The Yaroslavl Plant
of Composite Materials

The Yaroslavl Plant of Composite Materials

Mission

of the Yaroslavl Plant of Composite Materials

is introducing composite reinforcement materials into the international market as an innovative equivalent of steel reinforcement which will help bring down construction costs.

Introduction of composite materials on the design level in the manner which will bust the conservatism and current inertia of the construction industry.

Composite materials are solid products, such products consist of one or more materials which differ in their shape and/or phase state, and/or chemical composition, and/or properties, are bound with a physical bond and have an interface between the basic material (matrix) and its filler, including reinforcing fillers.

Information about the Plant

The Yaroslavl Plant of Composite Materials is a dynamically developing enterprise which manufactures glass-plastic and basalt-plastic composite reinforcement, composite nets and flexible bonds.

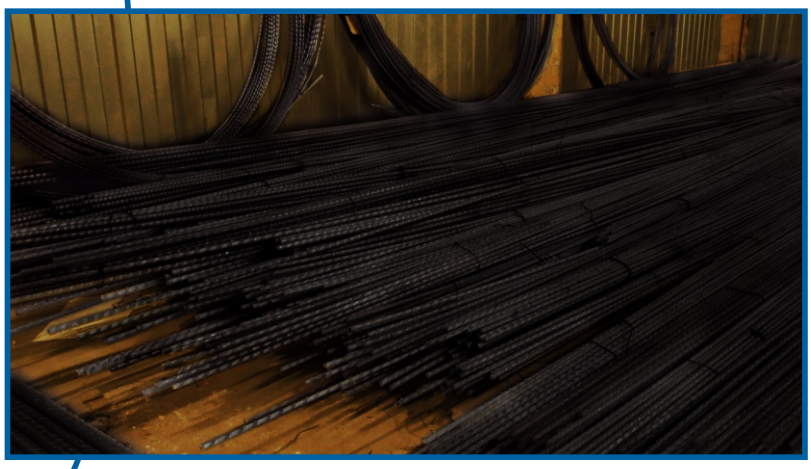
In a relatively short period of time the project has evolved from a business idea to develop new types of composite reinforcing elements to a production of those elements with own-made equipment.

Since February 2011 OOO YAZK has been developing and improving modern process lines for manufacturing composite reinforcement materials that are used both in civil and industrial construction in order to reinforce concrete. Such lines can produce reinforcement materials of various lengths and diameters depending on their further intended use.

The process of production of composite reinforcement is based on application of cutting-edge technologies for manufacturing modern construction materials. Products of our plant feature a high quality level and a competitive price.

Modern reinforcement must conform to certain requirements not only in terms of specifications and performance but also in terms of high quality. Therefore, in January 2014 a government standard GOST Composite Polymer Reinforcement for Concrete Structures was issued. This GOST is aimed at improving quality of composite reinforcement and will bind those domestic reinforcement manufacturers who developed and implemented their own specifications for their plants based on material and production capabilities of their companies to meet the norms of the national manufacturing standard.

For years of its operation our plant has proven to be a reliable supplier of quality products at a favourable price.



Composite reinforcement materials – nanotechnologies serve production needs

Nowadays in Russia glass composite reinforcement is getting more and more popular. This material was invented in the USSR in 1970s and was undeservingly abandoned due to the high cost of raw materials and manufacturing process. It must be mentioned that in the West its wide use started as early as 1990s due to a number of reasons, for example construction in corrosive environments where steel reinforcement would be affected quickly and attempts to improve energy efficiency of buildings.

We can say that the time of composite materials has come. They will gradually replace obsolete steel reinforcement in construction. Unique technologies result in ultrastrong, robust, high quality material that meets all current requirements of quality, safety and durability while it can fairly compete with traditional materials in price.

Advantages of composite materials:

- **Low thermal conductivity.** 0.48 W/m2 for glass composite and 56 W/m2 for metal. Glass composite is 100 less thermoconductive.
- **High corrosion and chemical resistance.** Glass composite does not corrode since it contains no metal and is resistant to the aggressive alkaline environment of the solution (concrete).
- **Low density.** Glass composite weighs 5 times less and is 2,5 stronger than metal with the same diameter.
- **Cost effectiveness.** Composite materials are cheaper than metal materials.
- **Strength and durability.** Stronger than metal and retains physical and mechanical properties in alkaline and warm moist environments.

