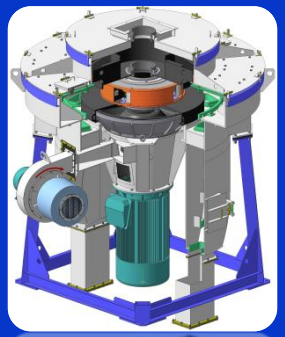
«NPO Center» OJSC

The equipment for minerals processing

Crushing, grinding, classification

The equipment to produce building materials

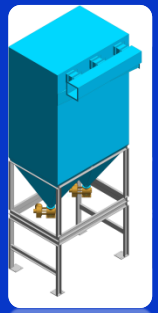
Centrifugal-impact crushers



Mills and grinding complexes

Centrifugal and air-gravity classifiers

Auxiliary equipment (sizing screens, cyclones, bag filters, fans)



Centrifugal-impact crushers

Make it possible to perform the operations on crushing the materials of any strength, hard-to-treat and abrasive materials including.

•Low capital and operating costs;

•To install the crushers there's no necessity in special foundations, they can be installed on a flat ground at any level of a production building;

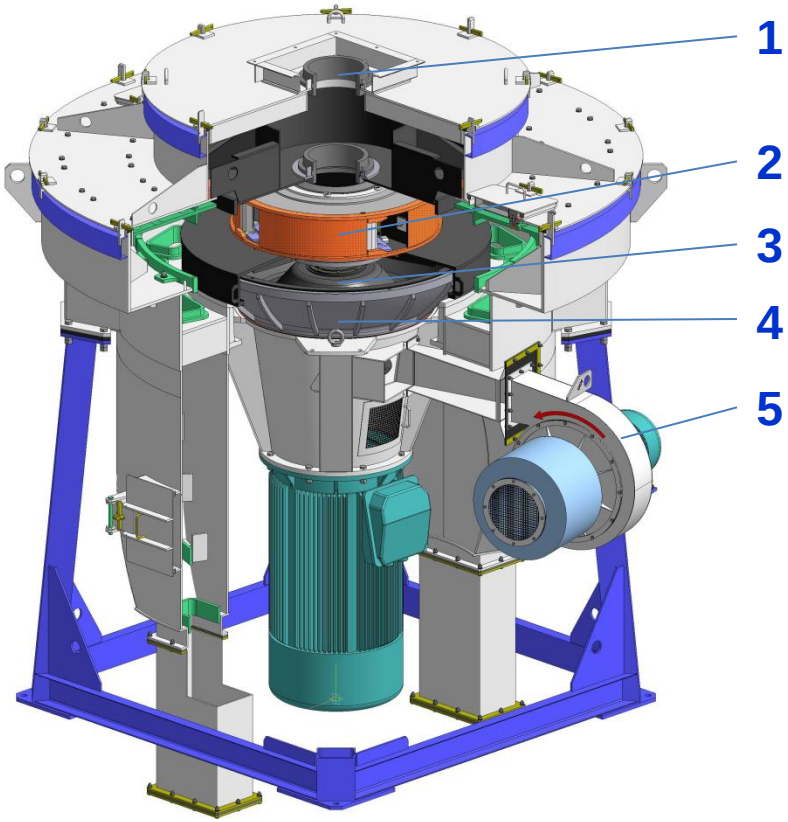
•The construction itself provides simplicity and ease at the execution of works when replacing the accelerator lining elements at the expense of the original execution of assembly units and fasteners;

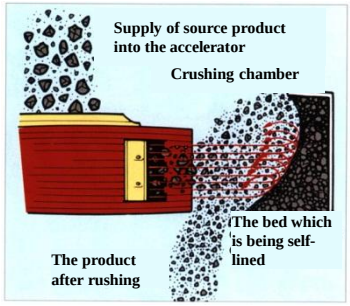
•The accelerator's dynamic mass balancing is not required after the lining elements have been replaced;

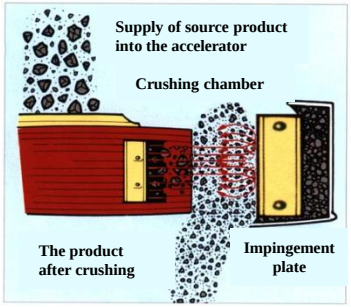
•All the wearing surfaces and parts are furnished with special wear-resistant elements;

•Grain size composition of the ground material does not depend on the wear of the lining elements.

Centrifugal-impact crushers







The principle of operation of a centrifugal-impact crusher

By a high-pressure fan (5) the air-pressure is generated necessary both for the «floating» of the rotor and the creation of the air gap between the rotor (3) and the stator (4). The air-cushion which is formed under the rotor plays the part of a gas bearing. The unique design of the working part of the crusher is a self-balancing system which secures a steady operation of the equipment. Source product (1) is fed through the hopper into the rotating accelerator (2). Having got in the accelerator the necessary peripheral velocity for grinding and, consequently, the kinetic energy it strikes against the bumper surface of the crushing chamber and breaks.

