

COAL BRIQUETTE PRODUCTION

METHOD OF REHASH OF BRAIZE (SWAFT) BY SCREW DISCHARGE UNDER PRESSURE WITH THE SUBSEQUENT HEAT TREATMENT

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1. The design characteristics.

The design purpose

Creation of highly technological production of a coal briquette from coal slime.

The **product characteristic:** the High-quality coal briquette, on physical and to chemical properties matching to existing GOST and standards.

Key parameters

Planned production volumes: the Coal briquette – 900 tons/months 1 stage, 3600 tons/months 2 stage.

Technological level of the equipment and production organization conforms to requirements of standards of system of quality and the ecological safety acting in territory of Ukraine and the CIS.

For design implementation it is planned

1. To redeem the ground area of 7,6 hectares with production, warehouse and domestic premises the total floor space of 3000 sq.m. There is own railway a branch, transport and power lines.

The price: **660000\$.**

2. To buy stage by stage 4 complexes on production of a coal briquette from braize of production of India (the complex passport is applied).

The price: **1600000\$.**

3. To buy a car and special technique: 4 cars SuperMaZ, 4 trailers, 3 scoop lift truck Amkador, 4autotrucks, 2 autobuss of a brand «MaZ», 1 minibus and 2 cars.

The price: **650000\$.**

4. To repair office, domestic, store rooms. To prepare for mouting production areas. To recover ventilating, sanitary, sewer and an electric equipment.

To rig chemical laboratory, to build a box for cars and engineering workshop. To establish the fire-security signalling system, video observation systems, internal and external illumination. To buy office equipment and office furniture, the equipment of a dining room, locker rooms, baths. To buy uniform summer and winter overalls

The price: **900000\$.**

5. To renovate a railway over-bridge, to build the railway overpass.

The price: **145000\$.**

6. To buy raw for productions (swaft).

The price: **360000\$.**

For 90 calendar days the supervision of erection, begin adjustment and alignment, instruction of the personnel and an exit on a design output of 1 complex is performed.

Combined value of necessary stage-by-stage financing — 4.315.000\$.

2. Goods.

2.1.Total characteristics.

In spite of the fact that in the world searching is led and new aspects of sources of combustible are advanced, coal remains to one of the basic natural resources used in many spheres of activity of the person as combustible.

At least 1/4 parts of extracted coal are a coal fines which goes to a waste. On estimations, only in

one of areas of Donbass negative impact on a condition of ecology of region has accumulated more than 250 million tons of such waste (data of 2008), making.

At the same time there is a significant necessity of combustible for domestic needs. Demand for coal grows in many countries of the world. According to the American agency on power engineering (ELA) world export of coal has attained 525 million tons (2009). In some regions of the world, for example, in the Western Europe the trend of lowering of own extraction and increase in consumption of coal at the expense of import is manifested.

Thus at application of coal for domestic needs the preference is given to coal briquettes. Usual at production of cakes simple enough production engineering at which the basic mechanical properties of cakes are attained by pressing of coal with application of special connecting components are used.

As a result cakes though possess a certain mechanical strength, have other low qualitative indexes (foreign smells, heightened ash content, difficulty of a kindling, heightened costs of production and many other negative characteristics). The indicated deficiencies are eliminated at application of offered production engineering. Such production engineering of briquette is the **KNOW-HOW of producer company** and consists in creation of special conditions for use of organic properties of the components which are already a part of coal, for the score the screw discharge under pressure and thermodynamic monitoring for mar tempering of mechanical properties of cakes, and also use of a special construction of some mechanic nodes of the equipment.

2.2. Occurrence history

Push for creation mini - plants on production of cakes of coal from a coal slime was imperfection of existing installations on coal briquette.

The in-service experience of industrial prototypes has shown that in some nodes of the equipment coal fraction самоуплотнялась - solid plugs were organized. The analysis of process of spontaneous formation of these plugs has led to idea of control of such process применительно directly to coal briquette.

Summary of practical implementation was production model creation mini - the plants, making coal briquettes **WITHOUT ADDING CONNECTING** in which the leading role is assigned to use of a control technique and forming of special conditions at creation of cakes of the improved quality. Use of such production engineering has changed also the mechanics supplying engineering procedure of conventional briquette.

As a result of this methodology the hi-tech, cost-effective, mobile equipment was received, on an order is more compact and deprived of all deficiencies of the predecessors. Besides adding of connecting components was expelled from engineering procedure in a coal mix.

2.3.Process production engineering

At first at small pressure there is an external seal of a material for the score removals vacuum between corpuscles.

