APPLICATION PRACTICE OF INNOVATIVE ENERGY-SAVING MATERIAL

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Liquid Ceramic Heat Insulation Coverage Cosmo Isol

Liquid ceramic heat insulation coverages (LCHI), including **Cosmo Isol** **,** appeared on Russian market at the beginning of 2000 years and their application on the objects of industry and buildings construction is swiftly broadening. What are these ultra-thin heat insulations are about?

Composition of Cosmo Isol

Cosmo Isol consists of membrane forming material, ceramic filler and other special purpose additions - bioprotective, antifoam and antifreeze agents.

Styrene - acrylic latex is used in material as membrane forming component. Styrene (about 20%) gives hardness to material, and acrylic constituent (80%) - elasticity and weather resistance. Membrane has all properties of acrylic binder, such as weather resistance (guarantee on coverage no less than 10 years), elasticity bend (1 mm), wonderful adhesion, with hardness about 0,4 Н/м2 at the same time, unlike acrylates (hardness 0,2 Н/м2) and ПФ of enamels (0,1-0,3 Н/м2).

Ceramic filler. It is microspheres, filled by discharged gas, most of it is in ready made coverage (75% volume of dried-up material). It is this component, that gives high heat insulating efficiency to material.

Material also contains bioprotective additions (biocide, preservative, antifungal and others). These additions prevent the processes of fermentation, prolong period of material shelf storage, and also prevent development of fungus on a surface.

Water-based material is ecologically pure and does not contaminate the environment.

Principle of action of Cosmo Isol

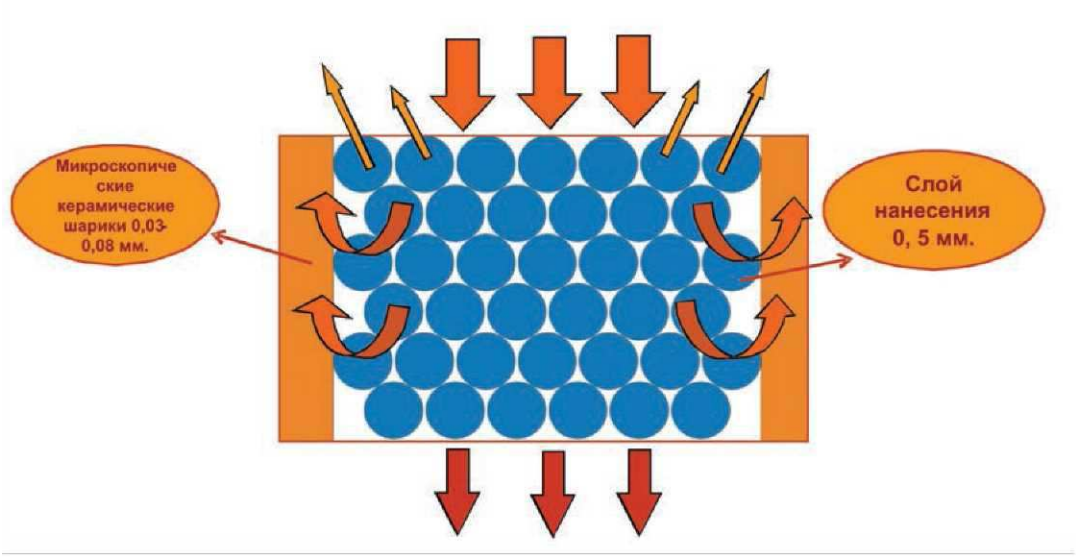
Thermo physical properties **of Cosmo Isol** substantially differ from similar properties of traditional heat insulators.

As it is known, the process of heat transfer in nature is fulfilled by plenty of physical phenomena:

- by heat conductivity of material itself;
- by convective heat exchange;
- by radiation.

Therefore resulting heat conductivity of any physical body is determined as a sum of these three constituents.

Cosmo Isol is a capillary and porous body. Its interporous space is filled by ceramic spheres that are being in discharged state. The gas, contained in microspheres, practically, does not conduct warm. In the process of heat transfer the wall of microsphere is heated at first, then gas inside of microsphere, then opposite wall, further, the heat is passed to the nearby microspheres with a loss of energy in every case. Taking into account that the diameter of sphere is microscopic (~10 mkm), a thermal stream has to do a long and winding way, although the thickness of material is only 0,5-3 mm. Thus, the rarefaction of interporous space significantly reduces the convective part of heat transition. It is known that at zero gravity convective heat exchange is absent at all.