Centrifugal-impact crushers

Description		Value			
Model		ДЦ-0,63	ДЦ-1,0	ДЦ-1.25	ДЦ-1.6
Throughput capacity, t/h		5-15	15-60	60-150	150-300
Maximal linear dimensions of a feed lump, mm		25	40	60	70
Electric motor power, kW		22-55	45-132	110-200	160-315
Overall dimensions, m	length	2,1	2,8	3,2	3,7
	width	1,7	2,4	2,8	3,2
	height	2,2	2,4	3,0	3,6
Mass, t		2,5	4,8	9	13

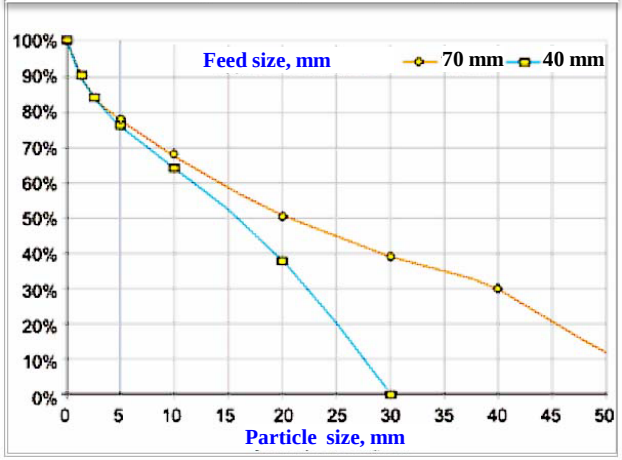
Technology to obtain cubiform crushed rock

The technology is based on the application of «NPO Center» OJSC impact-centrifugal crushers at the last stages of crushing.

It makes it possible:

- **to crush the materials of any strength;**
- **to obtain the product in a wide size-range;**
- **to obtain crushed rock which content of plate-like and prickly particles is within the range of 5-15 %;**
- **o obtain freshly-crushed broken stone with the enhanced activity of particles surface;**
- **to increase the crushed rock strength by 15-20%.**

Basic characteristic of crushing



Technology to obtain crushed rock

The technology can be realized in two stages: I - crushing; II – the following classification of screenings

I

II

Source material
Fraction 20-40 mm

Centrifugal-impact crusher

Unbalanced-throw screen

Return
Fraction 20-40 mm

Screenings of crushing
Fraction 0-5 mm

Fraction
5-10 mm

Fraction
10-20 mm

Screenings of crushing
Fraction 0-5 mm

Gravity classifier

Cyclone-discharger

Aspiration cyclone

Discharge of air

Aspiration fan

Dust

Fraction
0-0,63 mm

Transport fan

Fraction
2-5 mm

Fraction
0,63-2 mm

The application of cubiform crushed rock makes it possible

1. *In highway engineering:*

- to enhance strength and and lifetime of pavement road surface;

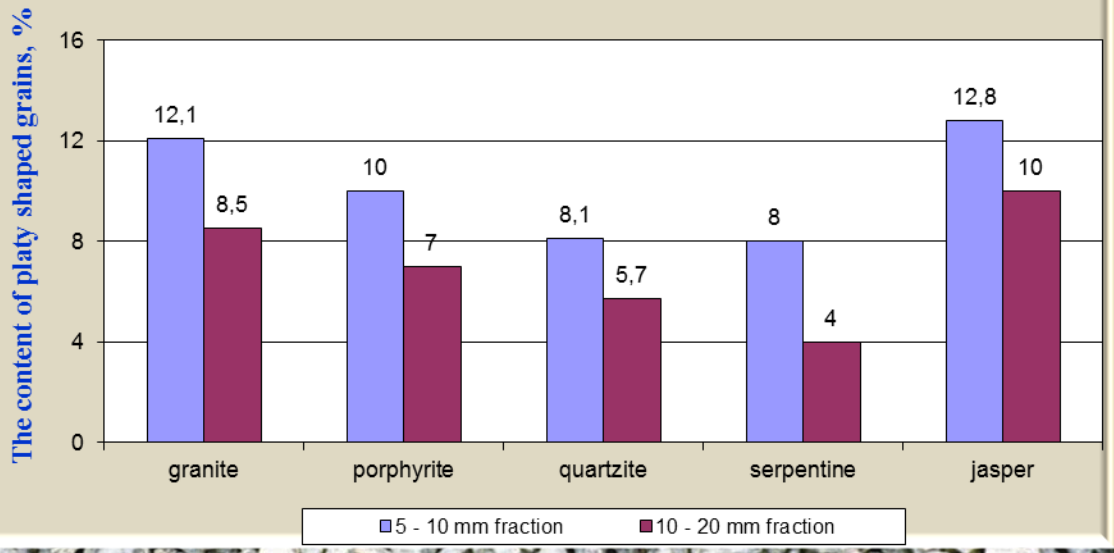
- to save binding materials and filling compound up to 30%;

- to reduce labor expenditures on roadway surfacing up to 50%;

- to increase the adhesive capacity up to 0,65-0,71;

- to reduce moving transport noise level by 10-12%.

