Solid industrial waste management cyber-administration

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Abstract. The modern production defective product is solid industrial wastes, which must be manipulated with effectively designed technical solutions. The solid wastes are done with processing through the production cyber-systems functionality and are material pieces and raw materials left-overs, which have some negative effect for the environment and human health, which could be useful for the industry after the secondary recycling. The solid wastes collection and separation in a production are the rational nature consumption technologies elements to provide the ecology technical influence lower level. In the automatic production conditions the solid industrial wastes manipulation mechanisms are specially actual. There is a company infrastructure scheme, which is necessary to collect and primarily separate the solid industrial wastes in a production section. There is a sorting out complex scheme of the separation final stages and solid industrial wastes collective storage before they are to be shipped to a recycling factory. The ecologically dangerous industrial wastes manipulation technologies are described in an automatic production.

1. Introduction

The modern production ecology policy made with the Industry 4.0 innovative development defined new company approach how to handle the solid industrial wastes after the technological processes are completed [1, 2]. The techno-sphere safety provision complex solution in the industrial segment requires to implement the stable nature consumption technologies into the industry, which must be selectively collected and processed as solid wastes potentially useful to be used again in the technological cycle [3, 4].

The solid industrial wastes effective handling are realized with the State and private ecology operators created on a recycling factory to gain the secondary item raw material, which expired its life time or which are left-overs of the primary raw materials (inner defects, material pieces and other), which are useless for the current technological processes [5, 6]. The solid wastes secondary processing includes the industry useful components like: metals, timber, organic polymers, plastics, resins and other which could be harmful for the environment and with some perspectives to be used again in a production [7, 8].

The solid industrial wastes detailed processing in a recycling factory is done after some preparation stages, which are done in a smart factory and include a centralized collection, first separation with some criteria and putting into containers some production defects and left-overs of the primary material [9, 10]. Only your own production industrial wastes are to be collected with some residue material...
components and mechanical grease formed in the item manufacturing with automatic cyber-systems (CS) [11, 12].

2. The wastes handling cyber-administrative systems
Technologies how to handle the solid wastes in the fully automated industry conditions engage a lot of processes with some production and engineer cyber-systems (ECS) controlled with the intellectual environment tools. The wastes handling cyber-administrative processes provides selective and mixed the primary raw materials left-overs collection, which are then to be out in a centralized way to a recycling factory [13].

A deep multi-nomenclature sorting-out and its return into the technological cycle of the solid industrial wastes may minimize the company financial expenses and increase the modern industry ecology safety. The wastes reasonable handling prevents from occurring some non-planned company expenses that compensate the technical ecology harm to the State.

Procedures to equip an automatic production with cyber-administrative systems to handle the solid wastes requires to create a specialized sorting out complex in the company to provide the pre-separation and pre-final non-used industrial raw materials left-overs utilization. The sorting-out complex is an auxiliary structure, which separately collects the industrial wastes made in all company technological sections with all types of the production CS. The majority of the solid industrial wastes are produced with packages and blanks production sections [14].

The industry capital investments to develop your own sorting out complexes infrastructure into the near perspective could reduce the company tax payments to utilize the goods in which manufacturing they took place. To minimize the company ecological payments is an effective stimulus to increase the company rent profitability without any significant damage to the environment and the human health [15].

3. Technologies of the industrial wastes collection and pre-separation
Technologies to collect and separate the cyber-production solid industrial wastes for that they use the CS instruments provision including manipulating brushes and air blowing devices. In the end of each technological operation they clean up the production CS working zone after which the mechanical contaminations and solid raw materials left-overs are collected into an embedded low dimension container.

![Figure 1. The company infrastructure scheme necessary to collect and pre-separate the solid industrial wastes in a production section.](image_url)

The container is an easy dismounting specialized CS compartment for the temporal storage for the
wastes and with a radio frequency identification chip. The radio frequency identification technology is used to transmit the container filling data into the intellectual environment and to evaluate the positioning data of each container into the company industrial zone.