Cosmo Isol, except heat transfer by heat conductivity, is semilucent for infrared (IR) radiation, i.e. has absorbing, radiating and dispersive properties, that fundamentally change the structure of thermal losses from a surface coverages, that consist of convective losses due to ablution of surface with surrounding air and radiation losses due to «relighting» of wall with terrene and welkin. For these reasons the heat emission coefficient of **Cosmo Isol** (1,29-2,2 W/^{of} m2 $^{0C)}$ is much below the level of other building and heat insulation materials (9-23 W/^{of} м2 $^{0C).}$

Cosmo Isol along with other hi-tech advantages possesses values, that practically do not meet in one material:

- heat insulation;
- waterproof;
- anticorrosive;
- soundproof.

Research of liquid ceramic heat insulation (LCH) efficiency has some difficulties. Ultrathin heat-insulation materials has not entered in operating СНиПы and GOST, there were no methodologies of research for similar materials, both as suitable measuring equipment.

Optical descriptions **of Cosmo Isol** are coefficients of absorption, reflection, radiation, that substantially differ from analogical descriptions for black metals, building materials or

standard heat isolations. Therefore sensors of thermal streams that are used in practice of technical control should be applied with

special calibration, because of high reflectivity and low level of **Cosmo Isol** coverage blackness, that result in substantial errors while using sensors, calibration of which was carried out with use of model blackbody emitters only for the values of radiation ability, that are close to 0.99, and are working in the spectral range of 7-18 mkm. Taking temperature probes of surface without introduction of special methodical amendments to the results of measuring, both as use of special filters to optical part of pyrometer, can result in substantial errors during fixing the final description.

At the same time, researches **of Cosmo Isol,** conducted in Moscow, Saint Petersburg, Kyiv, Minsk, Astana, Samara, Krasnoyarsk and other cities of Russia (based on energy saving at maintenance of programmed temperatures after putting **Cosmo Isol** of different thickness on enclosing structures, indicated high efficiency of material. According to these researches material thickness of 0,25 mm gives 15% of heat economy , 0,5 mm - 25%, 1 mm - 40%.

Technical specifications of Cosmo Isol

Name	Unit of measure	Value	Notes
Heat conductivity at 20°C, not more	W/ m °C	0,0010-0,003	GOST 7076-87 (GOST-state standard)
Density in dry state	kg/m3	380-410	GOST 17177-94
Density in liquid state	kg/m3	470-590	GOST 17177-94
Coefficient of vapour permeability	mg/ m h Pa	0,0014	GOST 25989-83
Specific heat capacity	kJ/kg °C	1,08	
Heat-resistance at temperature of 260°C	Absence of cracks, swelling and stratifications		
Water absorption	g/sm3	0,03	GOST 11529-86
Relative elongation at break, not more	%	8,0	GOST 11262-80
Relative elongation at break after accelerated aging (10 years), not more	%	8,0	GOST 11262-80
Linear elongation	%	65	GOST 11262-80
Coupling durability at tearing, no less - with metal - with concrete - with wood	Mpa	1,53 1,84 1,84	GOST 15140-78
Tension durability, no less - after infliction - after accelerated aging (10 years)	Mpa	2,0 3,0	GOST 11262-80
Shock durability	Kg/cm	50	GOST 4765-73
Whiteness % of diffusive reflection - after infliction - after accelerated aging (10 years)	%	93,0 90,0	GOST 896-69
Temperature of transportation and storage	C°		
Temperature of surface at material infliction	C°	from + 1 to +150	
Temperature of exploitation		from - 60 to 60	

Energetic

Calculation formulas for flat wall are much more simple comparing with formulas for cylindrical object. Usually formulas of flat wall can be applied if diameter of the insulated wall is more than 2000 mm. Thickness **Cosmo Isol** isolation changes within the limits of 0,5-3,5 mm range. Consequently when applying **Cosmo Isol** it would be reasonable to use the formulas of calculations for flat walls on cylindrical objects.