Platy shaped grains content in the crushed rock of impact-centrifugal breaking



Cubiform crushed rock in concrete production

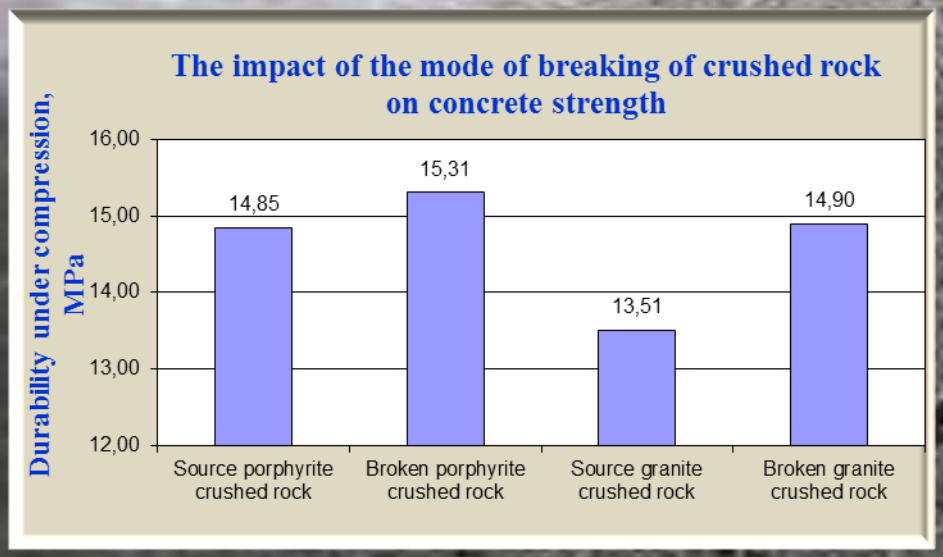
2. *The application of cubiform crushed rock in manufacture of concrete products makes it possible:*

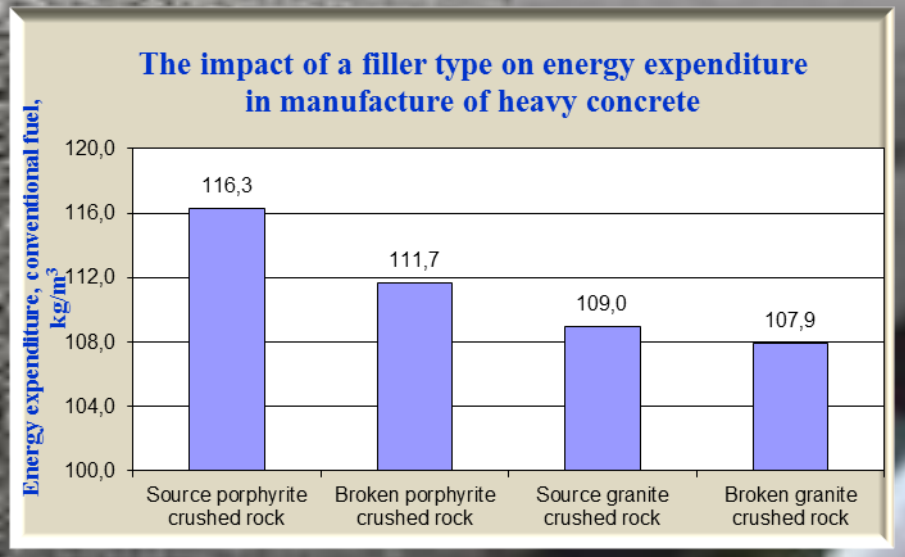
- to increase the concrete products durability by10%;

- to reduce the content of cement by 15%;

- to reduce concrete mix water demand by 3%;

- to reduce energy costs for the production by 2,5% on the average.





Cubiform crushed rock in concrete production

Fine-grained concrete which is obtained on the basis of crushed sand outperforms in its physical and mechanical properties similar concrete manufactured with the application of river sand.

In ensuring concrete high quality of great importance is the shape of particles of coarse aggregate (crushed stone). It is not to have more than 15% (by mass) of grains having plate-like and prickly shape. This requirement is easy to carry out with NPO Center crushing and grinding equipment.

The place of MIKASHEVICHI: crushing and screening complex

Crushing and screening complexes on the basis of centrifugal crushers provide the obtaining of high-quality cubiform crushed rock and sand in the volume up to 1 m. tons per year.

