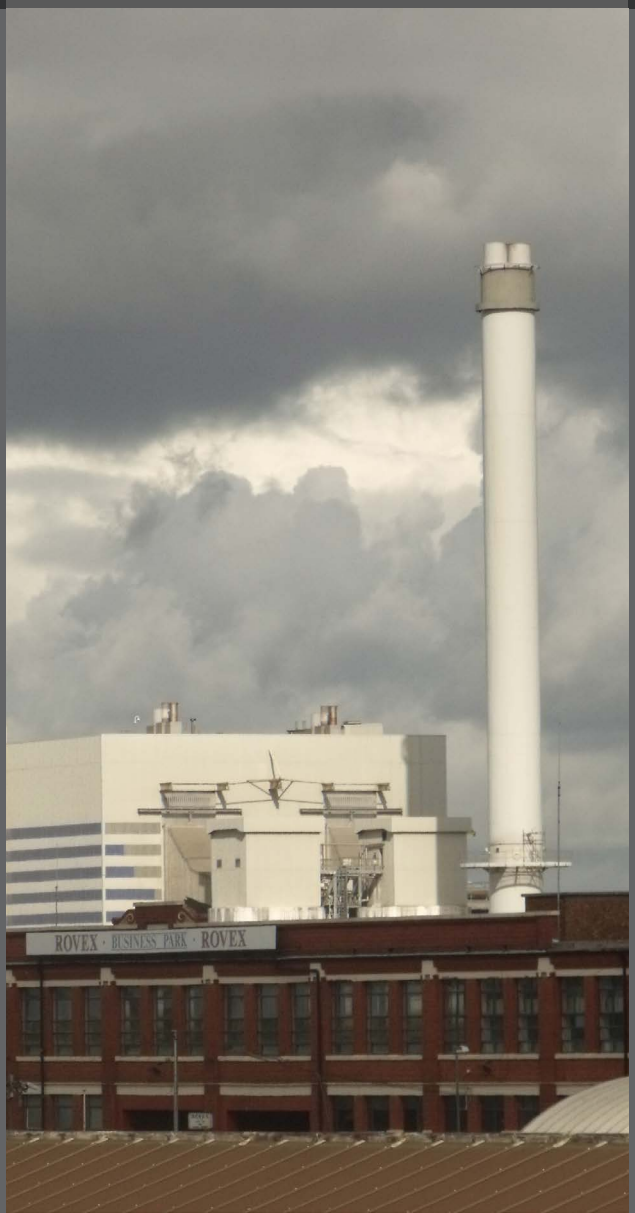
Waste incineration



envi.stromzivota.sk

ENVI-MOBILE: Integration of mobile learning into environmental education fostering local communities' development

2014-1-SK01-KA200-000481
ERAZMUS+ Programme

Project is co-financed by European Union, Programme Erasmus+.

EN

Activity No. 1

Part of the lesson:
EVOCATION

The aim of the activity: To introduce students to burning waste techniques and methods to reduce the environmental impact of waste products.

STEP 1.
Brief description of the activity:
Teacher provides a brainstorming to retrieve the pupils' knowledge on the subject.
Students work in groups of five and make notes into KWL columns (KWL table from ANNEX 1).
Instruction (what you need to tell the students):
Work in groups of five people. Use the given form to fill out.
In the group, discuss the question: "What do you know about waste incineration?" Please fill out the first column/"KNOW" of your KWL form. This represents what you already know about this topic. Then, fill out the second/"WANT TO KNOW" column. This represents what you expect to learn from this lesson. You have five minutes to complete this task.

STEP 2.
Brief description of the activity:
Feedback on the group work. One student will present their notes. Teacher should make notes on the board in similar KWL table, by choosing the important notes.
Instruction (what you need to tell the students):
Now one person from your group is going to share with us what you have written.

Tools for the activity (everything you need to take to the classroom): Annex 1 for each group, pen, crayons, KWL table and the board
Estimated time (max. 40 min.): 10 minutes

Activity No. 2

The aim of the activity: To understand the incineration process and its pros and cons.

STEP 1.

