НГП–ТЕХНОЛОГИИ

COMPOSITE-COUPLING TECHNOLOGY of REPAIR of MAIN PIPELINES (CCT): materials “PECM-IZOL”, “PECM-GERMET”, welded couplers “P-1”.

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Transportation at high pressures of large volumes of such environmentally aggressive product like oil and gas, requires special attention to the issues of preserving the integrity of pipelines, the prevention of failures, accidents. Therefore, the problems of ensuring the reliability and safety of pipeline system has always been the center of attention.

The age of the majority of pipelines in our country is 30-35 years and predicted probability of crashes for pipeline transport may become critical for the country's economy. Repair of the main pipelines is carried out in two alternative ways:

1) Stop pumping through the pipeline, cutting the emergency section of the pipe and coil setup, or complete replacement of the pipeline with a new one.

2) Installation of composite couplings without stop pumping through the pipeline.

CJSC "Stroycomplect" is a manufacturer and supplier of Composite structure for repair of pipelines by method of a composite-coupling technology (CCT) "PECM-IZOL" (18,45 kg) and Sealant for the repair of pipelines by the method of the CCT technology "PECM-GERMET" (15 kg), and composite couplings ("P-1") intended for the repair of main pipeline in any climatic conditions according to CCN technology without stopping pumping product by pipeline

The materials, produced by CJSC "Stroynovcomplect“ for CCT-technology for repair of pipelines used successfully by the following companies:

- **Oil Transporting Joint-Stock Company «Transneft»;**
- **CPC (Caspian Pipeline Consortium);**
- **Public Joint Stock Company Gazprom.**

The advantages of composite-coupling repair:

Carrying out works on installation of composite couplings is carried out in field conditions without stopping transportation of the product .

Installation of composite couplings 4-5 times cheaper than the installation of the coil; and ten times cheaper than laying new pipeline.

Guaranteed lifetime refurbished to a composite-coupling technology of the pipeline is at least 30 years.

Ease of installation: a team of 4 people sets of composite coupling on average in 3.5 hours with minimal tools and equipment.

The composite coupling may be composite and to reach a length of 10.5 m for pipes with a diameter of 530-1420 mm and 17.5 m for pipes with a diameter of 219-426 mm.

The quality of the materials produced by CJSC "Stroynovcomplect" confirmed by tests conducted by a subsidiary of OJSC "AK "Transneft" JSC CTD “Diaskan" on: Viability, Shrinkage, Strength and Durability.

Many oil and gas companies currently use a method of repair of pipelines, which consists in cutting from the tubing section or portion of section (coil) and the replacement of defect-free coil.

To apply the method of replacing the coils, the Customer must undertake the following:

1) For pipeline repairs:

- Excavation (construction of the repair pit, the device of the barn to accommodate the pumped oil from the pipeline, etc.)

- Insert the plunger in the pipeline for his release from oil and fix back after repair works;

- Stop pumping oil via pipelines and off plot;

- Pumping of oil from the disconnected section of the pipeline in parallel with the pipeline, in the NPC tanks, mobile tanks, collapsible tanks and rubber tanks, in earthen pits.

- Tenderloin parts or as replacement land or fireless method using explosion energy;

- Sealing the internal cavity of the pipeline;

- Welding and Assembly work to tie a new coil and control of quality of welded joints;

- The opening of the valves, the vent and filling the pipeline with oil;

- Insulation of the coil is embedded and filling the repair pit.

- Land reclamation on the spot repairs and excavation of the barn.

2) For repair of gas pipelines are similar in complexity, and also need to stop the pipeline or the installation of a temporary bypass.

The use of composite-coupling technology for repair of main pipelines with the use of materials CJSC "Stroynovcomplect" allows the Customer not to stop pumping the product through the pipeline and avoid a costly replacement of the pipeline.

The scope of the composite-coupling technology repair of the main pipelines.

