



MAGNETIC-IMPULSE SYSTEMS
FOR CLEANING AND COLLAPSING
OF BULK MATERIALS BRIDGING

MAGNETIC-IMPULSE INSTALLATIONS IM ARE DESIGNED FOR:

- collapse of bridging and elimination of hanging bulk materials;
- cleaning of different surfaces from sticking and freezing bulk materials.

EQUIPPED FACILITIES: hoppers, silos, rehandling facilities, chutes, dust catching towers, railway cars, heat-transfer apparatus, bag collectors and electric precipitators, fluid bed plants, drying installations, etc.

MATERIALS: ore, charge materials, concentrate, limestone, coal, coke, dust, gypsum, slag, molding sand mixture, compound feed, cement, block sulphur, flavour, dry milk, ground oil-cake, shuck, small rock, sand, phospho-semihydrate, potassium chloride, mineral fertilizer mixture.



APPLICATION OF IM SYSTEMS - IN ALL THE INDUSTRIES WHERE STORAGE AND PROCESSING OF BULK SOLIDS ARE INVOLVED, THAT INCLUDES:

- mining and concentrating industry;
- electric power industry and fuel industry;
- metallurgy industry;
- chemical industry;
- production of construction materials;
- food industry;
- cereal-processing and compound feed industry;
- gas cleaning;
- cleaning of railway cars.



Since 1993 about 700 installations IM were implemented in Ukraine, Russia, Republic of Belarus, Kazakhstan, Slovakia, Czech Republic, Hungary, Georgia, Armenia, Azerbaijan, Uzbekistan, Kyrgyzstan, Finland etc.

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Our company is a leader in the field of magnetic-impulse systems of collapse bridging and cleaning. For about 30 years it develops, manufactures and implements installations IM, successfully eliminating bulk materials hanging at the production facilities in various industrial branches.

*Oleh Matviienko,
Director of RPE «MITEK» Ltd.*

1. COMPANY INTRODUCTION

Research and Production Enterprise «MITEK» Ltd. (Ukraine, Mykolaiv) is a sustainable and dynamically developing organization founded in 1993 year.

Since the date of foundation, the company specializes in the development and implementation of new technologies based on conversion of electrical energy into mechanical energy, including development and production of the necessary equipment for this purpose.

During the years of productive work the company has worked its way up to improve the developed and manufactured products, to educate highly qualified team of employees, to create a modern material and technical base as well as to establish the reputation and achieve popularity.

The quality management system, covering the production, is certified to ISO 9001:2015.

Total number of employees – about 50 people, more than 70% of them have Master Degree in engineering and technical education.

The company has a modern administrative and production buildings, warehouses and auxiliary premises.

The main products of the company are magnetic-impulse installations IM (TY.Y3.01-19289902-170-98).