Then corpuscles are obturated and strained. Between them there is a molecular clutch. The high pressure in the end of pressing leads to transition of elastic deformations of corpuscles in plastic owing to what the structure is reinforced and the set form is saved. Secreted

Thus phenols and resins with the assistance of water are polymerized on a surface of corpuscles. Heating up of a material to stringently certain temperature directly at pressing improves process. At cooling and after dehumidifying cakes are definitively fixed.

As a result, costs of production are reduced, and at combustion of such cakes there are no foreign smells, the kindling becomes simpler.

The greatest temperature of a cake is attained in the geometrical centre of a cake - there is special almost smokeless combustion with the heated sphere inside.

The production engineering became possible with application of process control of briquette under the special program in such a manner that briquette of each cake is completed only in that case when a cake will acquire required quality. The time of forming of one cake fluctuates in small limits and occurring processes are not visible to the ectogenic observer.

Advantages of offered production engineering

Production product — a high-quality coal briquette. The applied innovative production engineering allows making a high-quality fuel product with mar tempering physical and initial stock chemical properties.

Complex rehash of coals is one of the most actual tasks in area fuel - power provision. In the given design it is offered to use new production engineering for coal rehash in high-quality, smokeless and non-polluting fuel briquettes without use of connecting components. Successful implementation of such task becomes really possible because the **manufacturing company** had been created progressive high technologies which allow performing rehash of coals with a minimum ecological load on a circumambient and enough high cost efficiency.

Use of this production engineering at rehash of coals allows receiving competitive goods which meets the most rigid ecological demands, actuating those standards which are inducted now in a number of most developed countries **of European Union** and the USA:

- To receive power-generating fuel with beforehand set qualitative behaviors considerably improved, in comparison with initial raw;
- To raise profitability of use of power resources at the expense of efficiency raise combustible using installations;
- To reduce cost of obtaining of energy at the expense of use of more low-cost energy carrier;
- To improve ecological parameters (to eliminate a fluffing in transit and rehash to reduce lets of oxides of nitrogen, sulphur, and also solid dust suspended matters) at combustible burning;
- To supply private individual users of coal with better power and ecologically valuable raw;
- To raise general crop of maintenance combustible using installations of small power engineering;
- To use a waste of coal production;
- To create autonomous transportable mini - plants of small productivity in modular modification with a capability of overgrowth of their productivity in volumes necessary for a user;
- To supply high manufacturability in production mini - plants at the expense of possibility of using simple and in most cases standard completing elements.

The complex on production of a coal briquette from braize makes a high-quality coal briquette which is used as domestic combustible; desing (passport) production volume of one complex – 900 tons/months Coal briquettes are a convenient aspect of combustible, and have a number of advantages in comparison with usual coal:

- Comfort of storage and transportation;
- Manufacturability of practical use;
- Uniformity of combustion;
- The increased time of combustion;
- Practically absence of residual products of use;
- Ecological appeal.

The complex on production of the given cakes represents a little мини - the plants integrated in one technological line-up.

The given production technology of a coal briquette allows to use unconditioned coal swafts. Siftings with ash content A-45:50 allow making domestic combustible, on the parameters surpassing extracted cost intensive coals.

2.5. The production technology

Fine corpuscles of coal are linked in a unit by a method the screw discharge under pressure to the subsequent heat treatment. In the course of a coal coalescence of particles are involved a little mini-plants:

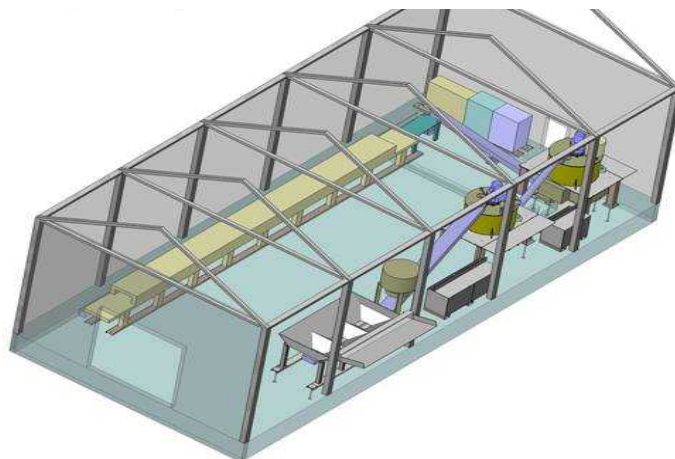
1. Hammer mill (crusher).
2. The holding furnace.
3. Separator.
4. Press forming.
5. Packing line.