The place of GLUSHKOVICHI: crushing and screening complex on the basis of ДЦ-1,6

These complexes permit the obtaining of crushed material with high consumer properties; flakiness does not exceed 10% and this corresponds to the crushed rock of group I according to State Standard (ГОСТ) 8267-93.

Gumbeika, Russia:
crushing and screening complex on the basis of ДЦ-1,6

JSC Kiembaevsky Ore Dressing and Processing Plant

In 2009 – 2010 the Enterprise «Orenburg minerals» (Russia) overhauled «JSC Kiembaevsky Ore Dressing & Processing Plant» on concentration of asbestos ores.

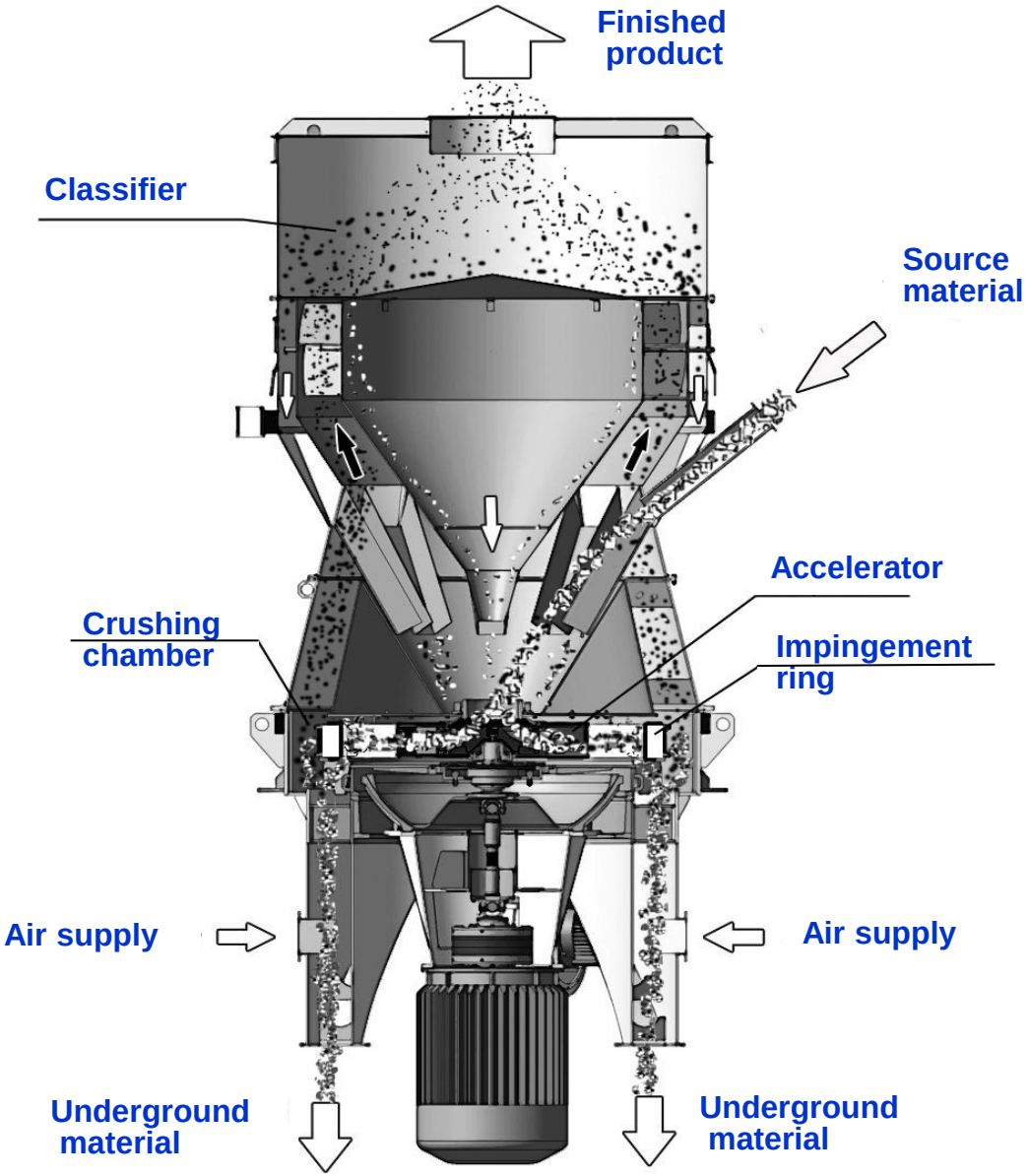
	Before the reconstruc-tion	After the reconstruc-tion
The amount of crushers	112 rotary crushers	39 ДЦ
The amount of the stages of crushing	5	3
Annual electricity consumption, MW	144 000	57 000
Manganese steel consumption (for quick-wearing elements) was reduced by 2700 t/year.		