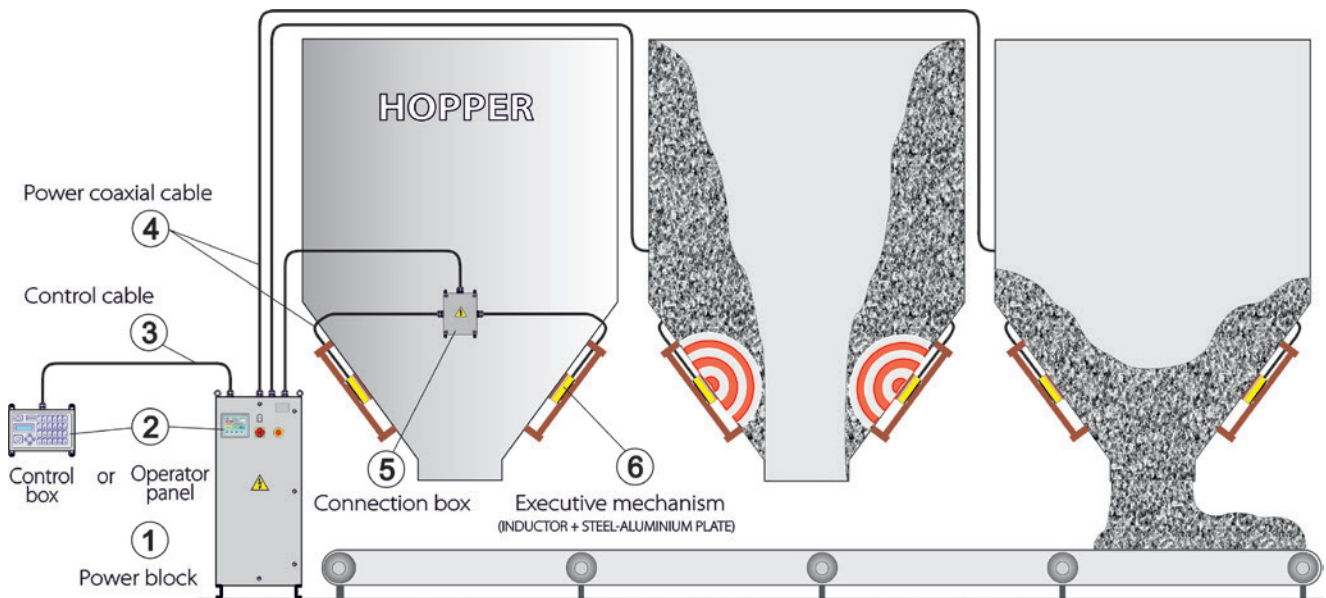


2. INSTALLATIONS IM

Enterprise «MITEK» develops and produces magnetic-impulse installations IM designed for collapse of bridging and elimination of hanging bulk materials as well as cleaning different surfaces from sticking and freezing bulk materials.

2.1. COMPOSITION AND SCHEMATIC STRUCTURE

The composition of magnetic-impulse installations IM is the following: power block (1), control box / operator panel (2), control cable (3), power coaxial cable (4), connection boxes (5), set of executive mechanisms (inductor + steel-aluminium plate) (6).

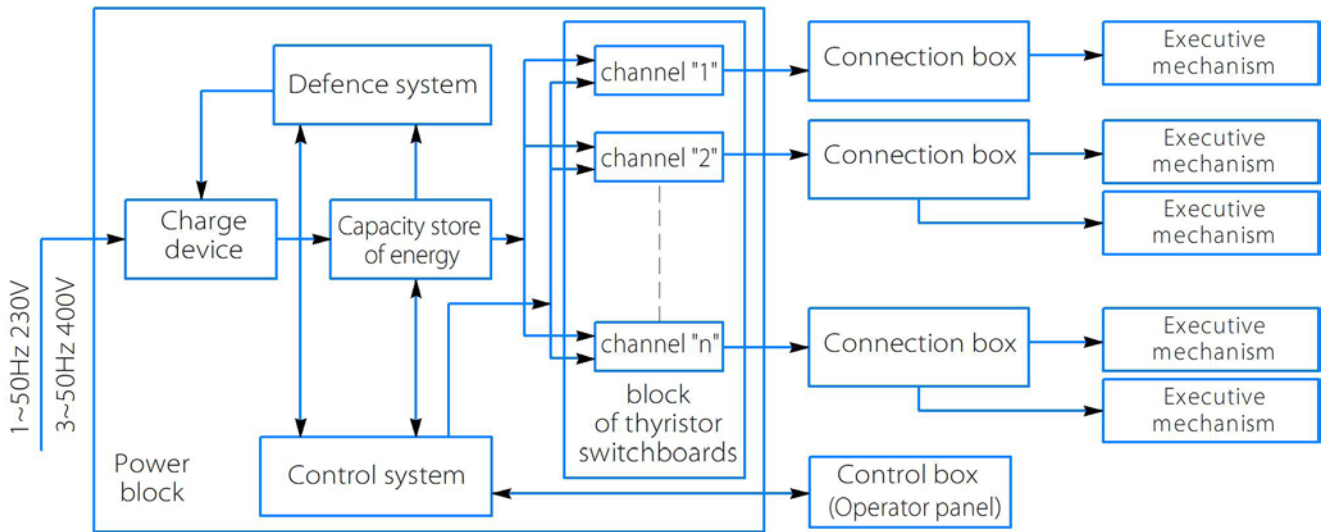


Hopper's equipping by magnetic-impulse system for collapse of bridging based on installation IM

A power block is designed for generation of powerful impulses of current, made in shape of dust- and moisture-proof box, consists of charge device, capacity store of energy, block of thyristor switches, control and protection systems. A power block is made multichannel, wherein one or two executive mechanisms can be connected through connection boxes and power coaxial cable to each channel. The recommended length of power coaxial cable from power block to each connection box is no more than 30 m. An executive mechanism consists of inductor and steel-aluminium plate. Control box (operator panel) with display enables entering and showing information as well as conducting operational control of installation IM. It can be produced as a separate block or embedded in power block.



