Nazwa w jęz. angielskim: Machines and Installations in Waste Treatment Processes

Dane dotyczące zajęć:
Information on course:

Jednostka oferująca: Wydział Inżynierii Środowiska i Energetyki // dr hab. inż. Andrzej J. Wandrasz
Course offered by: Faculty of Environmental and Energy Engineering // PhD Eng, Andrzej J. Wandrasz

Język wykładowy:

angielski

Language:

English

Strona WWW:
Course homepage:

Skrócony opis:

Short description:

We are in the twenty-first century. Waste is still generated despite the introduced ideas such as Recycling or Circular Economy. And the resulting stream of waste, especially municipal waste, seems to be getting bigger. New ideas are coming up more and more often, new solutions from limiting production to prohibiting production or reducing a certain amount of packaging ...., today, in the era of broadly understood consumption, we have to face the growing stream of waste. Of course, we must be aware of the fact that the amount of natural and fossil raw materials is decreasing every year, so it is necessary to manage the generated waste in such a way as to reduce the share of fossil raw materials in favor of secondary raw materials. Yes, secondary raw materials, the share of which should be significant in the overall balance of raw materials consumed. However, before such use of secondary raw materials takes place, the resulting waste stream must be subjected to appropriate technological treatments to use the separated secondary raw materials without problems. But how to do it?. What technological processes to use here? Well, in order to implement certain technological assumptions, appropriate installations must be used for this, in which the resulting waste stream is divided into various fractions that can be further used. Installations are one thing, each such installation is equipped with appropriate machines and devices thanks to which the processing of waste into secondary raw materials is possible and feasible.

Opis:

Description:

Lecture:

1. Introduction to the subject of waste management; morphological composition of municipal waste; potential possibilities of processing and application of obtained fractions from municipal waste. Assumptions of the circular economy and the possibility of reusing recovered fractions. Contemporary waste management hierarchy. Energetic use of waste as a source of renewable energy, taking into account different energy demands.
2. Collection of the resulting waste stream, taking into account the specificity of individual fractions and looking at the possibilities of collecting special, hazardous waste. Reloading stations, which are the first stage of the process of processing municipal and municipal-like waste.
3. Technologies and possibilities of waste stream processing. Mechanical processes with the use of specialized machinery and equipment, Technologies for the treatment of non-municipal waste in terms of thermal use. Possibilities of processing municipal waste into moulded/formed fuel.
4. Review of moulded/formed fuel production installations including solid, liquid and gaseous fuel production. Assumptions for this type of fuel, the genesis of this idea. The possibilities of using such fuel, which industry is the recipient?
5. Waste sorting installations. Installations using manual sorting; manual sorting installations supported by selected machinery and equipment; sorting installations automated or using a very advanced machine park allowing for the best possible separation of the waste stream.

6. Introduction to the subject of machines and installations. General presentation of issues divided into stationary machines and installations and the problems of mobile machines and installations. When it comes to stationary machines and installations, we have more room for comparing various possible machine configurations, while mobile installations can be adapted to the type of waste that this installation will have to deal with.
7. Conveyors, their types and types used in waste management. Belt conveyors, conveyor belts used depending on the type of material being transported; conveyors other as screw, scraper, chain, shock and others. Design assumptions, principle of operation and operational parameters.
8. Separators. Types of separators used. Construction and movement assumptions, purpose and application. Drum separators – principle of operation, construction, operating and operating parameters, specific structural elements that increase efficiency. Aerodynamic separators (air), design assumptions, use in installations and as individual devices.
9. Magnetic separators – design, operation, working variants. Non-ferrous metal separators – structural difference between the magnetic separator, application in the technological line, technical and operational parameters. Shock separators – different variants used in waste management, design differences and applications.
10. Grinding. Theoretical basis, division of used shredders. The use of different types and shapes of cutting elements due to the specificity of the material being shredded. Division of shredders due to the further purpose of the shredded material; pre-grinding, proper grinding; division of shredders according to the rotational speed of working elements, universal shredders, specialized shredders (only for one type of waste).
11. Shredders/Grinders – familiarization with a wide range of various available shredders used in waste management, taking into account the specificity of the shredded material and the possibility of further processing of the shredded material.
12. Machines and mobile devices. The idea of such a technological solution using the mobility of machines and devices. The specificity of such a solution is the ability to move the machine in the workplace such as a landfill or work yard, in addition, the advantage of such a solution is the ability to move specific machines over long distances thanks to building it on a wheeled chassis. The specificity of mobile combo machines (several different machines cooperating in one housing), their capabilities used in the processes of processing waste streams of a single-fraction or multi-fraction nature
13. Mobile machinery and equipment; specialized units for waste not only of municipal origin but for waste from construction, debris processing, waste from forest management, machines used for pre-processing of municipal waste as well as individual fractions such as tires or demolition wood.
14. Accompanying machinery and equipment. In addition to the entire machine park used in waste processing processes, the participation of accompanying machinery and equipment such as specialized loaders, balers, granulators (pellet machines), bag rippers, perforators for plastic bottles, metal detectors, devices supporting the proper distribution of the incoming waste stream on the conveyor belt and other previously unpresented machines and devices is of great importance.
15. Waste treatment installations, including selected machinery and equipment. A review of selected engineering projects using the previously presented solutions, taking into account the specificity of the processed waste or waste stream. The lecture and its content is a lecture closing and connecting together the presented topic on machines and installations used in waste management; Recycling; the circular economy; the processing of waste into moulded fuels; separating the waste stream into potential secondary raw materials for reuse.