Technology composite-coupling repair is designed to repair pipelines with the following characteristics:

- outer diameter of pipes from 219 mm to 1420 mm;

- the thickness of walls of pipes from 4 mm to 29 mm;

- internal pressures up to 14 MPa;

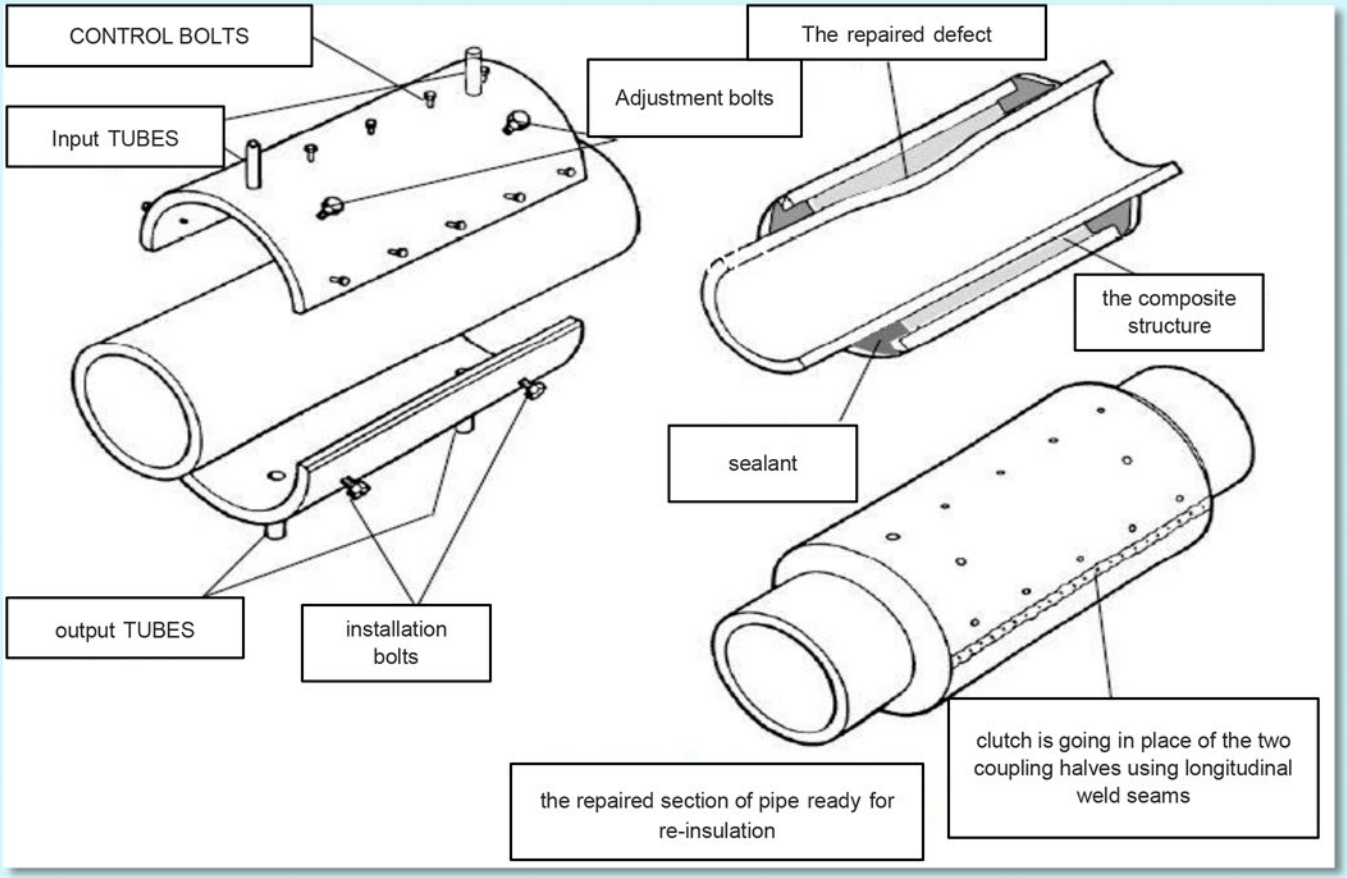
- mode of operation – cyclical, with cycles of loading internal pressure up to 360 cycles/year;

- temperature of pumped product on the repaired composite-coupling repair of structures, from minus 2° C to + 60° C;

- welded by electric welding of longitudinal, spirally and seamless pipes;

repair works are conducted at ambient temperatures from minus 30 oC to plus 40oC, while the operation of filling of the coupling with composite structure is performed at a temperature from + 4° C to plus 40° C. To provide the desired range of temperatures over the place repair installs heated protective shelter of the tent type.