Original appearance of installation IM components



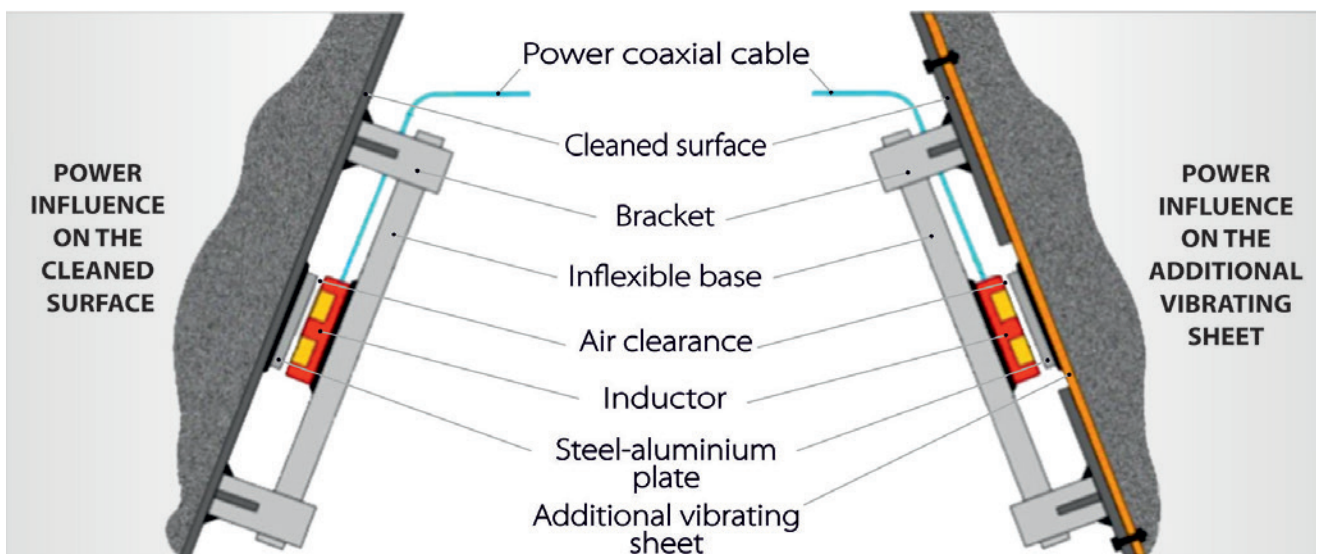
Flow chart of installation IM

2.2. OPERATING PRINCIPLE

The operating principle of the installation IM is based on converting of electrical energy, stored in the power block, into mechanical energy generated by the executive mechanisms of installation IM.

Being switched on, the installation IM battery charging set of the power block charges the capacitor battery of storage capacitor to a voltage of a predetermined value, and then through the thyristor switches discharges battery into inductor.

According to the laws of electromagnetism inductor, based on a rigid base and steel-aluminium plate rigidly fixed to the surface to be cleaned, repel each other. As a result, a powerful mechanical impulse effect implemented on the cleaning surface, the so-called «electromagnetic hammer», and the surface is cleaned of adhering material. The strength of the mechanical stress and the number of generated impulses are regulated and selected to secure collapse of sticking materials.



Original appearance of mounted executive mechanisms

Different variants of fastening constructions and location of executive mechanisms on cleaned surfaces are possible. The choice depends on capacity and construction of equipped facility (for example, hopper), thickness of cleaned walls and surfaces, presence of stiffening ribs, physical and chemical properties of feed bulk material, etc.

When walls are of high rigidity (large thickness, close proximity of stiffening ribs) the inner side of hoppers are equipped by additional flat sheets (vibrating sheets) of lesser rigidity in comparison to the wall, where impact is exerted.

