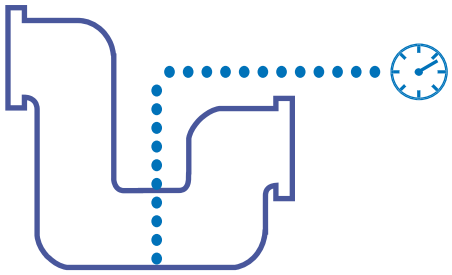
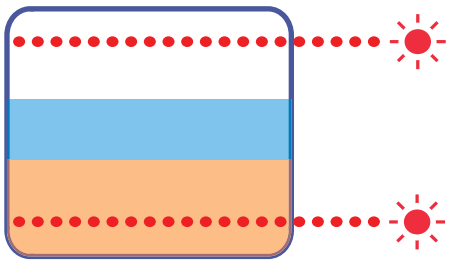
Manufacturing of the devices for non-contact control of technological processes in industry

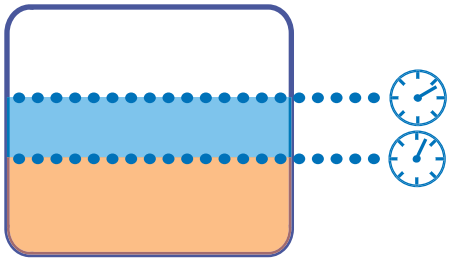
EcoPhysPribor Ltd
The Scientific and Technical Center



Measurement of density
of fluid media and pulps
in pipings, chutes and tanks



Signalling
of level and division boarder
of fluid and loose media



Continuous measurement
of level and division boarder
of fluid and loose media

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Environmentally safe radioisotope technologies

Advantages of our devices:

compact;
don't have moving parts;
don't need servicing;
irreplaceable when working with different media:

- toxic, aggressive and biologically hazard;
- corrosive and abrasive;
- molten and cryogenic;
- radioactive, with high or alternative radio activity level;
- foams, slurries and dredges;
- powders and other highly loosened substances;
- pulp, ore, charge and their analogues;
- without limitation of pressure and temperature inside of the controlled object

In contrast to conventional radioisotope analogues our devices use radiation and radiation source out of the incidence of safety-radiation services and safety-radiation standards of International Atomic Energy Agency because:

- don't create radiation background;
- don't need radiation protection;
- don't pollute the environment;
- don't require specially prepared and certified rooms;
- don't make problems when utilizing the equipment.

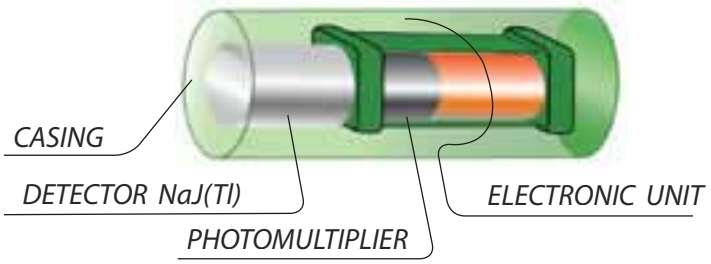
Since 1998 our products had replaced thousands of conventional radioisotope devices in systems of non-contact control in different brunches of industry.

Principle of operation

is based on registration of gamma radiation flow change, caused by the level or density change of the controlled material.

Main components

- **highly effective detection block:**



We offer a set of detection block modifications with different measuring characteristics, dimensions (from 20 to 58 cm lengthwise), weight (from 1.5 to 25 kg) and so on. The selection of detection block is determined by the operation conditions, the size of the detector crystal and electronics configuration, optimal for the solved problem.

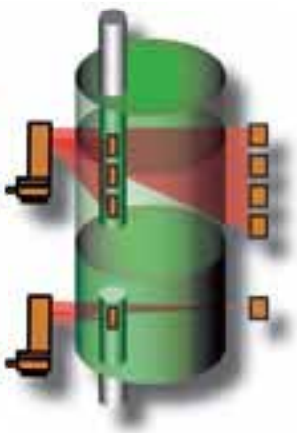
BD-2, BD-3 BD-5 BD-1 BD-4

- **data processing block (BOI):**

converts incoming to its input average impulses recurrence frequency into the standard analog current or relay output signals. These signals are connected with the input average frequency by the functional dependences, determined by the specific technological problem and software assigned.