Glass composite reinforcement has thermal expansion coefficient corresponding to that of concrete. This feature helps avoid crack formation and breakthrough in the layer of concrete that is why this kind of reinforcement widely used for constructing offshore and harbor facilities, highways, foundations, thermally efficient enclosing structures, electric power pylons and utility networks.

Depending on design requirements reinforcement may be made of fiberglass, basalt fiber, carbon fiber, aramid fiber or a combination of such materials.

Flexible bonds

Flexible bonds of polymer composites are used to interconnect layers within outer multilayer walls. This technology is often used to construct buildings with improved thermal insulation properties.

Since materials to be bound may differ in density and reaction to temperature changes the binding material must be flexible and thermally non-conductive, and such are properties of flexible bonds.

Flexible bonds in multilayered walls with warmth keeping insulation and an outer brick or stone layer must ensure flexibility towards force, thermal shrinking and vertical shrinkage deformations.

By using flexible bonds of composite materials a range of other unique advantages characteristic of modern buildings can be achieved such as magnetic enertness.

Composite reinforcement applications

- Reinforcement is used for industrial, civil and highway construction.
- Use in concrete structures of buildings and various purpose facilities:
  - For light and heavy concrete;
  - For layered masonry;
  - As flexible bonds of three-layered stone walls as well as of civil, industrial and agricultural construction facilities which comprise a bearing layer, an outer layer and a layer of rigid thermal insulation;
  - As nets and rods in structures.
- Bank protection.
- Offshore and port-side facilities.
- Sewer systems, land development and drainage.
- Road beds and fencing.
- Infrastructure of chemical productions.
- Concrete works with prestressed and unstressed reinforcing (lightning pillars, electric power pylons, insulating cross-beams of power transmission lines; road and walkway slabs, fencing slabs, curbs, poles and supports; railroad sleepers; shaped parts for mains, pipe and duct utilities systems (central heating, cable ducts).
- Construction of houses with permanent shuttering.
- May be effective for constructing seismic protection structures of both existing and new buildings and facilities.

By applying composite glass plastic it is possible to achieve a 2-3 times longer life of structures if compared to metal reinforcement, especially in corrosive environments including environments containing chloride salts, alkalies and acids.

Comparative characteristic of composite and metal reinforcement

Characteristic	Metal reinforcement class A-III (A400C) GOST 5781-82	Glass-plastic reinforcement GOST 31938-2012
Material	Steel	Polymer bound epoxy-resin based glass roving
Tensile strength, Mpa	390	800
Elongation, %	14	2,2
Elasticity modulus, Mpa	200 000	50 000
Compression strength, Mpa	390	300
Cross-cutting strength, Mpa	273	150
Corrosion resistance	Corrosive	Non-corrosive material
Thermal conductivity	Thermally conductive	Thermally non-conductive
Electrical conductivity	Electrically conductive	Dielectric
Profiles manufactures, diam. mm	6-80	4-22
Length, m	6-12	Upon request of the customer
Environmental safety	Safe	Non toxic, class 4 of human and environmental exposure hazard class (low hazard)
Life	In accordance with construction norms	Minimum anticipated life – 80 years
Conventional replacement of reinforcement based on physical and mechanical properties, diam. mm	6 A-III 8 A-III 10 A-III 12 A-III 14 A-III 16 A-III 18 A-III 20 A-III	ASK 4 ASK 5 ASK 6 ASK 8 ASK 10 ASK 12 ASK 14 ASK 16
Weight (equal strength replacement), kg	6 A-III – 0.222 8 A-III – 0.395 10 A-III – 0.67 12 A-III – 0.92 14 A-III – 1.28 16 A-III – 1.58 18 A-III – 2.00 20 A-III – 2.47	ASK 4 – 0.02 ASK 5 – 0.035 ASK 6 – 0.05 ASK 8 – 0.07 ASK 10 – 0.12 ASK 12 – 0.20 ASK 14 – 0.26 ASK 16 – 0.35

ASK – glass composite reinforcement, GCR

The Yaroslavl Plant of Composite Materials

Bases of calculation method for replacing metal reinforcement with glass composite reinforcement

Strength properties of metal and glass composite are used as basis for calculations.