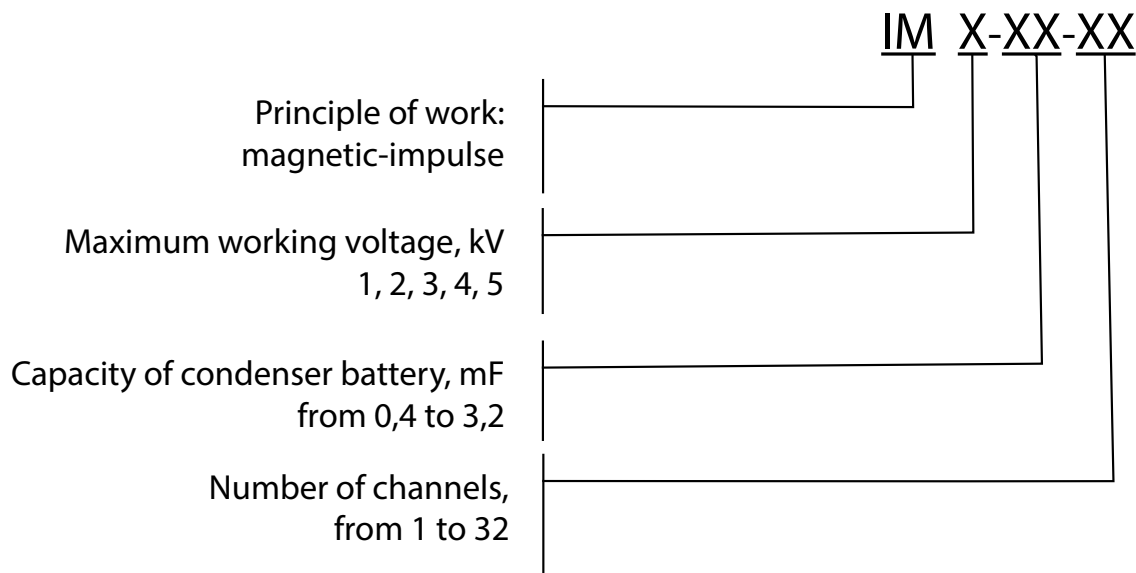
2.3. TYPES AND DESIGNATION

Considering the different type of facilities to be equipped by installations IM, it requires an individual approach to each and every facility in order to determine the necessary parameters of mechanical impulses and number of executive mechanisms for effective cleaning.

Therefore, the installations IM are available in different versions, with different energy parameters and the number of channels.

Energy parameters (maximum working voltage and capacity of condenser battery) determine the maximum possible impulse mechanical impact on the cleaning surface. Number of channels determines the maximum number of impulsive action points realized by one installation.

In general two executive mechanisms (two action points) conform to one channel.



Designation structure of installations IM types

Example of designation: IM3-1,5-9, i.e. installation with maximum working voltage 3 kV, by the capacity of condenser battery 1,5 mF, by the number of channels 9.

Installations IM are divided into types according to the size of maximal working voltage: IM1 - to 1000V, IM2 - to 2000V, IM3 - to 3000V, IM4 - to 4000V, IM5 - to 5000V.

Basic modifications of installation IM, produced by «MITEK»

Designation	Maximum working voltage, kV	Capacity of condenser battery, mF	Maximum accumulating energy, kJ	Application
IM1-1,2-n	1,0	1200	0,6	Bins (to 5 tons) with feed stuff, flour, plastic, sand. Drying tower and cyclones of spray-type drying installations.
IM1-2,4-n	1,0	2400	1,2	
IM2-1,2-n	2,0	1200	2,4	
IM3-0,8-n	3,0	800	3,6	Bins (to 100 tons) with flour, gypsum, slag, molding sand mixture, compound feed, cement, mineral fertilizer mixture. Centrifugal dust collectors, chutes, hoses and electrodes of bag collectors and electric precipitators.
IM3-1,5-n	3,0	1500	6,8	
IM3-1,9-n	3,0	1900	8,6	Bins with coal, compound feed, cement, limestone, small rock, charge materials. Charging and transfer chutes.
IM4-1,8-n	4,0	1800	14,4	Bins (to 1000 tons and more) with ore, concentrate, charge materials, limestone, coal, cement, under car dumper. Dust collecting towers.
IM5-1,8-n	5,0	1800	22,5	

2.4. TECHNICAL CHARACTERISTICS

Type of installation	IM1, IM2	IM3	IM4, IM5
Power supply voltage, V ($\pm 10\%$)	230	400	400
Power frequency, Hz ($\pm 1\%$)	50		
Installed power, kVA	from 0,5 to 1,6	from 1,6 to 4,0	From 2,5 to 4,0
Maximum voltage, kV	from 1 to 2	3	from 4 to 5
Capacity of condenser battery, mF	from 0,4 to 3,2	from 0,4 to 2,4	from 0,4 to 2,4
Number of channels, items	from 1 to 32	from 1 to 24	from 1 to 24
Number of inductors in a channel, items	1 or 2		
Pulse repetition period, s	to 10		
Maximum accumulating energy, kJ	from 0,2 to 6,4	from 1,8 to 10,8	from 3,2 to 30
Installation IM weight (max. channels), kg	to 750	to 850	to 1400
Mode of operation	Manual and (or) automatic integrated into APCS		
Communication protocols with Customer's APCS	Modbus RTU, Ethernet/Profinet, Profibus DP It is possible to use other protocols upon agreement with Customer.		