Lecture:

- **full-time studies: 30 h**

Number of ECTS credits: 2

Literatura:

Bibliography:

1. Tiltmann K.O.: Recycling betrieblicher Abfälle. Neue Techniken und Verfahren zur wirtschaftlichen Wiederverwertung industrieller Rückstände. WEKA Fachverlag für technische Führungskräfte GmbH, Augsburg 2000
2. Wandrasz J.W., Wandrasz A.J.: Paliwa formowane. Wydawnictwo „Seidel-Przywecki" Sp. z o.o., Warszawa 2006
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4. Thomé-Kozmiensky K.J.: Ersatzbrennstoffe 1. Neuruppin TKVerlag Karl Thomé-Kozmiensky, 2001
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6. Tillman D.A., Harding N.S.: Fuels of Opportunity: Characteristics and uses in combustion systems. Wyd. Elsevier 2004
7. Bilitewski B., Härdtle G., Marek K.: Podręcznik Gospodarki Odpadami. Teoria i praktyka. Wydawnictwo „Seidel-Przywecki" Sp. z o.o., Warszawa 2003/2006.
8. Thomè-Kozmiensky K.J., Beckmann M.: Energie aus Abfall. Band 9; TK verlag, Neuruppin 2012
9. Thomè-Kozmiensky K.J., Beckmann M.: Energie aus Abfall. Band 10; TK verlag, Neuruppin 2013
10. Thomè-Kozmiensky K.J., Beckmann M.: Energie aus Abfall. Band 11; TK verlag, Neuruppin 2014
11. Thomè-Kozmiensky K.J., Beckmann M.: Energie aus Abfall. Band 12; TK verlag, Neuruppin 2015
12. Thomè-Kozmiensky K.J., Beckmann M.: Energie aus Abfall. Band 13; TK verlag, Neuruppin 2016
13. Żygadło M.: Gospodarka Odpadami Komunalnymi. Wydawnictwo Politechniki Świętokrzyskiej. Kielce 1997
14. Wandrasz J. W.: Gospodarka Odpadami Medycznymi. Procesy termicznej utylizacji odpadów medycznych. Wydawnictwo PZiTS Oddział Wielkopolski w Poznaniu, Poznań 2000

In the case of specialist literature in the field of waste management or machinery and equipment, there is no specific, strict "canon". All items available in Polish and foreign language are the most source of knowledge. It should be noted that even those that we consider obsolete (e.g. year of publication 1984) can be valuable because today we most often use the Internet where the data is most often incomplete, or given only in the form of basic parameters. In book publications (so-called printed) you can most often find full data of installations or machines and devices.

Efekty uczenia się:

Learning outcomes:

A student completing the course "Machines and Installations in waste treatment processes" will have knowledge of the basics of waste management, circular economy and possible machines and devices that will be used in these processes. One of the most important effects will be to learn about the majority of machinery and equipment used in waste treatment processes, and what is related to their use in the treatment installation. Getting acquainted even with exemplary installations, the student will gain information and knowledge about the functioning of machines and devices installed cooperating with each other in the technological line, what are the principles of operation of individual elements of such an installation, how to properly select shredders, separators, conveyors and other elements of the technical infrastructure of the waste treatment installation. The expected effects are:
- getting acquainted with the machines and installations used in waste management,
- getting acquainted with the potential possibilities of assembling installations without an investment stumble oversizing or under-measuring machines and devices,
- getting acquainted with the available series of machines and their potential mobility,
- getting acquainted with the principles of setting up municipal waste treatment installations where it is the possibility of separating the waste stream into potential secondary raw materials,

Metody i kryteria oceniania:

Assessment methods and assessment criteria:

Lecture
Credit in the form of: a written study on a given topic.
Passing criterion: in addition to checking the correctness of the presented study, such elements as cited literature sources, correctness of citing them in the test, scientific and technical value of the presented work, current scientific and technical knowledge will be taken into account.

Przynależność do grup przedmiotów w cyklach:
Element of course groups in various terms:

Opis grupy przedmiotów Course group description	Cykl pocz. First term	Cykl kon. Last term
przedmioty obieralne studia stacjonarne stopień studiów – dowolny kierunek studiów – dowolny,	2024/2025	

semestr dowolny elective courses: waste management, circular economy, process engineering, environmental engineering, energy, renewable energy full-time degree - any field of study - any semester - any		