SECTION 8. INNOVATIVE TECHNOLOGIES

8.1 Modifier contrrust as anticorrosion innovative tool for technological progress and environmental protection

Experience and research in the long-term operation of metal products show that the most important factor in protecting and preventing corrosion is the reliable and correct preparation of metal surfaces for painting. It is easier and more reliable to prevent the corrosion process than to stop and repair the affected parts and products. Applying innovations, research and development with the appropriate support of government and society can benefit the economy and the environment.

The study of the types of corrosion and the processes that are tested at the beginning and during the corrosion of metals to find reliable reagents for damping corrosion micro sources and create a reliable film (protective layer) on the surface before painting under which it is impossible to start corrosion under the protective layer. Saving metal-based objects through the effective use of innovative technologies is a very important issue, but equally important is the creation of conditions and the support for innovation activity that creates innovation.

Many studies of corrosion processes and the arrangement of protective coatings are known. There are also many substances for cleaning surfaces, inhibitors, sprays, impurities, etc. Ecologically safe, effective means of plant origin are not presented. There is already a patented CONTRRUST converter Patent No. (11) 61544, by L. Vysotska. But the technology of its application and market promotion is still quite slow. Several monographs and dozens of articles have been published on the topic of the use of the CONTRRUST ecomodifier by authors (Savenko VI, Vashenko VM, Vysotska LM, Plugin AA, Mashkov OA, Kushchenko IV, Korolev VP, Zhuravsky OD, Korotiev AM, Kyslyuk D.Ya., Maksimov S.Yu., Polosenko OV, Klyueva VV and many others), many reports were made at international conferences, the work was marked by many awards, certificates, but as noted in the works of another plan (Shkvorets YF, Ron Hubbard, Kalyta PY, Savenko VI, Prigogine AI, etc.) it is very important that Rennes favorable conditions

and support innovation by the government and society, while the invention and innovation are the driving force of progress.

Promotion of the CONTRRUST rust converter and the spread of new technologies for protection of metals from corrosion in an environmentally friendly way, a way of preventing the start of corrosion processes with subsequent protective surface painting. Advanced science, high technology, education and staff development and the creation of the genome of business and spiritual excellence can ensure the company leadership in production and society. Currently the losses from corrosion in industrialized countries reach up to 3-5 per cent from the national income. It mainly concerns metallurgic and chemical enterprises, oil and gas pipelines, and floating crafts, which elements and structures operate in a highly corrosive environment. The inner surface of cargo compartments, liquid ballast tanks, fuel supplies, pipelines and other structures are subject to severe corrosion under the influence of seawater and oil products with a high level of sulfur. The carcass of reinforced concrete structures is of great significance since it takes in the pulling stress from the external load, providing the stability of the construction. Therefore, carcass corrosion is inadmissible. It leads to destructing the adhesion between the concrete and carcass, cracking and delaminating the protective concrete layer; moreover, it results in pre-stress losses in pre-stressed elements, which causes the destruction of buildings and structures. The total damage of corrosion sums up to billions of dollars because of

emergencies and ecological disasters. It is quite difficult to calculate all the losses from standstills and production decline of the equipment that is subject to corrosion, the disruption of technological processes, accidents caused by the stability decrease of metal structures, the environment pollution, payment of insurance benefits, and, finally, lethal outcomes. The presence of oxygen and water on the surface of iron products results in creating iron oxides and hydroxides, which in everyday life is called rust. Rust ends up in water mostly in the form of colloidal particles, but there can also be bigger particles (incrustations) – an oxide mixture. The corrosion of water lines leads to the biological contamination of water, which poses a potential threat to our health. The Committee of Maritime security imposed a new requirement on the availability of corrosion protection

systems in source water tanks, which are the most effective methods in any defect repair during the operation process examination. A rust modifier “Contrrust” has been invented by specialists and the PC “Ruslan and Lyudmila” authoring team. It has been developed as the main preventive tool for surfaces that are damaged by rust; it penetrates into the metal shell on a molecular level, blocks the rust within it, protects the surface from further rusting processes without damaging its structure. “Contrrust” is a universal, ecologically sound, plant-based anti-rust agent that allows us to eliminate corrosion during the construction, and operation process of metal constructions. The whole range of redox reactions results in creating a black with blue shimmer metal polymer foil with the thickness of 30-50 μm , the adhesion of 1 point (ISO 4618:2014) and impact index 50 cm (ISO 8501 – 1) on the surface of the deoxidized metal. The transformative technology of “Contrrust” with an average thickness of rust within 300 μm results in 100 per cent of purity. “Contrrust” – an ultimate protection against corrosion. “CONTRRUST” - rust modifier, protective primer of high efficiency, non-toxic, environmentally safe. One component. The main components which make up the “Contrrust” are: tanning extracts, succinic, citric, oxalic acid and other food acids, water. Fabricated in three modifications: a) liquid; b) viscous substance; c) powder