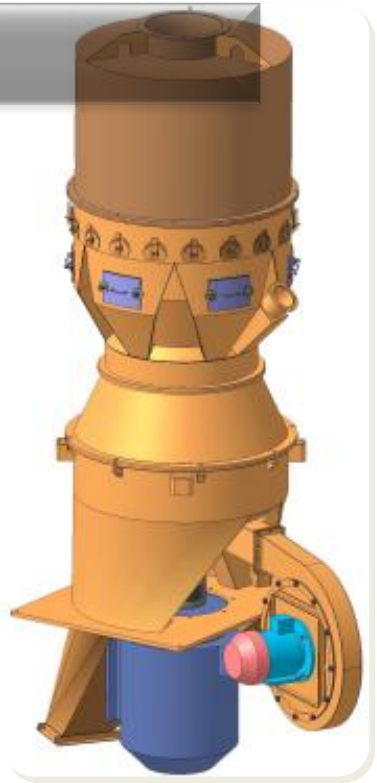
Centrifugal-impact mills

Comparing to ball mills they make it possible:

- **to obtain the ground product of a narrow granulometric composition in a wide size-range;**
- **to control the size of the ground product in operation;**
- **to obtain the particles of material with the shape approaching that of cubiform;**
- **to obtain products with the enhanced surface activity of the particles;**
- **to reduce significantly the milling of metal into the finished product;**
- **to reduce energy costs on grinding by 10-12%.**

