

Seal text: the Russian Federation
the Republic of Bashkortostan
Bashneft Oil Open Joint-Stock Company
OAO ANK Bashneft
Bashneft-Yanaul Branch
INN *illegible*

APPROVED BY:
Chief Engineer
Bashneft-Yanaul Branch
OAO ANK Bashneft
R.R. Vagapov *signature*
10/09/2009

**Minutes
of the Technical Retreat
on the Industrial Use
of Superfine Liquid Ceramic Heat-Insulating Material (LCHIM) KORUND**

Arlan Industrial Yard

4 September 2009

Present:

1. Representatives of OAO ANK Bashneft-Yanaul:
R.M. Valiullin, Chief Power Engineer;
A.M. Aminov, Engineer of Logistics Support & Complete Equipment Procurement Department
2. Representatives of Neftekamsk Branch of Rostekhnadzor:
A.G. Porshin, Head of the Branch;
M.V. Gilfanov, Deputy Head of the Branch;
3. Representatives of Arlan Oil and Gas Production Department:
A.I. Nikerov, Deputy Chief;
A.R. Zagirov, Lead Engineer;
4. Representative of OOO Arlanskoe UEN:
D.V. Akhmetov, Chief Engineer;
5. Representatives of OOO Arlanskoe UNSM:
V.B. Gumerov, Chief Engineer;
D.T. Shakirov, Deputy Director;
6. Representative of Volgograd Innovation Resource Centre (VIRC):
A.N. Nikiforov, Supplier of LCHIM Korund;

**Agenda
of the Technical Retreat**

1. Report of VIRC representative A.N. Nikiforov on LCHIM Korund.
2. Testing of LCHIM Korund.
3. Exchange of views regarding the applicability of LCHIM Korund at the facilities of OAO ANK Bashneft-Yanaul branch.
4. Decisions.

1. Report of VIRC Representative A.N. Nikiforov on LCHIM Korund

Superfine Liquid Ceramic Heat-Insulating Material Korund is the latest innovation made by the Russian scientists in the range of heat-insulating materials.

With a consistence resembling that of common paint, LCHIM Korund is a suspension that can be laid on any surface. Upon drying, it forms elastic polymeric coating that has unique heat-insulating properties (prime coat of LCHIM Korund 0.02 to 0.04 mm thick can reduce temperature by dozens of degrees), ensures corrosion protection and is highly resistant to climate effects. The guaranteed service life of LCHIM Korund that has been determined by scientific experiment is 30 years indoors and 15 years outdoors.

There are five basic types of LCHIM Korund:

- Korund Anticor;
- Korund Classic;
- Korund Facade;
- Korund Winter;
- Korund Volcano;

The main advantages of LCHIM Korund over conventional heat-insulating materials:

- Extremely low thermal conductivity (0.0012 W/m °C);
- Excellent corrosion protection properties: due to good adhesion (no condensate on the pipeline surface), neutralization of stray currents;
- Easy to apply on any surface of any configuration and in hard-to-reach areas;
- Being highly resistant to mechanical impacts, it is of no interest to vandals;
- Long-lasting material;
- It has dielectric properties in case of electric current passing on the pipeline surface;
- It can be applied to a hot surface, etc.

Over six months of operations of the representative office in Bashkiria, positive feedback has been received from the Ministry of Housing and Utilities of the Bashkortostan Republic, OAO Bashkommunenergo, CHP-2 (Ufa), OAO NEFAZ, Bashneft-Yanaul branch of OAO ANK Bashneft, etc.

2. Testing of LCHIM Korund

Coatings applied on the provided test bench (onto the metal pipe, d 108x4.5 mm and L=3 m):

- Primer GF-021;
- LCHIM Korund in sections, thickness:
 - 0.02 mm;
 - 0.5 mm;
 - 1 mm;
 - 1.8 mm;
 - 2.2 mm;

Conventional heat insulation was also applied on this test bench, L = 1 m: mineral wool D=50 mm, tin casing D= 0.7 mm. Mobile steam unit was used to achieve pipe body temperature of 130°C at 1 MPa. Thermocouple multimeter M-838 was used to measure the surface temperature of LCHIM Korund layers and of conventional heat-insulating material. The table below shows the measurement results adjusted for errors (as defined by FSUE Research Institute Santekhniki (Moscow)):

Item#	Measured surface	Temperature (°C)	Air temperature (°C)
1	Pipe body	130	19
2	LCHIM Korund 0.02 mm	75	19
3	LCHIM Korund 0.5 mm	73	19
4	LCHIM Korund 1 mm	65	19
5	LCHIM Korund 1.8 mm	54	19
6	LCHIM Korund 2.2 mm	47	19
7	Mineral wool + tin	39	19

Thus, the temperature prescribed by paragraph 2.1.8 of regulations PB10 - 573-03 is reached at D = 1.8 mm of LCHIM Korund.