Thus, the calculation of thickness of **Cosmo Isol** heat-insulation coverage on hot surfaces should be performed according to СП 41-103-2000 using next formula:

$$\delta_{CI} = \lambda_{CI} (T_m - T0) / \acute{\alpha}_{CI(1,2)} (T_n - T_0);$$

$$Q = \acute{\alpha}_{CI(1,2)} (T_n - T_0) \text{ ou}$$

$$Q = (T_n - T_0) / (1/\acute{\alpha}_B + 1 / \acute{\alpha}_{CI(1,2)} + \delta_{tr.} / \lambda_{tr.}),$$

where

δ_{CI} - is thickness of isolation Cosmo Isol (mm);

λ_{CI} =0,001 - coefficient of heat conductivity for Cosmo Isol (W/sq.m. °C)

$\acute{\alpha}_{CI-1,-}$ 1,29 - coefficient of heat conductivity for Cosmo Isol at indoor material infliction (W/sq.m. °C)

$\acute{\alpha}_{CI-2}$ = 2,2 - coefficient of heat conductivity for Cosmo Isol at outdoor material infliction (W/sq.m. °C)

T_m - Temperature of carrier (°C)

T_n Temperature of surface after infliction of Cosmo Isol according to sanitary and hygienic requirements (°C)

T_0 - Temperature of environment (°C)

Q - Heat losses on 1 sq.m. of surface isolated by Cosmo Isol (W);

During calculation of coverage thickness on objects located indoors, ambient temperature should be +18°C, +20°C.

During calculation of coverage thickness on objects located outdoors, value of ambient temperature should equal to average annual temperature in this Region.

Calculation methods of Cosmo Isol coverage thickness for cold surfaces (from condensate and formation of ice).

As practice indicates, the higher humidity of air in apartment, the thicker isolation should be. However there are such conditions, that make impossible the removal of condensate or ice from the surface of object. Such conditions arise when the gradient of temperatures is more than 35°C and air humidity is more than 70%.

Calculations of Cosmo Isol isolation thickness should be conducted according to СНиП 41-03-2003 year, using next formula:

$$\delta_{CI} = \lambda_{CI} / \acute{A}_{CI} \{((T_0 - T_m) / (T_0 - T_m) - 1)\}$$

where:

δ_{CI}- is thickness of isolation Cosmo Isol (mm);

λ_{CI} =0,001 - coefficient of heat conductivity for Cosmo Isol (W/sq.m. °C)

α_{CI} 1,29 - coefficient of heat transfer for Cosmo Isol (W/sq.m. °C)

Tm Temperature of carrier (°C)

T_0 Temperature of environment (°C)

(T_n - T) - calculated drop of temperatures on defined values (in %) relative humidity of surrounding air (°C);

Estimated period (T_n - T) is defined according to table #1

Table #1

To,^{0}C	Relative air humidity					
	40	50	60	70	80	90
10	13,4	10,4	7,8	5,5	3,5	1,6
15	14,2	10,9	9,1	5,7	3,6	1,7
20	14,8	11,3	8,4	5,9	3,7	1,8
25	15,3	11,7	8,7	6,1	3,8	1,9
30	15,9	12,2	9,0	6,3	4,0	2,0

In general calculations on isolation thickness are done according to СП 41-103-2000 using next formula:

$\delta=\lambda/\alpha((T_n - T_H)/ (T_n - T))$

Heat-insulation of pipelines and equipment

Removal of condensate

Thermal insulation of pipelines in households

Petroleum industry

Cosmo Isol can successfully be used for heat insulation of petroleum and gas pipelines of both surface and underground gasket. Thus cost of executed works with use of **Cosmo Isol** material on insulated object is on 30% cheaper comparing with rockwool and polyurethane foam. The second economy is diminishing of energy losses during exploitation of objects - to 40%. At the present moment **Cosmo Isol positively** proved itself positively on objects «Hazprom», «Rosneft», «Lukoil».

Heat insulation of capacities for water and oil products

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Engineering

Cosmo Isol is used for warming of carriages, diesel engines.

Warming of carriage cabins

Shipbuilding

In shipbuilding material **Cosmo Isol** is used for warming of cabins, interior parts of corridors on ships, waterproofing.