Does not contain any toxic elements such as lead or zinc chromate, phosphate acid, safe for human life and health during its manufacture and use.

Not flammable. Easy to use. Can be used in hardly-accessed areas of any configuration. Replaces corrosion removal, and serves as the primer layer. Replaces interim working primer. Positive effect on the welding. Restores and protects surface. Should be applied to tenacious layer of iron scale. Has good diffusion. Blocks centers of corrosion in metal shells. Dries quickly. No need to too wash off the surface.

Converts rust of 100-300 microns thick into protective anticorrosive film -primer, which blocks the surface from repeated corrosion over time.

Product consumption: 40-80 ml/m^2 . Economic effect reaches 60%.

- CONTRRUST blocks corrosion centers in metal surface holes, dries quickly, doesn't need washing down thereof from a metal surface, quickens a technological process

of metal surface coating and increases terms of exploitation of metal constructions without decreasing a normative exploitation in different environments according to the requirements of ISO 12994. Provides with a reliable adhesion strength relative to lacquer and insulation coatings;

- “Contrrust” substitutes sandblast, mechanical surface cleaning (local places, welding seams are cleaned), it is recommended for processing of rust damaged surfaces metal constructions and in cases when mechanical or sandblast cleaning is complicated or economically inexpedient;

Drying within 20-30 min. Under normal conditions, it forms dark-blue or black layer which is complicated ferric/ferric acid organic compounding, which provides with anti-corrosion protection. Protective layer may be used as a primer under different lacquer and insulation materials;

- The application of rust converter "Contrrust" allowed is surface painting 3rd - 4th level of cleaning from oxides with application of technological schemes of surface preparation 19, 23, 24 Table 4, under GOST 9.402-80 . If the technological process requires a preparation of a surface for SA 2,5 and other, the rust converter "Contrrust" is applied to blocking the corrosion centers which appear due to oxygen and moisture joining.

- Increasing the life of the coated system by 2-4 times (in closed spaces - in 6-9 times), and even longer – for other types of coatings;

- Reduction of labor costs, the cost and timing of metal- construction works by 50-70%;

- Complete safety and ease of use in any way (by brush, roller or spray, syringe, etc.)
- use without respirators and expensive arsenal of tools and accessories;

- Indispensable in the treatment of metal structures of particularly complex configuration (from seaport facilities to underground and above ground pipelines);

- Blocks and suppresses hidden deep corrosion - due to high diffusivity and organic components;

- Surface quality is maintained for many months (in an enclosed space - more than a year!) - With the normative requirements of GOST of Ukraine 9.402-80 only "24 hours ".

"Contrrust" is used at any time of the year for the treatment of steel pipes, cable sheath, roofs, reinforcing mesh, nodes pairing, tanks , reservoirs, pipelines, metal structures in mines, power plants and at nuclear power plants in the service station, ship repair and building, railway works, underground constructions, food processing equipment, to detect corrosion cells in pressure vessels and structures of special products, in particular stainless, as well as micro-cracks and pitting during the manufacture of steel materials for special purposes and in many sectors of the economy, in closed inaccessible spaces on stationary and moving civilian and military objects (bulkhead ballast tanks, holds, submarines, tankers, tanks, armored vehicles, tanks for drinking water and food storage, vehicles, on the valve of sandwich panels, ventilated facades, walls and new type roofings, etc.).

Can be used to isolation of steel and concrete structures in accordance with the requirements of EN 1504-7 "Products and systems for the protection and repair of concrete structures - Definitions, requirements, quality control and evaluation of conformity - Part 7: Reinforcement corrosion protection".

Before applying the "Contrrust" the surface needs to be cleaned from grease, dirt, ill keep paints, primers, isolation. Formation and loose rust is to be removed with a metal brush, and wiped with a damp cloth.