Besides, bare hand touch on the surface of LCHIM Korund, D=1 mm, D=1.8 mm, D=2mm does not show any signs of high temperature.

Testing additionally included the experiment with ice cubes placed on the surface of LCHIM Korund D=1 mm, D=2.2 mm and of conventional heat-insulating material. Ice on conventional heat-insulating material melted three times faster than on LCHIM Korund. The ice cube experiment leads to another conclusion that conventional heat-insulating material has very high heat losses, despite the low temperature on its surface.

LCHIM Korund was also tested for mechanical stability. LCHIM Korund was hit several times with a metal hammer at the same point and it left only a dent.

3. Exchange of Views Regarding the Applicability of LCHIM Korund at the Facilities of OAO ANK Bashneft-Yanaul Branch

The attendees at the technical meeting asked the questions about applications, guarantee periods, mechanical impact resistance, repair procedures, types of LCHIM Korund, cost of coating materials and work, additional advantages (adhesion, corrosion protection properties, etc.), infrared radiation frequency, tooling required to perform a large amount of work, etc. A.N. Nikiforov gave comprehensive answers to these questions.

The attendees at the meeting expressed the wish to conduct a comparative heat saving experiment in sections of steam and hot water pipelines to determine heat losses in cases of conventional heat-insulating material and LCHIM Korund.

A.N. Nikiforov suggested that the meeting consider using LCHIM Korund in tank and vessel farms of Bashneft-Yanaul branch of OAO ANK Bashneft both as thermal insulation and as an anticorrosion coating.

4. Decisions

Having exchanged their views, the attendees at the meeting resolved as follows:

1. LCHIM Korund is indeed an innovative and economical heat-insulating and anticorrosion coating, therefore it can be recommended for use in design and construction of heat supply systems.
2. In view of the foregoing, and considering the positive feedback from OOO Bashneft-Geoproekt (Letter FA-04-207 dated 26.08.2009) and positive experience gained by Bashneft-Yanaul branch of OAO ANK Bashneft (in December 2008, LCHIM Korund was experimentally applied to a steam manifold at the boiler house of OOO Khazinskoe UEN, village Redkino) regarding this issue, it should be deemed possible to use LCHIM Korund at the heat

distribution unit of the boiler house at industrial yards Arlan and Tashkinovo using the manufacturer's technology and within the established budgeted costs.

3. That the possibility of using LCHIM Korund for thermal insulation of vessels with a capacity of up to 200 m³ be considered.

5. Signatures of Attendees at the Technical Meeting

1. Representatives of OAO ANK Bashneft-Yanaul:

R.M. Valiullin, Chief Power Engineer: signature

A.M. Aminov, Engineer of Logistics Support & Complete Equipment Procurement
Department: signature

2. Representatives of Neftekamsk Branch of Rostekhnadzor:

A.G. Porshin, Head of the Branch: signature

Stamp text: the Urals Department of the Federal
Service for Ecological, Technological and
Nuclear Supervision
Department Head
Alexander G. Porshin

M.V. Gilfanov, Deputy Head of the Branch: signature

Stamp text: the Urals Department of the Federal
Service for Ecological, Technological and
Nuclear Supervision
Deputy Department Head
Mullanur V. Gilfanov

3. Representatives of Arlan Oil and Gas Production Department:

A.I. Nikerov, Deputy Chief: signature

A.R. Zagirov, Lead Engineer: signature

4. Representative of OOO Arlanskoe UEN:

D.V. Akhmetov, Chief Engineer: signature V.A.Parfenov

5. Representatives of OOO Arlanskoe UNSM:

V.B. Gumerov, Chief Engineer: signature

D.T. Shakirov, Deputy Director: signature

6. Representative of Volgograd Innovation Resource Centre (VIRC):

A.N. Nikiforov, Supplier of LCHIM Korund: signature

Seal text: the Republic of Bashkortostan
Neftekamsk
Sole trader
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