Composite-coupling repair structure consists of a steel coupling welded from two half-couplings mounted on the pipe in the center of the defect with the annular gap of from 6 mm to 40 mm. the Tolerance for the annular gap allows repairing the pipelines with the defects of geometry and the bending of the longitudinal axis. The ends of the annular gap filled with sealant. The volume between the pipe and the coupling is filled with a composite composition.



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The decision on the use of composite-coupling technology of repair of pipelines, is taken by the Customer based on internal pipe or external diagnostics of pipelines.

According to DD (Detailed documentation) "Methods for repair of defects and defective sections of gas-main pipelines and oil-products pipelines", OJSC "AK "Transneft", the use of composite couplings provides for the following defects of the pipeline:

1) the metal Loss up to 70% of the wall thickness of the pipe;

2) the Indentation, in combination with: metal loss, mechanical damage, crack, delamination, weld defect, etc.;

3) Convolute in combination with: metal loss, mechanical damage, crack, delamination, weld defect, etc.;

4) Reducing the wall thickness (technological) tube external or internal surface of the pipe;

5) Mechanical damage type of "deep scratch" to an external or internal surface of the pipe;

6) Crack on the outer or inner surface of the pipe;

7) Bundle;

8) Inclusion (a section with inclusions);

9) a Crack or anomaly in a transverse welded seam;

10) it's Time (gathering, chain of pores), slag inclusion, Utina (concavity), undercut, misalignment of edges in a transverse welded seam;

11) Fractures, planar discontinuity flaw type lack of fusion, undercut in a longitudinal weld seam; as well as other defects.

Bench tests of composite materials CJSC "Stroynovcomplect"

The quality of composite materials of CJSC "Stroynovcomplect" ("PECM-IZOL", "PECM-GERMET"; welded couplers "P-1") confirmed by the stand tests on the strength and durability, conducted by JSC CTD "DIASKAN" (subsidiary of JSC "AK "Transneft").

On these tests were presented D720x9 two pipes of steel of strength class K52 artificially applied with the following defects:

"Longitudinal loss of the metal with a crack" on the external surface of the applied artificial defect - longitudinal groove along the pipe axis (simulated corrosion defect) length 405 mm, width 14 mm, depth up to 4.5 mm (50 % of the nominal wall thickness). Along the bottom of the groove is applied propyl 386 mm. long, with depth to 6.9 mm (69% of the nominal wall thickness).

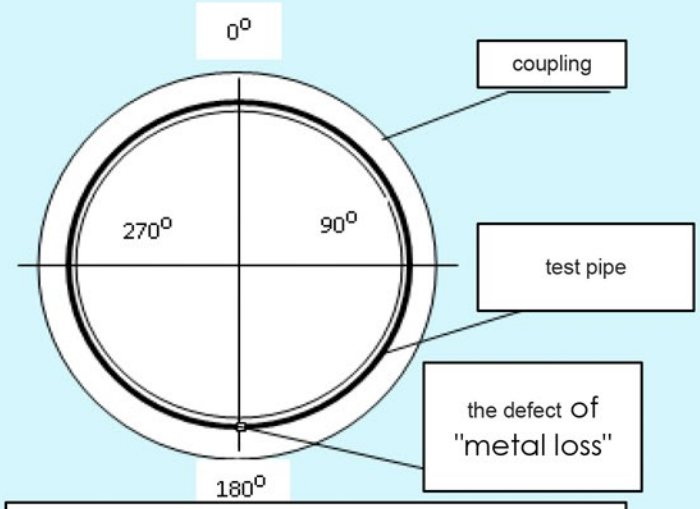
"Lack of fusion in the weld root" in the middle of the tube is circular weld seam defect 1355 mm (length of 60 % of the length of the circumference of the pipe) and a maximum depth of 6.2 mm (69 % of the nominal wall thickness).