Rupture strength or tensile strength σ:

- For metal σ_{met} = 390 MPa (reference)
- For composite σ_{gcr} = 800 MPa (GOST 31938-2012);

$\sigma_{met} / \sigma_{gcr}$ ratio – determines the equivalent factor:

$K = \sigma_{met} / \sigma_{gcr} = 800/390 = 2,05$

Since $\sigma_{met} / \sigma_{gcr}$ designates load per unit of section area the equivalent factor can be used for the ratio of sizes of the cross section

$F_{gcr} = F_{me} / K,$

Where F_{gcr} is cross-section area for glass-plastic reinforcement, F_{met} cross-section area for metal reinforcement,

Or

$$\frac{\pi D^2}{4}_{ask} = \frac{\pi D^2}{4}_{met} / K, \text{ where}$$

D_{gcr} and D_{met} are diameters of cross-section of glass-plastic and metal reinforcement, therefore

$D_{gcr} = \sqrt{D^2_{met}} / K,$

D_{gcr} D_{met} = **0,488**

At K = 2,05, the result is $\mathbf{D_{gcr} = 0,488\, D_{met}}$,

Since reinforcement $\mathbf{D_{met}}$ A3 (a-400) has elasticity modulus E_g , MPa – 200.000 (reference), and reinforcement $\mathbf{D_{gcr}}$ has ASK elasticity modulus E_g , MPa – 50.000 (GOST 31938-2012), we shall use a multiplying ratio for durability increase, $\mathbf{K_1}$ **= от 1,3 до 1,7** which increases along with the cross-section change. The result is as follows:

$\mathbf{D_{ack} = 0,488\, D_{мет}\, K_1}$

Raw materials

Anticorrosive, alkali-resistant fiberglass (roving) with aminosilane oil agent is the base of glass composite reinforcement.

Applied roving brand:
EC 17 – TEX 1200 – SE1200
EC 24 – TEX 2400 – SE1200
EC 24 – TEX 4800 – SE1500
EC 35 – TEX 9600 – Se1500

The first letter symbols refer to the manufacturer, the first number (17, 24, 33, 35) is thickness of elementary fibers, the second number (1200, 2400, 4800, 9600), tex fibers, is roving weight per a linear kilometer, the third number (SE1200, SE1500) is oil agent brand.

Epoxy-resin based polymeric compound is used as a binder.

The main component of the compound is epoxy resin ED-20 or equivalents, such as CYD-128, isomethyl tetrahydrophthalic anhydride, used as a hardener (Iso MTHPHA), special additives: alkofen and modifier DEG-1 or DEG-11.

Production process

Production of glass composite reinforcement is based on needletrusion process.

Fiberglass is pulled through a bath containing compound in order to soak and saturate roving with the liquid polymer.

After soaking fibers are pressed in order to remove excessive polymer from the glass fiber.

Fibers are shaped as reinforcement carcass by passing

through an extrusion device of a certain diameter followed by winding of pretwisted periodic profile.

The shapes carcass is pulled through a hating chamber where temperature of 180-300°C is maintained.

In the heating chamber the compound is polymerized. In order to accelerate the cooling process reinforcement material is pulled through a water bath. The reinforcement material is pulled by a pulling station with propylene rollers and then cut to the required size.

Product range

Glass composite reinforcement is manufactured by needletrusion with 2 mm to 32 mm diameter.

Glass roving and compound are dosed in accordance with the reinforcement cross-section size.

The Yaroslavl Plant of Composite Materials,
member of Chamber of Commerce and Industry

СИСТЕМА СЕРТИФИКАЦИИ ГОСТ Р
ФЕДЕРАЛЬНОЕ АГЕНТСТВО ПО ТЕХНИЧЕСКОМУ РЕГУЛИРОВАНИЮ И МЕТРОЛОГИИ

СЕРТИФИКАТ СООТВЕТСТВИЯ

№ РОСС RU.АИ32.Н02969

Срок действия с 11.02.2014 по 10.02.2017

№ 0839662

ОРГАН ПО СЕРТИФИКАЦИИ рег. № РОСС RU.0001.10АИ32 Общество с ограниченной ответственностью "Дальневосточный сертификационный центр" (ОГРН 1102539005634). 690105,Российская Федерация, г. Владивосток, ул. Бородинская, д. 46/50. Телефон (423) 2345019, 2328423, 2345019, факс (423) 2345019, 2328423, 2345019, адрес электронной почты dvcsi32@mail.ru.