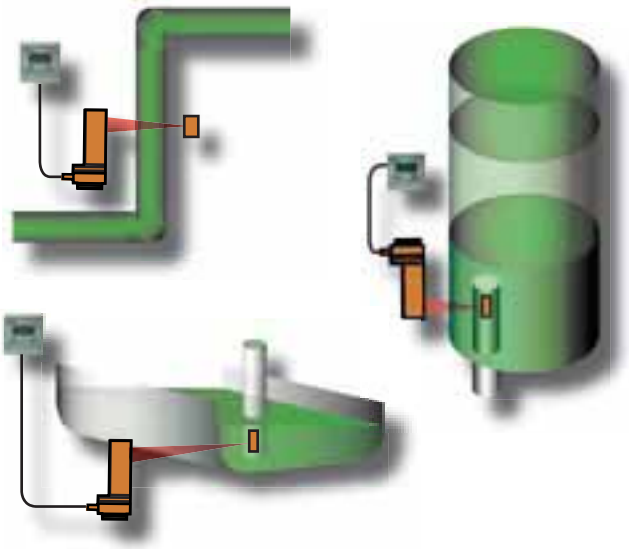
- **emitter:**

for different tasks such sources are used: gamma radiation of the natural background, gamma radiation of the environmentally safe Na-22, gamma radiation of the potassium chemical compounds with the natural concentration of the isotope K-40. Generally used point radiator Na-22 in a case of external installation is located in the mounting casing with the maximum size of 140 mm and if it is installed inside of the tank, put in pipe of 40 mm in diameter is used. Extensive radiator is assembled from several point ones.



Density measurement

• density meter IPB-1K



Our devices are irreplaceable for non-contact density measurement of fluid media and pulps in industrial pipings, chutes and tanks; simple in assembling and service.
Standard current output signal (0-5 mA) or (4-20 mA) allows connecting the equipment to the process control system.
Absence of contact between the devise components and the controlled material allows using the density meters for control of mains, filled with:

- corrosive, abrasive, aggressive, toxic, biologically hazard materials;
- molten and cryogenic substances;
- foams, slurries, dredges, powders, pulp, charge.

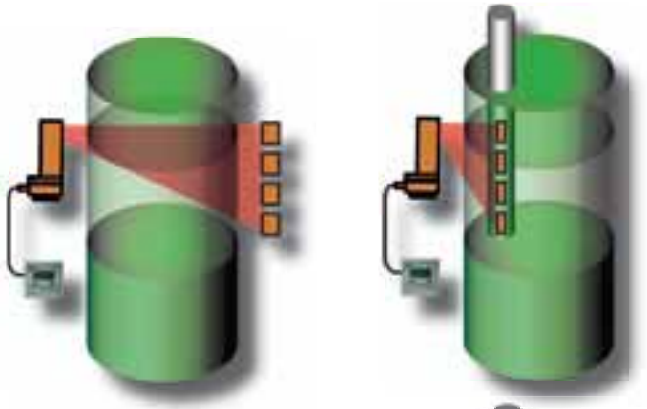
Temperature and pressure inside the piping can be of any value.

Level control

For the tasks of position (signalling) and continuous measurement of the materials level different kinds of solutions are used, depending on the specific conditions (material properties, tank size, wall thickness, convenience of equipment location and so on). Problems of the media division boarder level measurement are solved analogously with the addition of the density calculation procedure in process of handling of the radiation registration results.