After installation of composite couplings, these samples were quasi-static tests (with a maximum value of pressure with 8.05 MPa) and cyclic tests, reproducing the maximum operating conditions of the pipeline:

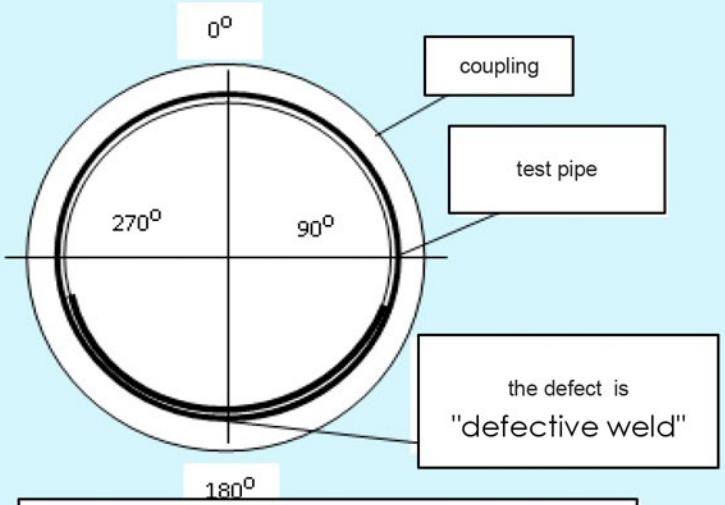
1), the Maximum pressure of 7.0 MPa
2) the Minimum value of pressure is 0.7 MPa
3) the Maximum value of the bending moment – 757 KN x M
The minimum value of the bending moment – 631 KN x M
The number of loading cycles – 10000

The tests showed that the composite coupling of CJSC "Stroynovcomplect" eases the pipe into the defect area and thereby increases its strength and durability for at least 30 years, which is similar to the life of the new pipe.

Bench testing JSC CTD “Diaskan".



the cross-section of a full-scale model with defect "longitudinal metal loss with crack"



the cross-section of a full-scale model with defect "defective weld"

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The materials used to repair a composite-coupling technology

1) "PECM-GERMET" - Specifications 2257-002-61845527-2009

Three-sealing the composition of the brand "PECM-GERMET" is intended for use as a curable sealant material.

The material has the following specifications:

1) appearance of the composition:
component a is "A" transparent, oily liquid; component "B" is a low viscosity transparent liquid; component "B" – powder filler.
2) Viability at a test temperature of 23±2C - 12-50 minutes.
3) Curing time at a test temperature of 23±2C - 30-90 minutes.
4) the Maximum compression stress not less than 50.0 MPa.
5) shear Strength of not less than 3.0 MPa.
6) the Modulus of elasticity at compression of not less than 0.5 GPA.

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The materials used to repair a composite-coupling technology

2) "PECM-IZOL" - Specifications 2257-001-61845527-2009

Three-component casting components-sizeonly material has the following specifications:

1) appearance of the composition:

component a is "A" transparent, oily liquid; component "B" is a low viscosity transparent liquid; component "B" – powder filler

2) Viability at a test temperature of 23±2C at least 60 minutes.