The pressing high pressure leads to transition of elastic deformations of corpuscles in plastic owing to what the structure is reinforced and the set form is saved.

Quantity of attendants — 6 persons in one gang.

Result of activity of these plants is the coal briquette, allowing substituting conventional domestic combustible.

Thus made product possesses high properties which have removed it on a leading place on application as domestic combustible.



2.6. The coal briquette characteristics:



The cake form ravioli figurative (by data the best on ash content and strength).

The cake elemental composition is determined exclusively on a coal elemental composition.

Moisture content in cakes 10 — 12 %.

Heat of combustion 3200 — 4500 kcal/kg.

On a mechanical strength cakes match to GOST 7299-54.

Resistance on a bending — not less than 10 kg / sq. see

Resistance on compression — not less than 80 kg / sq. see

At cake combustion there are no foreign smells, ash content is reduced, the kindling becomes simpler. The greatest temperature of combustion of a cake is attained in its centre — there is special almost smokeless flame with the heated sphere inside.

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The production technology envisions finished product output in a packing aspect — 5, 25 and 50 kg that is attractive to the population. Besides, 1 kg briquette combustibles substitutes at least 2-2,5 kg of coal. At complex maintenance on production of cakes of coal there is a capability of raise of efficiency output a product at the expense of use of some binders to a ratio of a cake of 1 kg — to 5 kg of coal. The production baseline, i.e. a complex which is not present in territory as the CIS, and Ukraine is necessary for handling of this production engineering.

3. Marketing

3.1. The market characteristics

The created factory will be one of the first producers of a coal briquette a method the screw discharge under pressure with the subsequent hardening in Ukraine.

As a part of Ukraine 26 regions. Necessity of coal only the market AR Crimea which concerns to the installed most gas regions — an order of 70000 tons of coal in a year. Demand for a coal briquette which on the technological parameters is more attractive fuel product, by results of preliminary monitoring is highly competitive in relation to domestic coal (cost of 1 ton of coal 850 hrv., the offered cost of 1 ton of a cake which is equivalent to 2,2 tons of coal, constitutes an order 1000 hrv.).

3.2. Competitive strength

Design marketing orientation — sufficing of necessity of users in a high-quality coal briquette. The negotiations which have been conducted with managing directors of private priming complexes, the factories of agricultural industry, coal warehouses have shown their high interest in the supply plan and implementation of a received fuel product.

In territory of the CIS 8.000.000 tons of a coal briquette which is applied to metal smelting in blast furnaces, as combustible for thermal power stations are annually made. For domestic needs of the population the coal cake practically is not issued.

Competitive strength of the design is supplied with a combination of a complex of parameters, the main things from which: unique basic processes, operative flexible structure of production, the multifold marketing policy and support of the design by guiding of regional state administrations and representatives of the factories entering in the planned wholesale network of implementation of goods.

4. The investment plot. Structure of costs.

Dynamics and structure of holdings (in \$ the USA).

Table №1

Event	1 month	2 month	3 months	6 months	9 months	In total
Acquisition of an industrial platform	660.000	0	0	0	0	660.000
Equipment acquisition	800.000	0	0	400.000	400.000	1.600.000
Car and special equipment acquisition	350.000	0	0	300.000	0	650.000
Repair of engineering buildings, Domestic office premises, purchase of office equipment and other	522.500	522.500	0	0	0	1.045.000
Raw purchase	0	30.000	60.000	90.000	120.000	360.000
Total:	2.332.500	552.500	60.000	790.000	520.000	4.315.000

The combined value of necessary investments constitutes 4.315.500\$ the USA.

5. The operational plot.

5.1. Resources and suppliers.

For provision of a flow process for coal briquette production delivery of following materials is required:

Table №2

Material	Supply rate (Tons/months)	The price (\$ USA)
Braize (swaft)	1 stage – 900 t/month	30/ton
The electric power	80 kw/days	7

Delivery of braize (swaft) it is planned to perform from pits and pits of Donbass (reserves of hundred million tons) by rail taking into account necessities and a minimum transport batch.

5.2. Production and sale.

The plot of production and sales is calculated proceeding from the forecast demand taking into account technological capabilities of the created factory.

Table №3

Product type	Production volume of tons/years	The price \$/ ton	Revenue \$/ year
Coal briquette	40.200	200	8.040.000

Annual sale of a finished stock will constitute an order 8.040.000\$ the USA.