Considering the specifics of equipped facilities, characteristics of installations IM could be different from specified in table.

2.5. BASIC ADVANTAGES

- **Higher efficiency** compared to other systems (vibrators, pneumatic collapsing) due to possibility of concordance of amplitude-frequency characteristics of influencing impulse with the physico-topological parameters of hopper and loose material and, as a result, achievement of assured collapse of stuck material at minimum power expenses.
- **Low operating costs.** Magnetic-impulse technologies in the essence are power-saving. The average power consumption of installations IM in an operational mode lies within 0,2-1,0 kW/h. Unlike the system of pneumatic collapsing, the compressors and devices of preparation (drainage) of air are not required. Maintenance costs of magnetic-impulse installations IM are minimal while being in operation.
- **Increase of labour productivity, volumes of the produced products** due to the increase of carrying capacity of hoppers, conveyor tracts, diminishing of time of the forced outage related to the manual purging of hoppers, chutes, charging trays of sintering machines, especially using damp mix materials.
- **Increase of quality, decline of reject of the prepared products** due to the timely exit of materials from hoppers that promotes the observance of requirements of production technology.
- **Increase of labour safety** due to the considerable diminishing, and in most cases exclusions of manual labour, for cleaning of hoppers and other facilities. Structural execution of IP54 and more, as well as contactless impulsive influence on the hopper wall provides possibility of application of installations IM in the premises of heightened danger.
- **Providing integrity of hopper walls** when cleaning, unlike application of eccentric vibrators or manual labour.
- **Reliability and longevity** of the magnetic-impulse systems due to absence of colliding details and interacting surfaces in the executive mechanisms, application of original schematic solutions, presence of number of protections from the non-permanent modes. Service life of installations IM before carrying out major repairs is no less than 10 years. In practice the timely maintenance service considerably extends the term of operation.
- **Possibility of installations IM operation both in manual and in automatic modes** with different operation algorithms accompanied by modern automated process control systems (APCS).
- **The magnetic-impulse installations IM do not have harmful influence on sensitive elements of control and measuring apparatus.** The installations have European certificate **CE** on the directives of electrical safety and electromagnetic compatibility, consonant with the different strain gauge devices.

The main advantages of magnetic-impulse installation by RPE «MITEK» in comparison with the magnetic impulse-installations of other manufacturers

1. The presence in the executive mechanisms the guaranteed air clearance between the inductor and steel-aluminium plate rigidly set on cleaned surface. Through such a construction, patented by enterprise «MITEK», the method of completely non-contact impact on cleaned surface by power impulse of special form is realized, providing a high cleaning efficiency, reliability, and operation durability of installations IM.

2. The existence of the types of installations IM, with the maximum stored energy up to 30 kJ, that enables using the installations IM on the complex facilities – hoppers with capacity of 200 tons and more, thick walled, lined, rigid finned with hard running materials. «MITEK» manufactured and implemented around 200 installations IM with a maximum stored energy of more than 14kJ and an operating voltage of 4 kV and more. The use of magnetic-impulse installations with lower energy indicators cannot provide a sufficient effect for collapse of bridging on the above mentioned facilities.

3. APPLICATIONS OF INSTALLATIONS IM (geography, fields, enterprises)

Magnetic-impulse installations IM became widely used in various industrial sectors.

1. Mining and concentrating industry – more than 100 installations IM.

Bulk materials: coal, ore, limestone, concentrate, dust, formation, charge materials, mined rock, bentonite, etc.

Facilities: reception hoppers, storage hoppers, dosage hoppers, overturning chutes, guiding trays, etc.

Customer List: ArcelorMittal Kryvyi Rih, Poltava GOK (Ukraine), Altyntau Kokshetau, Ridder, Zhairem, Zyryanovsk GOKs (Kazakhstan), Concentration plant Kaskad KTC, Stoilensky Mining and Beneficiation Plant NLMK (Russia), Belaruskali (Belarus).