The wastes unloading from the CS container is performed with intellectual environment commands to turn around and orient the transport manipulation device to accumulate into multi-section collector of the technological section for non-used into the production processes components. Each collector section is to receive a particular type of solid wastes, which are sub-divided into mechanical, toxic, aggressive and other types of components. The transport manipulator transports the wastes and multi-sectional collector forms the wastes redistributing production unit, which is available in each company technological section.

The wastes sorting out into the collector sections, which are differentiated into universal and special is done with the transport manipulator depending on each production CS technological operation. To synchronize the unloading processes and to fill-in the wastes is done with the intellectual environment from the measuring chips automatically processed data embedded into containers and collector. The company infrastructure scheme necessary to collect and pre-separate the solid industrial wastes in a production section is given in figure 1.

4. The sorting out complex infrastructure to handle the wastes

The technological section multi-section collector is available to unload with the sorting out complex maneuver transport manipulators, which are ECS. To put into containers the sorting out complex wastes requires to centralize the raw materials left-overs collection from the entire production and their final separation before they are shipped into a recycling factory.

The solid wastes separation is done according to the collector sections specialty where the primary classifier is the material and substances properties, which are to be processed for the second time. A way to separate the wastes is based on production CS technological processes correspondence tables and raw material left-overs nomenclature, which are formed in each operation.

The transport manipulator fills the collector sections in sequence and place each solid wastes type into its pre-destined changing reservoir of high capacity in the sorting out complex. The manipulator is equipped with collector grasping mechanism (lifters) and turning around devices (turners over) which provide the wastes unloading into the reservoir. The wastes handling mechanical processes into the sorting out complex so the technologies of selective content mixing in all collectors and technologies of subsequent the raw materials left-overs separated storage into the reservoirs.

![Figure 2. The production sorting out complex infrastructure scheme.](image-url)

The reservoirs have the pictorial graphics marking, which is understood with the transport manipulator optical system and for the storage of the industrial wastes huge volumes which are being collected in the production for a long time. The production wastes intermediary storage reduces the company expenses of its periodical taking away and makes cheaper the product being manufactured. The reservoir hydraulic systems make denser (pressing) the wastes being loaded with the transport
manipulator to reduce its volume.

The sorting out complex provides the collection and separated storage of all solid production wastes categories without changing its physical and chemical properties. The production sorting out does not include the utilization on site or the wastes recycling even if the hazardous substances concentration is significantly higher over the permitted level or the wastes detailed separation in all types of the raw materials left-overs.

The separation way being supported in the company provides the solid wastes mixing reservoir storage with high inclusions of any separate useful components, which is to be used in the industry. This method is of low cost for the production and corresponds the second wastes recycling technology (neutralization), which are used in a recycling factory and when the mixed wastes must be separated. The sorting out complex production infrastructure scheme in an industrial production is given in figure 2.

5. Conclusion
The automatic production feature is the item manufacturing technologies CS strict observation. Any defect occurred from a technological failure could be cleared by humans. A non-correctible defect is deemed to be a solid waste (defected part), which is to be returned into the technological cycle after the second recycling.

They say an automatic production is of non-defect category but generally it is not so. A product which does not satisfy the established requirements could be made after some non-conditioned components from the sub-contractors and must be isolated in the company. To restore such a product they require the human intellectual resources and repairing CS, which are collaborative robots.

The production industrial wastes handling requires to create a special infrastructure to provide the collective collection, transporting and pre-separation of the raw materials left-overs where the separation depth corresponds the useful components extraction technologies which are applied in a recycling factory. The solid wastes handling production objects is a component of multi-step machines chain which support the entire rational industry nature application.

The production participation in the wastes handling system is a strategy element of the company responsible attitude to the general bio-sphere or to the nature safety laws in particular. The useful components returning of before extracted from the primary raw material and from the second obtained from the wastes into the technological cycle, which may significantly economize the nature resources some of which are of non-renewable resources class.

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