6. Management. The plot on the personnel.

The managerial personnel on all stage of implementation of the design will consist of number of responsible partners. For minimization of times of adjustment of engineering procedures the operating personnel of producers-suppliers will be used. Problems with hiring of the other personnel (the workers serving, engineering technical workers), considering a situation on a labor market of Ukraine, it is not anticipated. The basic accent is supposed to be made on military men of the power departments transferred to the reserve on a long service and staff reduction.

Average salary by activity in a complete regular regime, considering unhealthy conditions of work and level of the average salary on the coal industry, it is supposed at level of 4000 grivnas in a month.

Factory personnel instruction will be made by representatives of supplier companies of the equipment and is obligatory criterion of contracts.

Aggregate number of workers of the factory to 160 persons.

The monthly fund of payment, together with social deductions will constitute 70.000\$ the USA.

7. Financial model business — the plot.

Design date started — 01/02/2012 of year.

Observed time - 3 years (36 months) with the planning period in 1 year — monthly, next two years — annually.

Calculation system:

Fiscal year begins in January.

Calculation is produced in real terms in US dollars.

Design currency:

Design major currency — US dollar.

Exchange rate — 7,94 hriv. For 1 US dollar (for the period of production of calculations)

Table №4

Taxes			
The tax title	Baseline	The period	The rate
The profits tax	Profit	Month	25 %
THE VAT	Value added	Month	20 %
The property tax	Property	Quarter	2 %
Payments in a pension fund	The salary	Month	17,5 %
The transport tax	The salary	Month	1 %
The tax for users of highways	Sales volume	Month	2.5 %

Table №5

The planned supply rate													
Product	Unit of measurements	04.12	05.12	06.12	07.12	09.12	10.12	11.12	12.12	01.13	2013	2014	2015
Coal	Ton	900	900	1800	1800	2700	2700	3600	3600	3600	20100	40200	40200

Marketing (pricing)													
Product	The price/ton	04.12	05.12	06.12	07.12	09.12	10.12	11.12	12.12	01.13	2013	2014	2015
Coal-briquette	200	180000	180000	360000	360000	540000	540000	720000	720000	720000	4320000	8640000	8640000

Raw and delivery:													
Product	The price/ton	04.12	05.12	06.12	07.12	09.12	10.12	11.12	12.12	01.13	2013	2014	2015
Swaft	30	27000	27000	54000	54000	81000	81000	108000	108000	108000	648000	1296000	1296000

Salary:

Quantity working — to 160 persons

Payment in a month - to 70.000 US dollars (a wages fund of ~10 %).

Table №6

Profits – deficits													
Financial parametre	04.12	05.12	06.12	07.12	09.12	10.12	11.12	12.12	01.13	2013	2014	2015	
Sales volume (o6m)	180000	180000	360000	380000	540000	540000	720000	720000	720000	4320000	8640000	8640000	
THE VAT	45000	45000	90000	90000	135000	135000	180000	180000	180000	1080000	2160000	2160000	
Net volume of sales	135000	135000	270000	270000	405000	405000	540000	540000	540000	3240000	6460000	6460000	
Raw and accessories	27000	27000	54000	54000	81000	81000	108000	108000	108000	648000	1296000	1296000	
Gross profit	108000	108000	216000	216000	324000	324000	40100	40100	40100	2592000	5174000	5174000	
The salary	10800	10800	21600	21600	32400	32400	43200	43200	43200	259200	517400	517400	
Profit before tax discharge	97200	97200	194400	194400	291600	291600	388800	388800	388800	2323800	4656600	4656600	
The profits tax	24300	24300	48600	48600	72900	72900	97200	97200	97200	580959	1164150	1164150	
Net profit	72900	72900	145800	145800	218700	218700	291600	291600	291600	1742941	3492450	3493450	
Deductions of the sum of a share of the investor	37179	37179	74358	74358	111537	111537	148818	148818	148818	378899	1068424	1068424	
Deductions of the sum of investment										1000000	1397500	1397500	
The income	35721	35721	71442	71442	107163	107163	142782	142782	142782	364041	1026526	1026526	

8. The basic economic parameters of the design (4 lines of briquette on 10000 tons/years) for 12 and 24 months.

Table №7

№	The name of financial parameters	12 months	24 months
1.	Goods volume in money terms, \$ the USA.	4320000	8640000
2.	The pure reduced income. NVP, \$ the USA	1742941	3432450
3.	Volume of investments, \$ the USA	4315500	4315500
4.	Profitableness of investments (profitableness index) PI	0,72	1,97
5.	Internal rate of profitableness, IRR, % year	76	127
6.	Payback period, PBP, month	18	18