2. Electrical energy industry and fuel industry – around 15 installations IM.

Bulk material: coal, chalk, ash.

Facilities: rail car dumpers, feed hoppers, etc.

Customer List: Irkutskenergo, Cherepetskaya GRES, Gazprom neftekhim Salavat (Russia), Smilaenergopromtrans, Lukoil-Odessa Refinery (Ukraine), etc.

3. Metallurgy – more than 200 installations IM.

Bulk materials: charge materials, concentrate, coal, slag, limestone, dolomite, molding sand mixtures, bauxites, etc.

Facilities: various hoppers, screens, silos, feeder funnels, discharge chutes, screens, trays, heat exchangers, etc.

Customer List: Azovstal Iron & Steel Works, Zaporizhstal, Dneprovsky Integrated Iron&Steel Works (Ukraine), Severstal (Russia), U.S.Steel Kosice (Slovakia), Arcelor Mittal Ostrava (Czech Republic), Aktobe Ferroalloys Plant (Kazakhstan), ISD Dunafer, and many others.



4. Chemical industry – more than 80 installations IM.

Bulk materials: ore, solid sulphur, lime, soda, dust, ammophos, phosphosemihydrate, phosphogypsum, coal, chalk, salts, potassium chloride, blast-furnace slag, compound mineral fertilizers, etc.

Facilities: various hoppers, cyclones, discharging chutes, drums, silos, feeder funnels, trays, bag collectors, etc.

Customer List: Nokian Tyres (Finland), Belaruskali, Gomel chemical plant (Republic of Belarus), group of companies PhosAgro and EuroChem (Russia), etc.

5. Production of construction materials – around 15 installations IM.

Bulk materials: crushed stone, cement, dust, coal, gypsum, slag, chalk, aleurolite, etc.

Facilities: various hoppers, cyclones, discharging chutes, drums, silos, feed funnels, trays.

Customer List: Heidelbergcement Ukraine, Yugcement Dyckerhoff Ukraine, Cement CRH (Ukraine), Metahim (Russia), Kazakhcement (Kazakhstan), etc.



6. Food industry – more than 220 installations IM.

Bulk materials: flour, starch, dry milk, sugar, powdered whey, etc.

Facilities: productive hoppers, dispensing, hoppers of free-packing store of flour, cyclones, silos, discharging chutes, feed funnels, trays, etc.

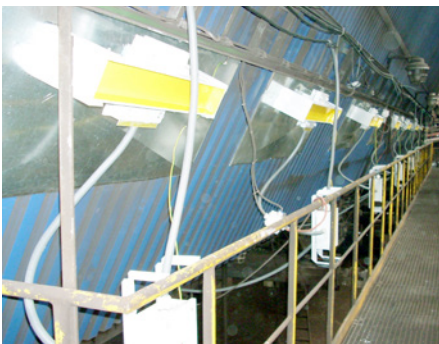
Customer List: various bread-baking plants, milk plants, butter-cheese production companies, confectioneries, starch and treacle combines, etc.

7. Cereal-processing and compound feed industry – around 40 installations IM.

Bulk materials: ground oil-cake, husk, press cake, bone flour, grain, mineral and floury raw materials, etc.

Facilities: various silos and hoppers, discharging chutes, etc.

Customer List: Mironivsky Khiboproduct, Agroprominvest 08, Olyar, Boryspil experimental combined feed mill, etc.



8. Gas cleaning – more than 50 installations IM.

Bulk materials: dust, ash, etc.

Facilities: dust-collecting towers, cyclones, absorbers, dust hoppers, bag collectors and electric precipitators, prechambers, etc.

Customer List: Metahim Cherepovets Metallurgical Plant (Russia), Zaporizhstal (Ukraine), U.S. Steel Kosice (Slovakia), Arcelor Mittal Ostrava (Czech Republic), Georgian Manganese (Georgia), etc.

It's promising to use magnetic-impulse installations IM for cleaning the railway cars as on car dumpers and bottom discharge as well. There are some installations IM produced and supplied for equipping car dumpers at the enterprises of Ukraine and Russia.

Since 1993 «MITEK» has produced and implemented around 700 magnetic-impulse installations IM in various countries: Ukraine, Russia, Republic of Belarus, Kazakhstan, Slovakia, Czech Republic, Hungary, Georgia, Armenia, Uzbekistan, Kyrgyzstan, Azerbaijan, Finland and others.