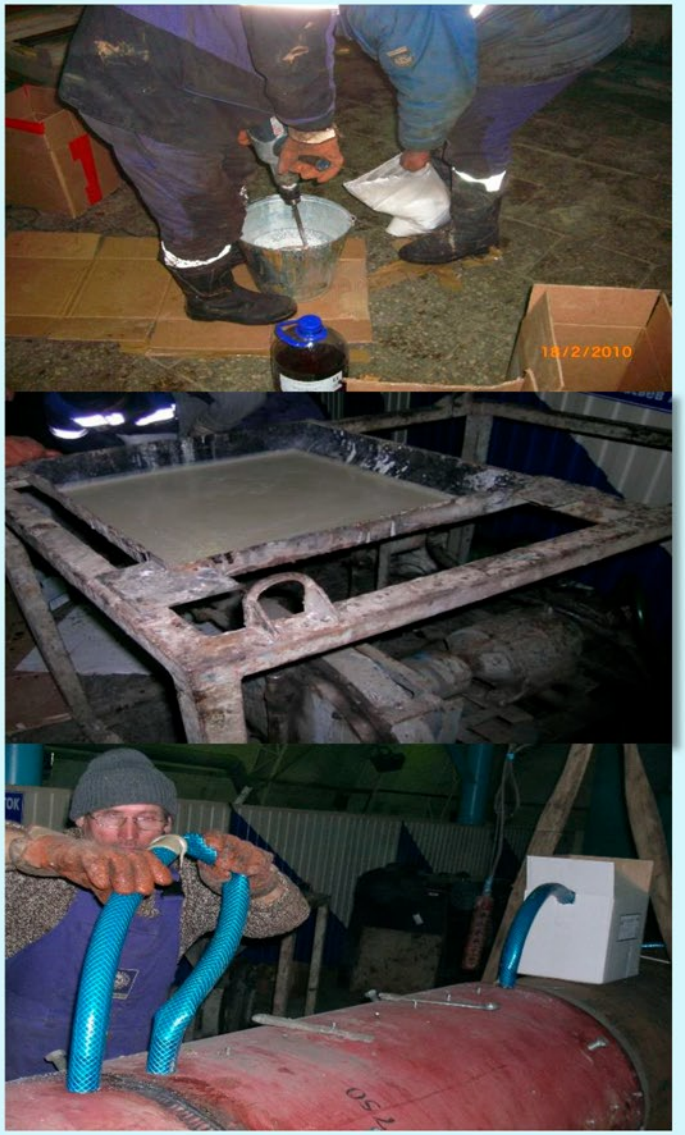
3) the turnover Rate at a test temperature of 23±2C – not less than 100 mm.

4) tearing Strength of at least 6 MPa.

5) Maximum compression stress not less than 70.0 MPa.

6)shear Strength of not less than 3.0 MPa

7)Modulus of elasticity at compression of not less than 1 GPA.



The materials used to repair a composite-coupling technology

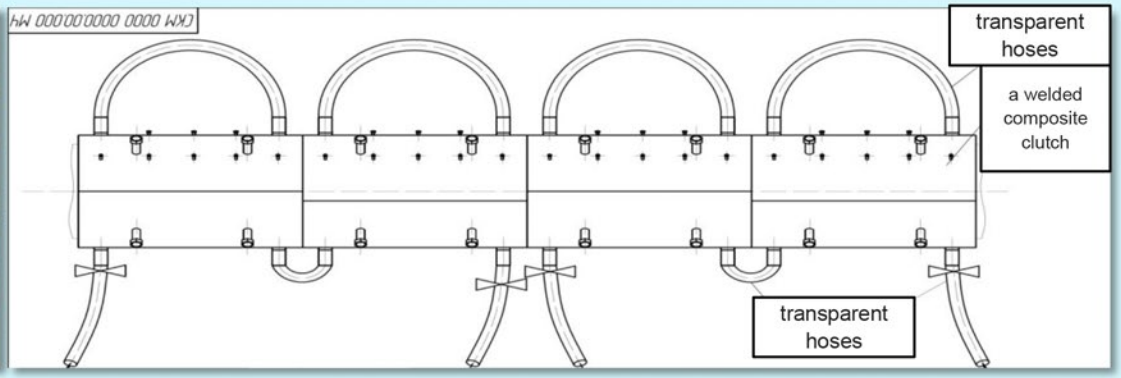
3) Composite couplers "P-1" designed to selectively repair defective sections of main pipelines.

For repair of pipelines with a diameter of 530-1420 mm used clutch length: 1000 mm, 1500 mm, 2000 mm, 2500 mm, 3000 m, 3500 mm; pipe diameter 219-426 used clutch mm length: 500 mm, 750 mm, 1000 mm, 1250 mm, 1500 mm, 1750 mm, 2000 mm, 2250 mm, 2500 mm, 2750 mm, 3000 mm, 3250 mm and 3500 mm.