Centrifugal-impact mills

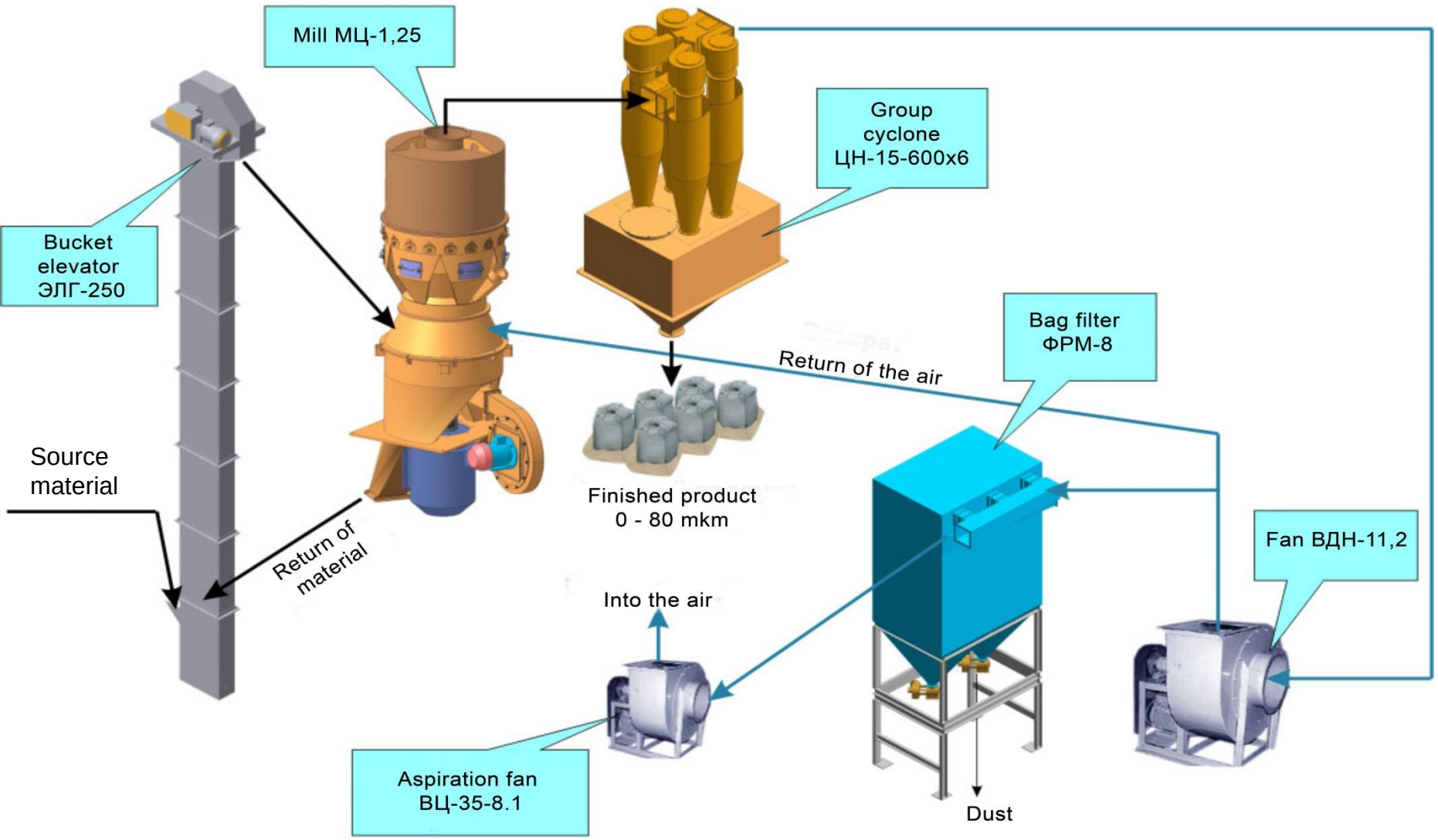




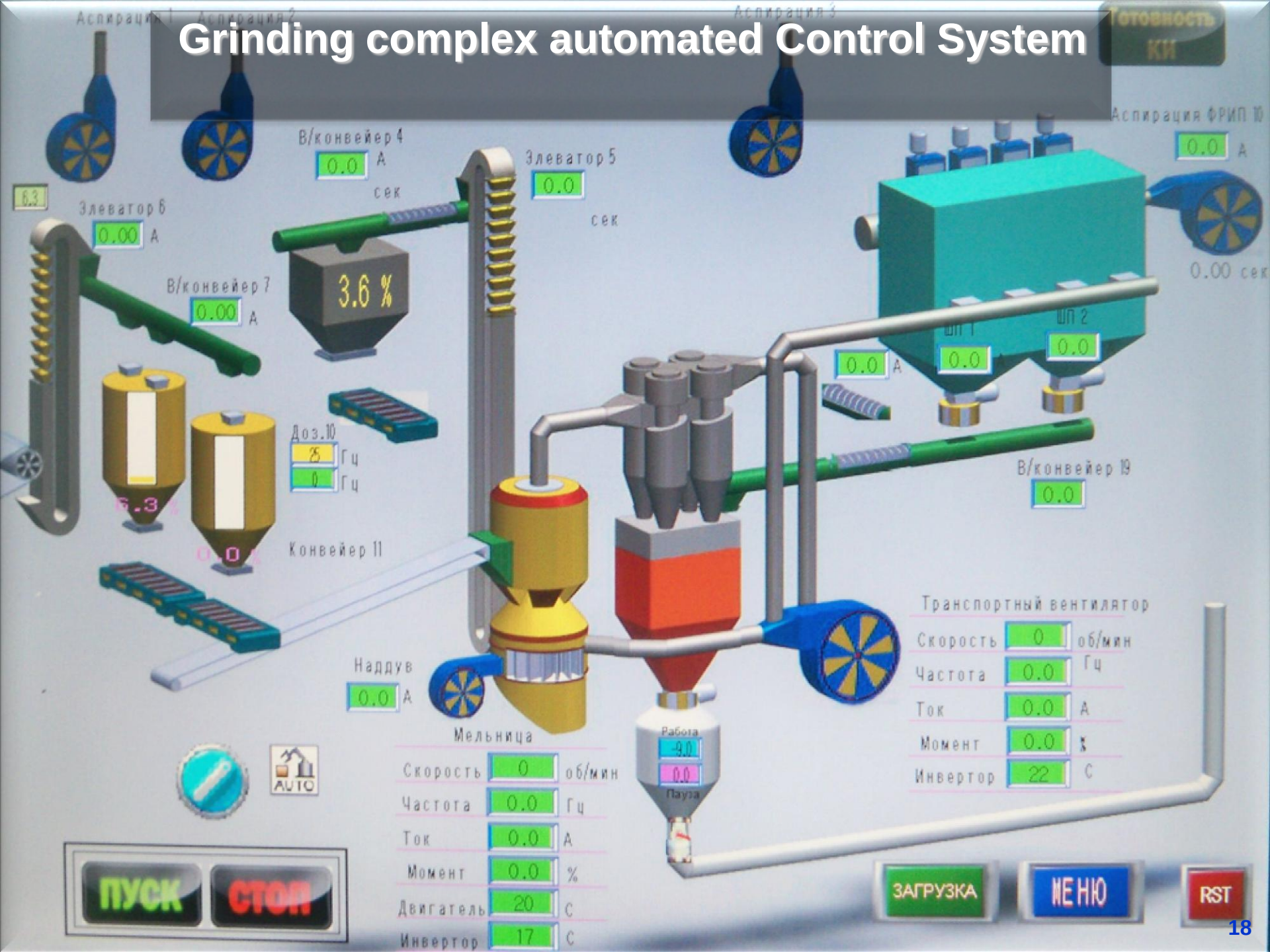
Classifiers which the mills comprise serve to withdraw the material of the required size from the grinding zone as well as to return the underground product for re-grinding.

