Berechnungen erhöht.