Heat insulation of ships and interior parts of corridors on ships

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Example of joint use of polyurethane foam and liquid ceramic coverage Cosmo Isol in heat insulation of pipelines

We will take a specific example:

Outdoor heating pipeline D=820 mm.

Тн=+150°С is a temperature of carrier on exit from boiler room;

To=+25°С is a temperature of surrounding air. We take a summer period for calculation, because at this time of year the surface of pipe will has the highest temperatures;

Тп- temperature of pipe surface after infliction of **Cosmo Isol**;

λ_{CI} = 0,001 - coefficient of Cosmo Isol heat conductivity (W/m°C);

$\acute{\alpha}_{CI}$ = 2,25 - coefficient of Cosmo Isol heat emission (W/m°C);

Cosmo Isol is inflicted on a pipe both as anticorrosion and heat insulation material. In our example it should reduce the temperature of pipe surface to the values, that are acceptable for subsequent use of polyurethane foam.

Taking into consideration that the surface of pipe can have roughness up to 0,15 mm, we will inflict 0.6mm of **Cosmo Isol** material for high-quality coverage of the pipe.

The thickness of **Cosmo Isol** coverage is calculated with a formula:

$$\delta_{CI} = \lambda_{CI} (Tm - Tn) / \acute{\alpha}_{CI} (T_n - To)$$

As we can see, at the above mentioned conditions, the unknown value is a temperature of pipe surface Тп) after infliction of **Cosmo Isol** $\delta_{CI=0.6}$ mm thick.

Consequently:

$$0,0006=0,001*(150-T_п)/2,5*(T_п-25)=0,15-0,001*T_п/2,5T_п-32,25;$$

$$0,0025*T_п=0,1875;$$

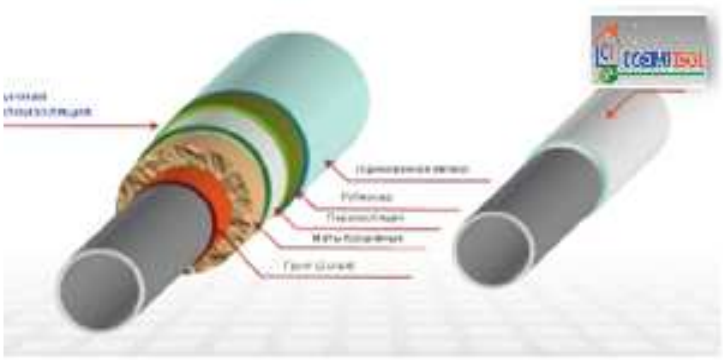
$$T_п=75^0C$$

The temperature of surface +75 °С is fully acceptable for subsequent additional heat insulation with polyurethane foam.

Heat insulation of steam lines and pipelines

Cost saving

1. Reduction of labor and time capacity of **Cosmo Isol** use**,** due to easiness and simplicity of work with material.
2. Cost saving on expenses for repair of pipeline after expiration of warranty period, due to absence of necessity to uninstall the old insulation and performing works on preparation of old pipeline for insulation.
3. Cost reduction on economy of thermal energy in pipelines, steam-boilers and so on, due to high heat-insulation descriptions **of Cosmo Isol** and complete insulation of pipelines, steam-boilers, bolts, transitions and so on, even in places with the most difficult access.
4. Possibility to inflict **Cosmo Isol** directly on hot surface, without shutting down the heating system network or steam-boiler.
5. Cost reduction on installation of heat-insulation, due to diminishing of technological operations, related to warming of pipelines and so on, when using **Cosmo Isol** as an insulation.
6. Cost reduction on repair of pipeline in case of emergency situations, due to reduction of time for search of flow, fistula and no need to uninstall the old isolation.
7. Cost reduction on repair of heat insulation, due to the increase of warranty period comparing with standard insulations.
8. No expenses on restoration of insulation because of no possibility for its secondary use.



Building industry.

Cosmo Isol is used in building not only as heat-insulating coverage, but also as a waterproof material. Presence of latex in material provides it with low water absorption capacity.

Possibility to use **Cosmo Isol** as protection from condensate formation in apartments, enables antifreeze protection, both as removal of mycotic formations and mould.