"Contrrust" is applied to dry or wet surface with a continuous uniform layer without streaks in any convenient way: brush, roller, means towels, airless spray, etc.

After applying the rust converter it does NOT need to be rinsed or cleaned, and after drying the coating can be directly applied in accordance with needed coating requirements.

For example: When repairing a vehicle (body, bottom and in other accessible places) use a metal brush to clean the surface and an emery paper to polish the surface , thus, the surface should remain only with the "noble" rust, that is "red rust" Passages and channels in the hardly available spaces are to be cleaned by any sharp tool (a thin knife , etc.). Fatty place should be degreased. Other dismounted parts of the car (caliper, metal disk, etc.) should be heated to +16+35 °C (heat from sun shown might be enough) and treated with "Contrrust".

Having assured that the surface is dried up and no rust spots remain on the surface (and if there are still present – should be treated with rust-converter locally – the primer should be applied (sealer, insulation), in hardly accessible places - should be splashed inside. For the treatment of the inner surface of the car through the hole thresholds introduce a rubber tube to the end of the threshold, pour a rust converter, gradually pulling the tube out.

At negative temperatures, the process of applying rust-converter is recommended to be supported by adding alcohol or warming the surface itself.

The warranty period for the «Contrust» protection applied according to the manufacturer's instructions is no less than the warranty period of the paint coating that will be applied on the surface after treatment with «Contrust» (including coatings that can withstand temperatures above 300 ° C) In all cases, we recommend using coatings or paint after treatment by «Contrust».

"CONTRRUST" modification "B" (powder, which can be prepared under extreme conditions for modification "A") allows elimination of point and gap corrosion in the course of metalwork.

The economic effect of using rust modifier on different objects, structures, and metal structures is currently over UAH 62 million. including:

Kyiv, str. Solomianskaya 2a, customer - Court of Appeal, designer - CJSC "GIPROtsivilprombud" - economic effect - 30,0 million UAH;

PJSC «PVI-ZIT Oil and Gas» as a contractor for Kutaisi-Abasha (Georgia) gas pipeline - UAH 10.2 million, Lviv Bobrivka - UAH 0.743 million, Brest (Belarus) - UAH 0.739 million; Lukoil - Karpatnaftochim Company - UAH 6.41 million; Kharkiv, Sumy market - contractor of LLC Spetsstroy montazh - Ukraine - UAH 5.8 million and other.

At the present stage, from the experience of previous years, success can only be achieved with government support in the form of creating favorable conditions for the activities of organizations.

CONCLUSIONS

1. On the basis of basic researches of corrosion mechanisms (including under the protective coating), methods of estimation of a condition and forecasting of corrosion

resistance of metal-containing structures and possible terms of their failure and possible ways of prolongation of service life were created and implemented.

2. The newest technology of preparation of the corroded surface with the use of the CONTRRUST rust modifier (hi-tech technology), which currently has no naturally analogues, is proposed and introduced in the industry.

3. On the basis of the conducted researches the rational technology of surface preparation at drawing various types of paints and varnishes on metal structures of different technological purpose is developed.

4. Designs of coating systems for corrosion protection of oil and gas pipelines, valuable metal equipment, machines and other metal products are proposed. Studies and tests have shown that the proposed coating systems meet the required regulatory requirements to ensure long-term corrosion protection of metal products and can have great prospects, first of all, for the repair of existing facilities.

5. Methods for diagnostics, assessment and monitoring of the condition of metal structures and products developed and implemented at the state level (DSTU).

6. The overall economic impact of the implementation of the work is over UAH 62 million. including: Kyiv, str. Solomenska 2a, customer - Court of Appeal, economic impact - UAH 30.0 million; at Kutaisi-Abash gas pipelines (Georgia) - UAH 10.2 million, Lviv-Bobrivka - UAH 0.743 million, Brest (Belarus) - UAH 0.739 million, Karpatnaftokhim - UAH 6.41 million; Kharkiv, Sumy market – UAH 5.8 million; Temple, Kyiv, Michurina str. 64 - 981 thousand UAH, objects of the defense complex of Ukraine, including Zhytomyr BTZ, Shepetivska RE, Mykolayiv BP, and others.

7. Success can only be achieved with government support in the form of creating favorable conditions for the activities of organizations. The future leading position of any company, also a production one, is determined by the ability of leaders and all personnel to master high technology innovations, to generate and quickly implement their inventions and discoveries.