Environmental safety of galvanic cyber-production

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Abstract. The galvanic production is an industry direction to produce hazardous for environment technological wastes during the technological operations completion process. The innovative approach to project the galvanic production relates to the engineer cyber-systems (CS) involvement into the cleaning facilities infrastructure to neutralize the industrial wastes. Each CS is specialized in cleaning a particular type of waste until there is only sediment left and hazardous matters are crystallized. The engineer and industrial CS are united with a pipeline communication, which are resistant enough against the wastes aggressive solutions. A separate channel of cleaning is an administrative and household channel where wastes with biological contaminations are being circulated. There is an infrastructure system scheme for the advanced galvanic production cleaning facilities equipped with wastes neutralization engineer CS. The cleaning technologies are described to provide the residue levels of contamination into the outlet galvanic production collecting units to influence minimum-ly the ecology.

1. Introduction

The galvanic production ecology engineering is an Industry 4.0 resource preserving direction, which is an integral part of the business owner mind if they produce the metallic construction [1]. The galvanic technics use chemical formula and aggressive technological media, which interaction with metallic and plastic items produce the good items and residue hazardous for the environment [2, 3].

The galvanic has a direct negative influence on the soil and grounds and water reserves, which are in vicinity to the company [4]. To minimize the galvanic production influence on the environment is a clear priority of the company industrial policy and provides methods and means of engineer cyber-systems (ECS), which together with hydro and technical collecting units of the cleaning facilities system [5, 6].

To project and construct the cleaning facilities and also the permissible level of left contaminations are strictly regulated with international nature safety laws to protect flora and fauna [7, 8]. The household disposal units must be cleaned and worked out technological substances left after the galvanic process must be reduced until the environment safe level and must correspond the self-cleaning capabilities of the nearby eco systems [9].

To make the cleaning facilities and to establish the ECS depends on physical and chemical methods
used in a galvanic company and is done with an individual project taking into account the landscape special points and being supported over there the sanitary regime technical regulations [10, 11].

The galvanic production waste technological cleaning history development experience established for the Industry 3.0 companies the positive results are the most perspective approach to provide ecological engineering with some module solutions, which can be used for the second time [12]. The module solutions of the cleaning facilities infrastructure correspond the ECS technologies to let with combining methods and mathematical calculations to design taking out water collecting units and local pump installations with prognosticated quality of the waste neutralization [13, 14].

2. Galvanic production and natural ecosystems interaction

To construct a production company of galvanic specialty are permitted and controlled with the State institute, which makes the nature safety surveillance. Ecology monitoring and industrial production safety are the territory innovative development perspective plan components defined by the government to realize the Industry 4.0 pilot projects. A galvanic production section photograph with automatic load (unload) of the items is given in figure 1.

Figure 1. A galvanic production section with automatic load (unload) of items.

The production projects have investment attractiveness when the erection of industrial objects in earth premises having engineer communications and one near the water reserves. The surface waters vicinity gives the galvanic production the necessary water resources, which let it build cleaning facilities efficient systems to minimize the industrial wastes left amount.

The natural ecosystem influences significantly the galvanic production competitive state, which gives the industry the relatively cheap water resources and hydro energy resources. The reduced household expenses give a positive effect of the metal and plastic items being manufactured self-cost and reduces the end item cost. The cheap electric energy reduces the investor capital expenses to erect a new industrial object and reduces the time of the galvanic production innovative project cost returning.

The company connection points to the engineer nets presence reduces the project development estimated cost and lets it use typical solutions to make the cleaning facilities infrastructure for special
cyber-systems (CS). The company water distributing communications location plan and the scheme of the external water providing (water taking out) nets are basic components of the galvanic production projects.

Before to construct a new industrial object they organize the engineer and geology works (geodesy) to define the ground complex properties where the basic company construction will be installed. A galvanic production project must be approved with profile state institutes designing city formation plans to occupy the territory where the documentation will be ecologically checked and other.

To design galvanic production cleaning facility is defined with the industrial company wastes technical characteristics being processed after technological processes. The quality requirements to clean up the running water is deemed to be estimated ECS productivity with a long term durability reserve of its exploitation properties. The decisive factor to characterize the ECS efficiency is the company running water ecological safety for the environment.