• continuous level meter IUB-1K

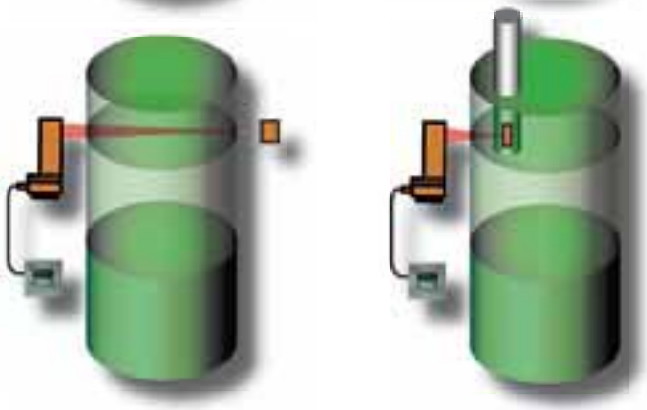
Extensive radiator and detection block are located on different (to diameter or chord) sides of the controlled tank. When the level rises, the flow of registered radiation decreases due to the shielding by the controlled material.



• non-contact point level meter BPU-1KM

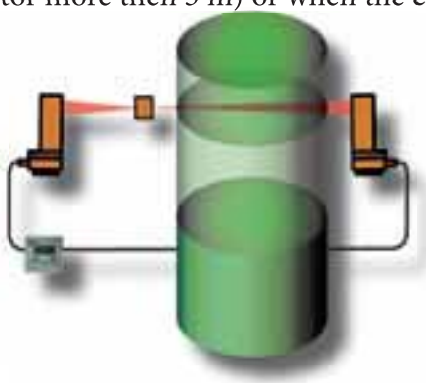
- classical variant:

Emitter and detection block are located on different (to diameter or chord) sides of the controlled tank.
When the level of the controlled material changes also changes the flow of registered radiation due to the shielding.



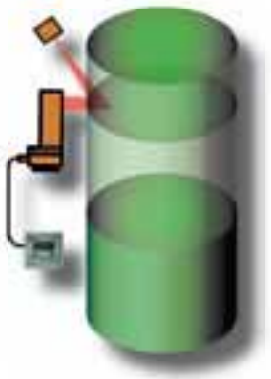
- variant with two detection blocks:

This variant is used for the tanks of major diameters (if the distance between the detection block and the radiator more then 5 m) or when the controlled material or background have radiation properties variable in time. The solution is based on the registration of gamma radiation annihilation of the positron component of radiator Na-22.



- reflection variant:

Emitter and detection block are located on the one side of the controlled tank.
When the level of the controlled material changes also changes the flow of registered radiation due to the backward scattering.



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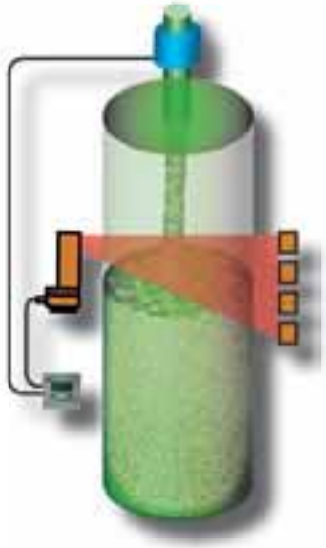
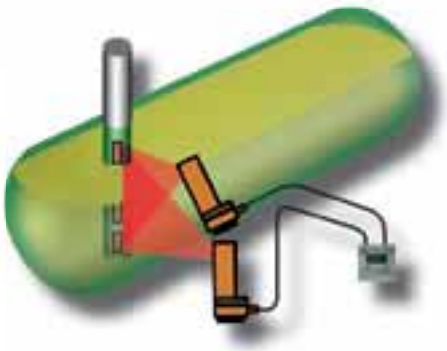
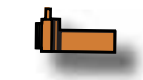
Non-contact continuous level meter IUB-1K

Non-contact point level meter IUB-1K is intended to measure the level of liquids and bulk fluids inside various technological vessels.
The operation of the device is based on detection of ionizing radiation changes that caused by variations of the level of tested material inside a vessel.
Industrial operation of the device is not the subject of control by the radiation protection services because the activity of radiation sources is so small that they do not require special registration and permission.
The device is manufactured in 6 modifications depending on the type, number and version of detection blocks and radiation source.