Places of installations IM implementation

Our enterprise possesses a number of the elaborated technical solutions enabling achievement of guaranteed hanging mass collapse of bulk materials in hoppers of any construction.



Hopper before installation of IM system (on the left) and after installation (on the right)

High efficiency in the use of installations IM confirmed by numerous customer testimonials.



MORE THAN 180 COMPANIES SUCCESSFULLY OPERATE INSTALLATIONS IM



4. LICENSES, CERTIFICATES, PATENTS, AWARDS

Throughout the entire period of Research and Production Enterprise «MITEK» activity at its production base the scientific researches and experiments are conducted in the fields of electrical energy conversion, and resulted in our «know-how», innovations and inventions, protected by more than 25 patents.



Trade mark – MITEK Magnetic Impulse® is protected by Certificate №97672 on mark for goods and services. Quality management system RPE «MITEK» Ltd. on design, development, sales and implementation of installations IM is certified by international standard **ISO 9001:2015**, as evidenced by certificate of Austrian expert organization TÜV AUSTRIA Cert GmbH, Vienna.



Installations IM are certified in system CE of European Union, and have the certificate of conformity to Directives of the European Parliament and the Council on safety and electromagnetic compatibility. The installations have **Certificate of Conformity to Technical Regulations of Eurasian Economic (Customs) Union**: «On safety of machinery and equipment», «Electromagnetic compatibility of technical means», «On safety of low voltage equipment», as well as **Declaration of compliance to the requirements of technical regulations of Ukraine**: «Technical regulation of low voltage electrical equipment», «Technical regulation on electromagnetic compatibility of equipment. There is permission of **Gosgorpromnadzor of Ukraine** for installations IM **usage in explosive areas**.



RPE «MITEK» is a regular participant of exhibitions and competitions, where our company and manufactured production take leading positions. According to the results of government statistics information in the field of internal economic activity our enterprise is regularly awarded the title «Exporter of the Year». Production of RPE «MITEK» was granted a Quality Mark «The Highest grade», and the enterprise itself was awarded a diploma «Ukraine - the best companies» and was a laureate of contest «Metal-Progress» in nomination «The Best innovation in the field of production». In international economic ranking «League of the best» RPE «MITEK» is regularly given the status «Company of the Year» and was awarded «Business Star of Ukraine». RPE «MITEK» is also a winner of contest «100 best goods of Ukraine».



5. SCOPE OF MITEK SERVICES

RPE «MITEK» is capable of performing the full range of works when equipping facilities by installations IM:

- development of design solutions and design documentation;
- manufacture and supply of installations IM;
- reconstruction of facilities in order to prepare them for equipping by installations IM;
- mounting (supervision) of installations IM at intended facilities, including installation of power block, control box, connection boxes, executive mechanisms, laying of cable routes;
- start-up and commissioning of installations IM;
- warranty and post-warranty (service) maintenance of implemented installations IM.

Upon request of Customer RPE «MITEK» can execute equipping of facilities on a turn-key basis or execute separate works from above-mentioned list.

RPE «MITEK» has got a positive experience in cooperation with various organizations that include installations IM in their projects, such as Outotec GmbH & Co.KG (Oberursel), Kazmintech Engineering (Ridder), SE UkrRTC ENERGOSTAL (Kharkiv), Metinvest Engineering, SE Ukrgiprommez (Dnipro), BMZ Progress (Kyiv), KENES, GSK-Shahtpoekt (Moscow), LDI HIPROPROM, SME Dneproenergostal (Zaporizhzhya), Kazgiprotsvetmet (Ust-Kamenogorsk), Belgorkhimprom, NPO Passat (Minsk), Mining and Chemical Engineering (Cherepovets), etc. (in total more than 100 project organizations).

6. PLACING OF ORDERS FOR INSTALLATIONS IM

If you are interested in purchasing of magnetic impulse system of collapse bridging kindly ask you to fill in the questionnaire form, which can be found on our website www.mitek.com.ua/eng, or send to us the following information.

1. Full name, address of Customer.
2. The coordinates of the Contact person.
3. Sketch of the facility intended for equipping by magnetic-impulse installation IM.
4. Properties of hung, stuck material.
5. Assumed operation mode of installation IM (manual, automatic, etc.)

WAITING FOR YOUR ORDERS!



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