To control the cleaning facilities infrastructure and some ECS is done with the intellectual environment to collect and analyze the galvanic production technical characteristics. Each engineer infrastructure component through a system of sample checking to evaluate the contaminating substances level into circulating technical substances into the pipeline and is being translated into the intellectual environment registered with the measuring results. The intellectual environment automatically defines to which ECS and in which quantity will be supplied the technological substances to be neutralized.

A cleaning facilities complex unites water supply reserves and technical pipelines with production and ECS certified with ecological safety standards for the galvanic. The cleaning systems functional capabilities is calculated in the stage of the industrial object construction and may equally increase the ECS productivity and also to expand the contaminants nomenclature to be neutralized. The cleaning facilities collecting commuters done with the pipeline connections by-pass scheme to provide unobstructed specialist access to the company infrastructure when they do preventive maintenance of CS.

3. ECS technology to clean up the technical collecting units

The cleaning facilities equipped with ECS forms in a galvanic production with hydro technical inlet and outlet collecting nets to unite the main technological equipment and the company administrative division. The CS cleaning units are installed in a separate room and provides the different ways to neutralize the wastes.

To choose the way how to neutralize the wastes (restoration, bombarding and other) and the ECS type to support the corresponding cleaning procedure is done automatically with the artificial intelligence technologies. The galvanic production industrial running waters supply into the cleaning CS is provided with pipeline communications coming through the entire company. Each ECS is set to clean up the liquid wastes with a particular type of contaminants.

Expenses for neutralizing reaction agents and CS working modes are done robustly and depends on chemical substances concentration into the production collectors. To analyze the contamination level they use an autonomous CS with a sample extracted from the inlet collector.

The production collectors CS cleaning quality are established with sanitary and hygiene and ecological norms established in the company and depends mostly from the contaminants biohazards class. The galvanic production traditional wastes are salts of colored, valuable and rare earth metals into aggressive substances for the environment made after an electrolyze and also oil products (oils) which are used to take away the item grease.

The direct disposal of the galvanic production wastes into the city sewers collectors is prohibited because the water resources will be contaminated and because electrolyze substances has some aggressive influence over the pipeline materials. Technological processes to neutralize the wastes result into CS outlet with low-toxic components and substances where the primary reaction substances of the initial solutions, which are dangerous for the ecology are dissolved.

Components which cannot be technologically processed with CS form a sediment and are separated in a special collector as some crystal slime which is to be recycled in a recycling factory. The galvanic
production wastes recycling technological processes are formalized today and input with some library instructions into the CS intellectual components. A general scheme to neutralize the wastes is a sequence of an auxiliary production stages after which in step by step the reaction agents are cleaned up.

Taking away of poisonous and contaminating substances from the galvanic production wastes is a water consuming process which creates additional company expenses and increases the self-cost of metallic and plastics items. Increased water consumption is performed when they fill the CS reserves with solved electrolyte baxes to neutralize the solutions, baxes to clean up the items and other. Galvanic inlet and outlet collector nets provides company administrative commutation to return the water cleaned after it was used for the galvanic production into the initial technological reservoirs.

The galvanic engineering nets provides preserving resources technologies built with backing cleaning systems of the industrial collectors. The neutralized substances are not to be used again for the technological processes because they have some residual chemicals concentrations permitted with technical rules and also some contaminating substances which are out through the inlet company collectors which is agreed with the city general cleaning facilities (stations).

The galvanic production intellectual environment equipped with the industrial collectors cleaning ECS scheme is given in figure 2.

4. Conclusion
The Industry 4.0 galvanic production is fully automatic but the CS it contains must be repaired and
preventively maintained. Humans restore a CS and for this purpose the industrial object engineering communications contain some administrative and household sewers.

To unite industrial pipelines with technological substances and the pipelines of the household collectors is prohibited. But the household collectors as much as technological ones contain contaminations hazardous for the environment. The biological wastes contaminate the household collectors and they must be neutralized. To sanitize and clean the biological wastes there is a special class of ECS, which is separately installed in the galvanic production infrastructure.

To project and construct an industrial object some engineer solutions must be reserved to provide an emergency drop of the industrial running water. The emergency sewers is engaged very rarely only in the case of emergency in the galvanic production like a technical catastrophe. An emergency sewers have the same technological requirements of the technical rules as the primary cleaning facilities.

A galvanic production is a dangerous industrial object, which could potentially be very negative for the environment in effect. The galvanic production ecological safety and the engineer nets functionality (cyber-systems) of the cleaning facilities infrastructure is a base of the industry nature safe treatment and to minimize the technical risks.

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