An experienced team of repairmen in the 4 – 5 person performs the installation design for 3.5 hours.

If the length of the desired to repair the coupler exceeds 3500 mm, we used a welded composite coupler consisting of several couplings arranged back to back with each other and connected by a circumferential weld seam.

The length of the composite coupler can reach 10.5 m for pipes with a diameter of 530-1420 mm and 17.5 m for pipes with a diameter of 219-426 mm.



Technological operations performed during the installation Composite couplings.

1) Shot blasting the surface of the pipeline in the area of installation of the coupling and the interior surfaces repair of the coupling halves.

2) Welding repair of construction (coupler "P-1") on the pipeline.

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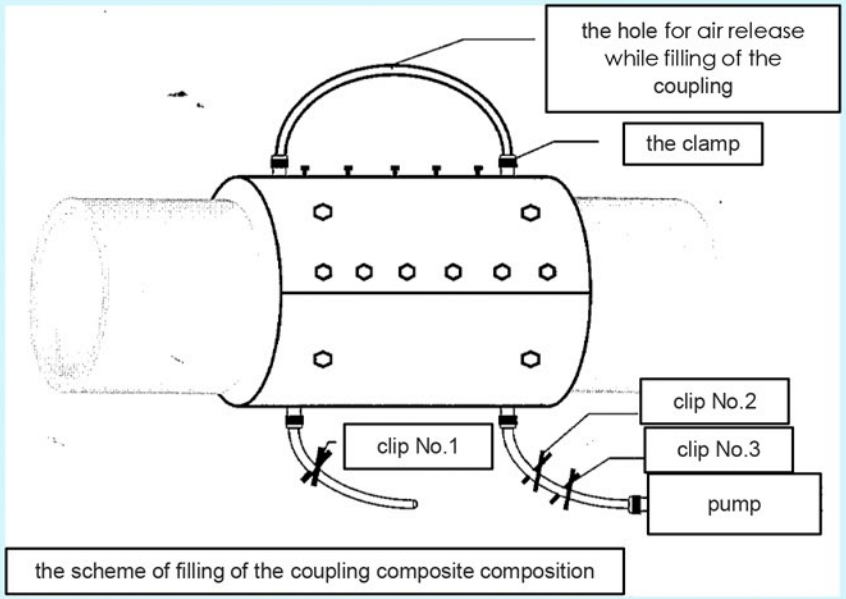
3) Adjustment of the annular gap between the pipe and the coupling installation is carried out by bolts taking into account the geometry of the pipe.

4) Preparation of sealant and sealing the edges of the annular gap of the coupling.

5) Preparation of the composite composition. Depending on its quantity, is used mixer power-operated or manual mixing device.

6) Filling the composite structure of the annular gap of the coupling by a pressure pump with acceptance hopper.



the scheme of filling of the coupling composite composition

7) After curing the composite material by using a grinder cut off flush input and output connections, control and adjustment bolts.

Our Customers

1) Subsidiaries of JSC "AK "Transneft". :

- *ООО «Транснефть – Балтика»*
- *АО «Транснефть – Верхняя Волга»*
- *ООО «Транснефть – Восток»*
- *АО «Транснефть – Дружба»*
- *АО «Транснефть – Приволга»*
- *АО «Транснефть – Сибирь»*
- *АО «Транснефть – Север»*
- *АО «Транснефть – Западная Сибирь»*
- *АО «Транснефть - Урал»*
- *АО «Транснефть – Центральная Сибирь»*
- *АО «Черномортранснефть»*
- *АО «Юго-Запад транснефтепродукт»*

2) Subsidiaries of PJSC "Gazprom":
- ОАО «Газпром трансгаз Беларусь»

3) ОАО «Гомельтранснефть Дружба»

4) CPC (Caspian Pipeline Consortium);

5) Contractors:
- *ООО «Газпромизоляция»*
- *ООО «Газпромтрубопроводстрой»*
- *ООО «ИНПП «ВНИИСТ–Подолье»*
- *ООО «ТРУБОПРОВОДСТРОЙ»*