It is well-known that for calculation of thermal resistance of building enclosing structures, the next formula is used:

$$R_{m.} = 1/\acute{\alpha}_{ext.} + \delta_{m.} / \lambda_{m.} + \delta_{is.} / \lambda_{is.} + 1/\acute{\alpha}_{ext.}$$

where:

$R_{m.}$ - resistance of fencing construction, required according to СНиП (W/sq.m °C)

δ_{m} - thickness of wall (m);

$\lambda_{m.}$ - coefficient of wall heat conductivity (W/sq.m °C)

$\delta_{is.}$ - thickness of **Cosmo Isol** insulation (m)

λ_{is} = 0.002- coefficient of **Cosmo Isol** heat conductivity (W/sq.m °C)

$\acute{\alpha}_{int.}$ = 8.7 - coefficient of heat transfer of fencing construction outdoor surface (W/sq.m °C).

It is accepted according to СНиП in engineering calculations for any outward surface.

Liquid ceramic heat insulation coverages, including **Cosmo Isol,** coefficients of heat emission are much below those accepted by СНиП: 8,7 and 23 units.

Thus, $\acute{\alpha}_{CI\ (ext)}$ =2,2 units at outdoor coverage and $\acute{\alpha}_{CI\ (int.)}$ =1,67 units at indoor coverage.

In such way, at engineering calculations with classical heat insulation, its thermal resistance is calculated $R_{is.} = \delta_{is.} / \lambda$ because in calculations thermal resistance $R_{ext.}$ and R_{int}, respectively 8.7 and 23 units remain unchanged.

When using **Cosmo Isol,** for example on outdoor surface of fencing construction, at $\acute{\alpha}_{CI\ (ext)}$ =2,2 units of thermal resistance of the surface will be: $R_H = 1/2{,}2 = 0{,}45$ units (in engineering calculations according to СНиП -0.04 units).

Consequently, additional thermal resistance of heat insulation **Cosmo Isol** will be in case of outdoor coverage:

$$R_{CI} = \delta_{CI} / \lambda_{CI} + (1 / \acute{\alpha}_{CI} - 1 / \acute{\alpha}_{ext.}) = \delta_{CI} / 0{,}002 + (1/2{,}2 - 1/23)$$

$$\delta_{CI} = 0{,}002 \times (R_{CI} - 0{,}41).$$

and in case of indoor coverage:

$$R_{CI} = \delta_{CI} / \lambda_{CI} + (1 / \acute{\alpha}_{CI} - 1 / \acute{\alpha}_{int.}) = \delta_{CI} / 0{,}002 + (1/1{,}67 - 1 / 8{,}7)$$

$$\delta_{CI} = 0{,}002 \times (R_{CI} - 0{,}48).$$

From practice of material application the next indexes of heat conductivity and heat emission coefficients of **Cosmo Isol** are recommended in building construction:
λ_{CI} = 0,002 - coefficient of **Cosmo Isol** heat conductivity (W/sq.m °C);
$\acute{\alpha}_{int.}$ = 1,67 - coefficient of **Cosmo Isol** heat transfer at indoor coverage (W/sq.m °C);
$\acute{\alpha}_{ext.}$= 2,2 - coefficient of **Cosmo Isol** heat transfer at outdoor coverage (W/sq.m °C);
Recommended thickness of coverage – from 0,4 to 3,5 mm.

Heat insulation of frontage and painting with any color



Heat insulation and water protection of roof


Heat insulation of walls, ceilings and floors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Warming of the balconies and elimination of cold bridges



Thermal insulation of cottages






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Vapour permeability of Cosmo Isol

Cosmo Isol has low coefficient of vapour permeability. Therefore we will consider whether it will not be hindering the diffusion of moisture vaporization from the layer of wall to outside, as long as resistance of vapour permeability should be diminished because of internal layer of multilayer construction to outer one.