Detection Block

Data Processing Block

Emitter

Range of measured level, m:	
- **IUB-1K-1**	**up to 2.0**
- **IUB-1K-2…IUB-1K-6**	**up to 1.5**
Absolute error, m	**up to 0.05**
Standart current output:	**0 – 5 mA or 4 – 20 mA**
Digital indication on a front panel of data processing block	
Diameter of a vessel, m:	
- **the source is outside**	**up to 3.0**
- **the source is inside**	**any value**

Power consumption, W:	not more than 10
Range of working temperatures, °C:	
- for a detection block	from – 40 up to + 60
- for a block of data handling	from – 10 up to + 50
Versions of detection blocks:	
- BPU-1K, BD-3, BD-4, BD-5	hermetically sealed
- BPU-1K, BD-3	explosion proof (2ExsIIT4)
- BD-1	explosion proof (1ExdIICT5)

Environmentally safe radioisotope technologies

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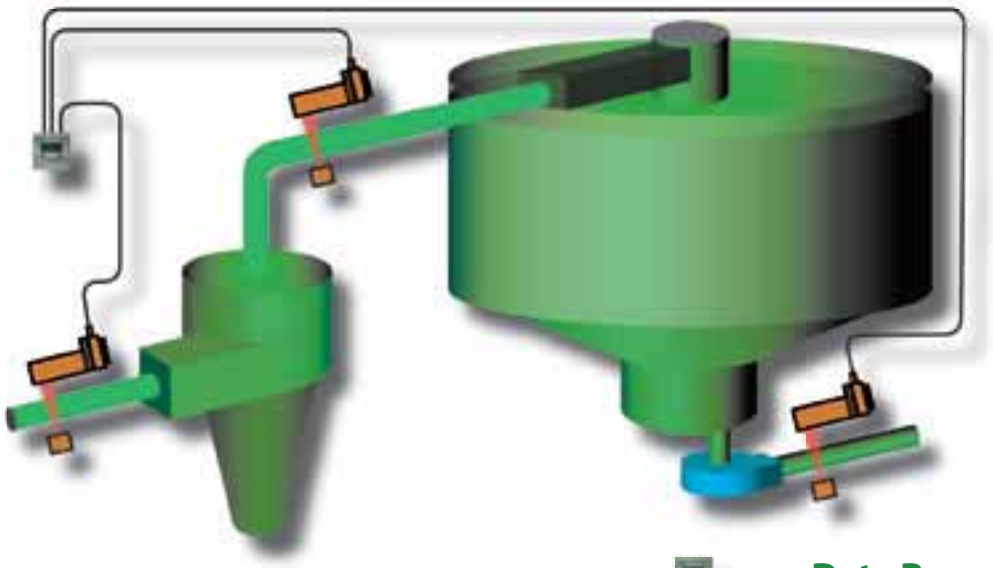
Non-contact density meter IPB-1K

The device is intended for non-contact continuous measurement of the density of fluids as well as pulps in pipes in different kinds of technological processes in mining, chemical, oil and gas, metallurgical and other branches of industry.
The operation of the device is based on detection of ionizing radiation changes that caused by density variations of tested material.

Industrial operation of the device is not the subject of control by the radiation protection services because the activity of radiation sources is so small that they do not require special registration and permission.
The device is manufactured in 5 modifications depending on type, number and version of detection blocks and radiation source.



Data Processing Block

Detection Block

Emitter

Range of measured density, kg/m3	from 600 up to 2200
Outer pipe diameter, m	from 0.1 up to 0.4
The limit of the absolute error, kg/m3:	
IPB-1K	6
IPB-1K-1	10
IPB-1K-2, IPB-1K-3	15
IPB-1K-4	30
Standart current output:	0 – 5 mA or 4 – 20 mA
Digital indication on a front panel of data processing block	

Power consumption, W:	not more than 10
Range of working temperatures, °C:	
- for a detection block	from – 40 up to + 60
-for a block of data handling	from – 10 up to + 50
Versions of detection blocks:	
- BPU-1K , BD-4 , BD-5	hermetically sealed
- BPU-1K	explosion proof (2ExsIIT4)
- BD-1	explosion proof (1ExdIICT5)

Environmentally safe radioisotope technologies

Perspective developments

• density meter of grounds, concrete, asphalt IPPG-1K

It is a portable gauge with self-contained power supply from rechargeable accumulator. It doesn't need predetermined calibration, because contains embedded program considering element structure of the controlled material. The device is intended for quality rating of building, hydroengineering and road work execution.