Such a scheme permits both the substantial improving of the economic performance of grinding and the quality factors of the resulting material. The size of the finished product can be regulated in operation without the shutdown.

Flow chart of the grinding complex



Grinding complex automated Control System



The application of the products from impact grinding

- when using cement to increase the strength of concrete articles by 20-25% or to reduce cement consumption by 10-12%;
- when using sand and lime in the production of foam concrete and cilica brick to enhance the strength of the articles by 40-50%;
- to obtain high quality building materials.

Centrifugal-impact mills

The material obtained through NPO Center mills is distinguished by a narrow granulometric composition, by a low content of both coarse and fine fractions. The particles have homogeneous isometric shape with a well developed surface. It contributes to the obtaining of durable and qualitative articles and in so doing there is a reduction in material (binders, water) and energy expenditures.

Description	Value				
Model	**КИ-0,4**	**КИ-0,63**	**КИ-1,0**	**КИ-1,25**	**КИ-1,6**
Capacity, t/h	**0,05-1,0**	**0,5-5,0**	**1,5-10,0**	**3,0-20,0**	**5,0-25,0**
Feed size, mm, up to	**10**	**20**	**25**	**25**	**25**
The size of the ground product (can be regulated), mm, not more than	**0-0,02…3,0**	**0-0,02…3,0**	**0-0,02…3,0**	**0-0,02…3,0**	**0-0,02…3,0**
Installed capacity, kW, not more than	**40**	**160**	**290**	**430**	**520**
Overall dimensions, m, not more than: length x width x height	**5,0x4,0x4,1**	**11,0x4,0x8,7**	**14,0x7,0x9,0**	**15,0x8,0x10,0**	**15,0x8,5x11,0**
Mass, t	**3,5**	**14,5**	**21**	**40**	**50**

Homel Ore Dressing & Processing Plant: grinding complex to obtain powder quartz

The results have shown that the obtained materials are in full compliance with the requirements of State Standard (ГОСТ) 9077-82.

Productivity: 2 t/h

Product size: 50 µm

Milling of metal, not more than: 0,02%

JSC «Polotsk-STEKLOVOLOKNO»: The complex to grind sand and erklez

At the present time two complexes КИ-1,25 for sand grinding have been launched and are being in successful operation at JSC «Polotsk-Steklovolokno».

The replacement of jet mills to grind sand and erklez for NPO Center grinding complexes in 2009 gave 50 thou. $ saving of the operating costs per month.

«KOELGA-MRAMOR», Russia: the grinding of marble powder

At the present time up to 70 % of all the filling compounds on the basis of marble powders in CIS countries are produced with «NPO Center» equipment.

Classifying equipment

Gravity classifier

Cascade-gravity classifiers are applied for the separation of coarse-dispersed materials into the specified fractions in the size-range from 0,1 to 5,0 mm. The separation of the material takes place at the expense of the interaction of the field of the gravitational forces and the air flow.

Cascade system of separation realized in the equipment construction permits the achieving of high precision separation.

Centrifugal classifier

Centrifugal classifiers are applied to obtain fine-dispersed powders of specified fractional composition in the size-range from 0,005 to 0,1 mm. The separation of the material takes place at the expense of the interaction of the centrifugal force field and the air flow.

The size of separation products is regulated by change in rotational speed of the speed-up rotor as well as by change in the amount of the air flow.

Centrifugal classifiers

Classifiers of this type are used to obtain high quality filling compounds, pigments, high-quality cements, micro-talc and other materials. The size of separation products is regulated both by change in the rotational speed of the rotor and by change in the quantity of the air flow.

Description		Value					
Model		КЦ-0,3-1	КЦ-0,4-2	КЦ-0,6-5	КЦ-0,8-20	КС-2.001	КС-2.002
Productivity, t/h, not more than		1	2	5	20	5	20
Boundary size of the products of separation, mm		0,05-0,01	0,05-0,01	0,05-0,01	0,07-0,02	0,4-0,063	0,4-0,063
Air consumption, thou. m^3/h		2	5	8	20	6	22
Hydraulic resistance, kPa		1-3	1-3	1-3	1-2,5	1-2	1-2
Installed capacity, kW		2,2	7,5	11	15	-	-
Overall dimensions, m	length	1,4	1,4	1,7	2,3	1,2	2,4
	width	1,2	1,4	1,6	2,0	1,1	2,3
	height	2,2	2,2	2,3	2,5	2,2	5,8
Mass, t		0,35	0,44	0,8	1,3	0,8	1,5

Gravity classifiers

Classifiers of this type can be applied both independently and as a part of crushing-and-sorting lines. The advantages of cascade-gravity classifiers in comparison with conventional screens lie in the absence of expensive quick-wearing fine-meshed screens and vibration mechanisms. Many years service of “NPO Center" air cascade-gravity classifiers proved their high efficiency, reliability and simplicity in maintenance.