We will do simple calculations:

Cosmo Isol -μ_{CI} = 0,0014 mg / m*h*Pa - coefficient of vapour permeability;

Brick - μ_K=0.11 mg/m*h*Pa - coefficient of vapour permeability;

Aerated concrete (type “Sybyt”) μ_c = 0.17 mg/m*h*Pa - coefficient of vapour permeability;

a) brick wall with thickness of δ_K=0,51 m is insulated by **Cosmo Isol** from outside with thickness δ_{CI} = 0,0025 m = 2,5 mm

R brick = δ_B / μ_B = 0,51 / 0,11 = 4,6 m^2 * h *Pa / mg;

$R_{CI} = \delta_{CI} / \mu_{CI}$ = 0,0025 / 0,0014 = 1,8 m 2*h*Pa / mg;

Conditions are fulfilled.

Advantages of Cosmo Isol comparing with standard insulation

1. Highly resistant to weather conditions and drops of temperatures.
2. Highly resistant to influence of sun radiation.
3. Extremely low coefficient of heat conductivity.
4. Durable – with warranty term of 10 years, term of exploitation at outdoor use - over 20 years.
5. High degree of adhesion.
6. Corrosion resistant, waterproof.
7. High temperature of exploitation – up to +260 °C.
8. Works on installation of heat insulation are not laborious.
9. Easiness of repair activities and finding out the flows.
10. Resistant to mechanical damages.
11. Possibility to use the insulation on pipelines and objects with complicated configuration, in places of difficult access .
12. Ecologically clean and fireproof material.
13. Cost and period of installation works are 30% lower comparing with traditional heat-insulation.

Most effective spheres of Cosmo Isol application:

- Walls of apartments and industrial buildings, both from internal and external sides.
- Roofs of apartments and industrial buildings, both from internal and external sides.
- Metallic constructions.
- Angaras and garages.
- Crane girders.
- Lower part of bridges (lowers the freezing).
- Pipelines of thermal heating systems.
- Steam and gas pipelines.
- Systems of air conditioning.
- Pipes with cold water (for prevention of condensation).
- Hydrants, water heaters and boilers.
- Heat exchanger
- Steam boilers.
- Underground and ground oil pipelines.
- Hot chemical mixer tanks.
- Capacities and tanks for storage of water, chemical reagents etc.
- Cooling chambers.
- Coverage of internal side of motor compartment corps, roofs of transport vehicles.
- Coverage of internal side of military and special purpose facilities.
- Refrigerators.
- Motor car and railway cisterns for different liquids.
- Engine-rooms of ships.
- Decks and internal part of ship corps.

Instruction for infliction of heat-insulation coverage Cosmo Isol

Please read instruction attentively before application!

Cosmo Isol - liquid warm - is waterproofing coverage from microscopic, ceramic vacuumed balls and silicate balls, filled with air, that are in form of suspension, composed with latex and acrylic polymers mixture.

Isolating works can be conducted on surfaces with a temperature from +5 to +150 °C.

1. Preparation of surface. Preparation works should be done in accordance with **ISO 8501-1** (or **СНиП 3.04.01-87,** part 3).

1.1 Preparation of metallic surface.

1.1.1. Cleaning of metallic surface from rust should be fulfilled by means of metallic brushes and sandpaper or by appliance for stream cleaning with removal of rust loose layer, than we should degrease it and give to dry out fully.

1.1.2. The hand cleaning of metallic surfaces is done to preparation degree St 2 according to ISO 8501-1. (At examination without zooming, a surface must be free of oil, grease and dirt, also from greater part of rolled dross, rust, paint and foreign particles. Any remaining contaminations should stick firmly).

1.1.3. The stream cleaning of metallic surfaces is produced to level of preparation Sa 2 V2 according to ISO 8501-1. (At examination without zooming, a surface must be free of oil, grease and dirt, also from greater part of rolled dross, rust, paint and foreign particles. Any remaining tracks of contaminations must have a look of easy painting spots or stripes only).

1.2. Preparation of concrete surface. Concrete and brick surface, before infliction of **Cosmo Isol** should be cleaned of dust and moistened with water. Surface at examination must be even and free of foreign particles.

1.3. Preparation of wooden surface. It is necessary to delete dust and, if possible, resin from a wooden surface.

1.4 Preparation of plastic surface. Plastic surface should be cleaned by polishing sandpaper, remove dust and degrease it.

1. Preparation of material for work.

1.1. Uncover.
1.2. Remove the appearing crust, carefully immersing and lifting flat

wooden spatula on center and along the walls of bucket, so that the liquid covered the crust.