ПРОДУКЦИЯ Арматура композитная полимерна конструкций, тип АСК, АБК, АКК, Ф 4мм – Ф 24мм, выпуск ГОСТ Р 31938-2012.

СООТВЕТСТВУЕТ ТРЕБОВАНИЯМ НОРМА ГОСТ Р 31938-2012

ИЗГОТОВИТЕЛЬ Общество с ограниченной отв 7604230627. Адрес: 150002, г. Ярославль, ул. Стачек,

СЕРТИФИКАТ ВЫДАН Общество с ограничен композитов». ИНН: 7604230627. Адрес: 150002, г. Яр

НА ОСНОВАНИИ Протокол исследований № 1 ООО «ПродМашТест», рег. № РОСС RU.0001.21АВ7 14, стр. 1

ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ Схем

Руководитель органа

М.П.

Эксперт

Сертификат не применяется

СИСТЕМА СЕРТИФИКАЦИИ ГОСТ Р
ФЕДЕРАЛЬНОЕ АГЕНТСТВО ПО ТЕХНИЧЕСКОМУ РЕГУЛИРОВАНИЮ И МЕТРОЛОГИИ

СЕРТИФИКАТ СООТВЕТСТВИЯ

№ РОСС RU.АГ92.Н05983

Срок действия с 11.06.2013 по 10.06.2016

№ 1220416

ПО СЕРТИФИКАЦИИ рег. № РОСС RU.0001.11АГ92.Орган по сертификации ции ООО "КапиталСтрой". 115093, г. Москва, пер. Партийный, 1, корп. 58, стр. 1, тел. (499) 7, E-mail Kapitalstroy-sert@bk.ru.

УКЦИЯ Сетки т.м. ООО "ЯЗК": СБП-Д, СБП-С, ССП-Д, ССП-Ф. 2655746-003-2013. ный выпуск.

код ОК 005 (ОКП): 59 5287

код ТН ВЭД России: 7019 90 990 0

627.

тательная лаборатория снодарский край, г.

Чечерников

Гром

фикации

РОСГАРАНТ

Орган по сертификации системы «РосГарант»
«Центр сертификации и обучения»
109052, г. Москва, ул. Нижегородская, д. 47

СЕРТИФИКАТ СООТВЕТСТВИЯ

N РОСС RU.3761.04ХЮУ0/СМК.01672

Выдан

**Обществу с ограниченной ответственностью
«Ярославский завод композитов»**

150002, г. Ярославль, ул. Стачек, д. 63

ИНН 7604230627

Настоящий сертификат удостоверяет,
что система менеджмента качества применительно к выполнению работ указанных в Приложении

соответствует требованиям:

ГОСТ ISO 9001-2011

Настоящий сертификат обязывает организацию поддерживать состояние выполняемых работ в соответствии с вышеуказанным стандартом, что будет находиться под контролем органа по сертификации системы «РосГарант» и подтверждаться при прохождении ежегодного инспекционного контроля.

Дата выдачи: 04 октября 2013 г.

Срок действия до: 04 октября 2016 г.

Центр сертификации и обучения

Л.Н. Волкова
Руководитель органа

С.В. Зиновьева
Эксперт

Система сертификации «РосГарант» зарегистрирована в едином реестре систем добровольной сертификации Федерального агентства по техническому регулированию и метрологии.
Регистрационный N: РОСС RU.3761.04ХЮУ0

001826

The Yaroslavl Plant of Composite Materials,
Limited Liability Company
d. 63-ul. Stachek, Yaroslavl, 150002
Phone: 8-800-200-48-52, calls are free all over Russia
Phone, Yaroslavl: +7(4852) 20-08-08
Phone, Moscow: +7(499) 340-69-81

www.yazk.ru