Description		Value					
Model		КГК-2.001	КГ-3.006	КГ-3.011	КГ-3.012	КГ-3.013	КГ-3.014
The number of separation products		2	3	3	3	3	3
Productivity on loading, t/h		60	35	40	10	40	60
The size of separation products (can be regulated), mm		5-2 < 2	5-2 2-0,63 < 0,63	5-2,5 2,5-0,16 < 0,16	5-2,5 2,5-0,16 < 0,16	5-1,2 1,2-0,16 < 0,16	5-2 2-0,16 < 0,16
Air consumption, thou. m^3/h		30	28	25	9	25	31
Hydraulic resistance, kPa		2,5	2,0	2,5	2,5	2	2,5
Overall dimensions, m	length	2,5	2,2	3,0	2,4	3,6	3,8
	width	3,2	2,0	2,4	1,6	2,4	2,6
	length	5,5	7,0	7,6	5,8	8,2	8,3
Mass, t		4	2,3	3,5	1,6	4	4,2

Classifying complexes permit to obtain the crushed rock fractions of 0-0,63 mm; 0,63-2 mm; 2-5 mm from the screenings of crushing.

Millions of tons of screenings (fraction 0-5 mm) are stored in the dumps of different enterprises. After the screenings are processed in the classifying complex, small-sized crushed stone is produced as well as building sands, fillers and other materials the cost of which is incomparably higher than that of the screenings.

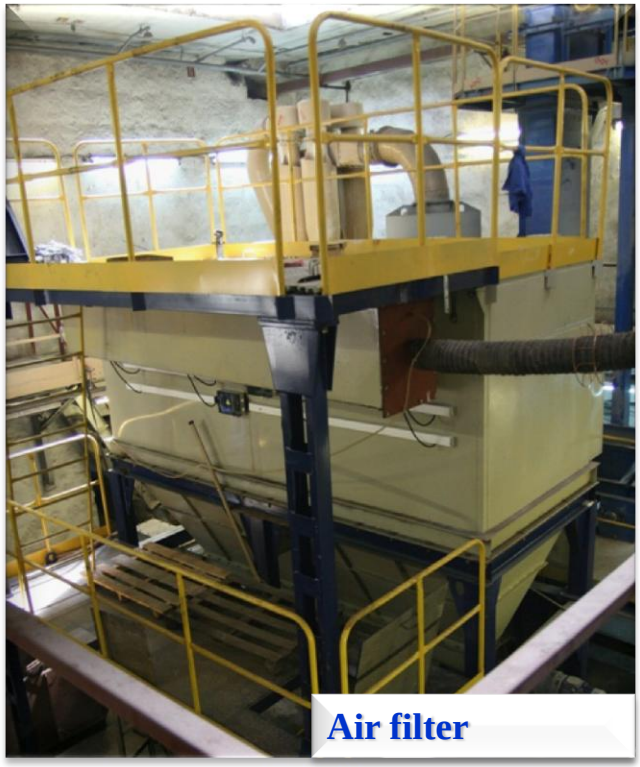
Classifying complexes to separate screenings of crushing with the capacity of 80 t/h

Being incorporated into crushing-and-sorting complexes they carry out waste-free processing of granite into high-quality commodity products.

Auxiliary equipment

Unbalanced-throw screen

The screens are intended for the mechanical separation into fractions of crushed rock, sandy gravel mass and other bulk. The screens can be applied both independently and as part of technological lines of crushing and classification which are designed by «NPO Center» OJSC.



Air filter

The air filter is intended for cleaning of non aggressive, non-explosive, without-tendency-to stick and form condensate gas mixtures from fine-dispersed dust at the temperature up to 100 C. The filter can be completed with the systems of filtering elements regeneration which use both the atmospheric pressure and compressed air or the mechanical shake-up.

Auxiliary equipment

Cyclones are intended to trap the suspended particles from gases. Depending on the requirements to gas cleaning, on the properties of the particles and their disperse content, the cyclones can be used separately or applied as the devices of the first and the second stages of cleaning in combination with other gas-purifying devices.

The productivity of cyclones on gas can be from some hundreds cubic meters per hour to hundreds of thousands. They can be used single and in group (by 2, 4, 6, 8 elements). The cyclones are provided with the air shake system of the material in the bunkers for the sake of their complete discharge and for the prevention from the material caking. They also have filling level sensors of the bunkers. The cyclones have a lot of modifications as to bunker volume and constructional execution. They can be customized according to the specific requirements.

OPEN JOINT-STOCK COMPANY «NPO CENTER»

More then 450 units of «NPO Center» centrifugal equipment successfully operate at the enterprises of Belarus, Russia, Ukraine, Kazakhstan, Azerbaijan, Uzbekistan, Estonia, Viet Nam, Iran and other countries.

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