1.3. Continuing vertical interfusions of spatula, to load thickening part of material in more loose one. Turn on a drill with spiral attachment for interfusion and mix the content of bucket slowly for 10 - 15 minutes.

1.4. Continue interfusion until the crust will fully dissolve and homogeneous mass will appear without clots and lumps.

1.5. Pour the mixed product in a clean bucket through a filter with diameter of holes reticulum (0,5 - 1 mm), remove remaining lumps.

1.6. Before infliction of the material, the prime coating layer should be inflicted. Give it 1 hour to dry out.

1.6.1. Preparation of primer: primer is firstly prepared in trial volume, 1 liter in container, for which 500-700 ml of prepared **Cosmo Isol** is used, with addition of distilled water to it. The amount of water depends on temperature of the object surface, on which **Cosmo Isol** is inflicted, both as temperature of surrounding air – the lower temperature the less amount of water is needed. Primary volume of water is 20 ml and more. Primer should lie down evenly, fluently, without lumps (lack of water at high temperature of the object surface) and bruises (too much water at low temperatures).

1.7. During work with primer it is necessary to mix it constantly in order to prevent the raising of easy material factions. While inflicting the prime with brush, the thickness of layer per one passage of instrument is 0,08-0,1 mm, infliction by appliance «Graco» is 0,06-0,08 mm.

During work with material on hot surfaces with temperature higher than +70°C, it is necessary to use more liquid primer.

Attention! Cosmo Isol is not a paint, but an isolating coverage. Do not use high speeds for interfusion, cause it will result in destruction of ceramic and silicon balls. When using a drill, the interfusion speed during rotation of blade should not exceed 300 turns/min.

2. Equipment.

2.1. Coverage **of Cosmo Isol** can be inflicted on surfaces by using the hydro spray or brush with a long, soft, natural bristle.

2.2. Recommendation. For infliction of isolation on area more than 50 square meters or pipes with diameter >300 mm, use the nebulizer of airless type analogical to the nebulizer of «Graco-695», «Graco-795» etc. with maximal pressure of 230 bar (23MPa), and working pressure 80-140 bar.

2.3. Preparation of appliance to infliction of material should be fulfilled according to

to instructions of appliance exploitation.

3. Infliction of material.

3.1. Carefully mix material directly before infliction. Infliction of material should be made cross on cross in 2-4 **passages**, thickness of inflicted material for one passage should be 0,1-0,2 mm. Total thickness must not exceed 0,38-0,5мм, this layer is called a **technological layer.** The second technological layer should be inflicted only after sufficient drying out of the first layer (no less than 12 hours). In 2 hours after infliction, the material becomes resistant to action of water.

3.2. Infliction of material should be done from corner to corner, without interruptions of infliction.

3.3. Do not inflict the material at relative humidity of air that is higher than 80%.

4. Control of inflicted coverage thickness.

4.1. The control of inflicted coverage thickness should be conducted directly after infliction by measuring probe «Hrebenka» (Comb), and after its complete drying out - by means of next instruments: calipers ШЦ 125-0,1; micrometer 0-25 GOST 650788 (on a technological witness); by electronic devices for determination of thickness.

4.2. The material consumption depends on many factors and is defined by separate document. (ТУ5767-001-95648941-2006 dated 07.08.06).

5. Safety requirements.

5.1. During work with material it is obligatory to observe the requirements of safety in accordance with СНиП (SNIP – building standard)111-4-80, Сан Пин (SAN PIN- higenic standard) 6027A-91, GOST 20010, GOST 12, 04, 013, GOST 27575, GOST 27574.

For calculation **of infliction general thickness** contact with specialists of НЦ «Siberian Heat Saving Company».

1. Passage – thickness of material, inflicted at one time (from 0,1 to 0,2 mm)
2. Technological layer – is fulfilled in 2-4 passages, thickness of technological layer should be from 0,38 to 0,5 mm. Between period of technological layers infliction material should be left to dry out during 12 hours at temperature not less than -12°C (at temperature lower than -12°C the time for drying should be prolonged to 24 hours).
3. General thickness of infliction – calculation thickness of material that is needed for the object and is received due to technical calculations of heat values. Is fulfilled by several technological layers with preserving the interval for drying out.