• universal facility complex KS-401

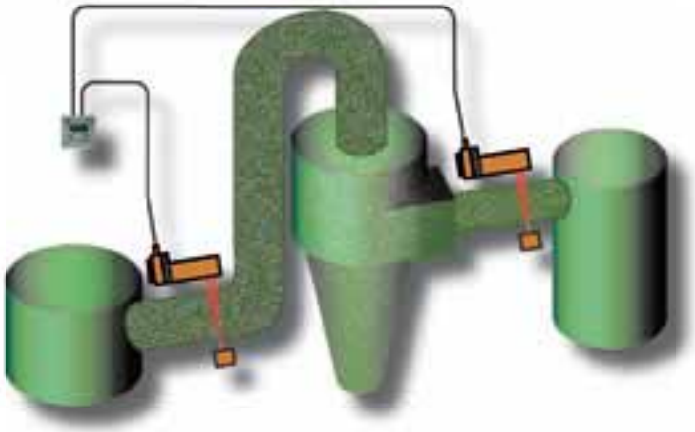
It is intended for construction of multi-channel measuring and signalling systems of level and density (up to 32 universal channels per one controller). It is based on the new generation of detection blocks with two-way exchange by RS-485 interface.

Experimental-industrial exploitation

Ecophyspribor carries out partner programs of its products adaptation in technological control complex systems of enterprises in different branches of industry, carries out assistance in starting-up and adjustment works (chief-assembling).

Examples of the realized solutions

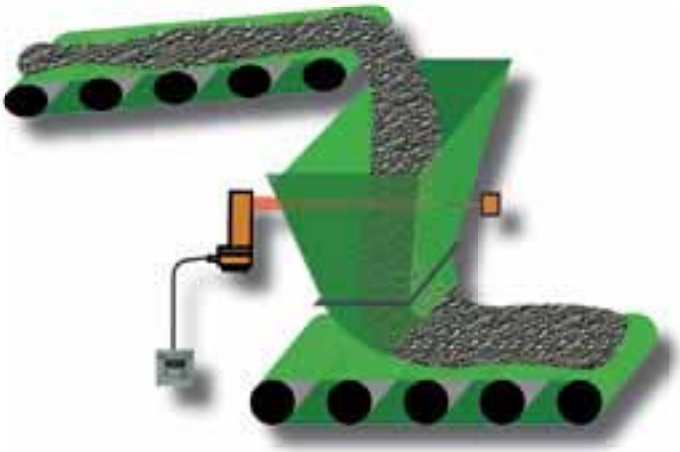
• pulp density measurement in feeders and hydrocyclone sinks



• lime burning furnace

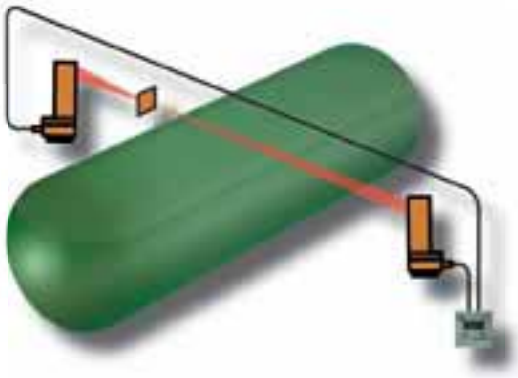
diameter of the furnace is 4.5 m, temperature is 1000°C, wall structure: fire-brick and heat insulation layer, on the way of radiation put in pipes with heat shields are set into the wall

• supply leakage and transfer-conveyor units clogging control



• maximum level signalling of tank-wagons filling up

distance between detection blocks is 5 m, filling up fluid: chlorine, ammonia and so on



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