Brief description of the activity:

The teacher shows a short video, that explains the process of waste incineration. E.g.: https://www.youtube.com/watch?v=wcZHpebRPcs (EN video) or alternatively find other videos on YouTube or other channels, or read the additional text on incineration (Annex 2). Briefly discuss how does it works.

Instruction (what you need to tell the students):

Look at the video about waste combustion.

What can you see? How does it work?

STEP 2.

Brief description of the activity:

By group work students will find out how the waste incineration works and what is its PROs and CONs. At the same time they are trying to find the answers to the questions mentioned in second column in KWL table.

Students can use additional text "waste-to-energy production" (ANNEX 3) and a flowchart from internet (links can be found in NOTES).

The teacher asks each group to complete the section L (what I learned) card method KWL.

After app. 10 minutes teacher asks each group to present the information from the last column. Then all discuss shortly, what they want to remember about waste incineration.

Instruction (what you need to tell the students):

Work in groups. Find out how the waste incineration works and what are its PROs and CONs. At the same time, try to find the answers to the questions mentioned in second column in your own KWL table.

Use the ANNEX 3 for more information or relevant websites provided by teacher. Try to search also on your own for more information and answer the questions mentioned in the column "WANT TO KNOW".

Make notes into column "LEARNED" – answers to your questions, PROs and CONs of waste incineration and other interesting facts. You have 10 minutes for your group work. If needed divide the individual work amongst the group members.

Part of the lesson:

APPRECIATION

Tools for the activity (everything you need to take to the classroom): KWL table, video on YouTube, internet connection, overhead projector, laptops for each group, ANNEX 3 for each group

Estimated time (max. 40 min.): 20 minutes

Notes:

EN:

http://www.epd.gov.hk/epd/english/environmentinhk/waste/prob_solutions/WFdev_IWMFtech.html

http://blog.mordorintelligence.com/global-wate-to-energy-market/

rintelligence.com/global-wate-to-energy-market/

Activity No. 3

Part of the lesson:
REFLECTION

The aim of the activity: Reflection on waste incineration and its environmental impact.

STEP 1.

Brief description of the activity:

Teacher asks students to divide into two groups. The first group represents those who think that waste incineration is suitable method for waste disposal and the other who think the opposite. Ask each group to choose one spokesman.

The task of the spokesmen is to give 30 seconds speech and persuade the others about their truth. All the group members work on the speech preparation.

Instruction (what you need to tell the students):

Divide into two groups. The first group stands on the LEFT and the other on the RIGHT. The first group represents those who think that waste incineration is suitable method for waste disposal and the other who think the opposite. In each group, choose one spokesman.

The spokesman from the first group speaks on behalf of the company developing waste incineration stations and wants to build such a station in your city. Your task is to explain your truth and the need to establish the station as the most suitable waste disposal method.

The spokesman of the other group speaks on behalf of the people from the city, whose refuse building of waste incineration station.

The task of both spokesman is to give 30 seconds speech and persuade the others about their truth. All the group members are involved in the speech preparation, suggesting their arguments. You have 5 minutes for preparation.

STEP 2.

Brief description of the activity:

Presentation of opinions. Each spokesman presents their speech. Teacher than asks students to vote for the one who provided better arguments and persuaded them about their truth. All the students vote, except the spokesman. Before voting, ask students to vote according to their own opinion and not based on the group they were part of. At the end, discuss the other possibilities of waste disposal.

Instruction (what you need to tell the students):

Spokesman, please provide us with you speech. (after 1 minute) Now you all vote for the one who persuaded you about their truth. Do voting based on your own opinion, not a group one.

Estimated time (max. 40 min.): 10 minutes

SOURCE: ENVI-MOBILE / envi.stromzivota.sk

Annex 1

K-W-L table (or "Know – Want to know – Learned" table)

(what I) KNOW	(what I) WANT TO KNOW	(what I) LEARNED

ANNEX 2

Explanation of basic terminology:

Combustion: is a chemical reaction where oxygen is added to a compound to obtain water and carbon dioxide. Combustion is an exo-energetic reaction releasing a great amount of thermal energy, which can be used for various purposes.

Incineration: concerns only the organic fraction of waste made of materials rich in carbon and hydrogen atoms and it is the process during which these elements are transformed into the corresponding oxides or carbonic dioxide and water.

Waste incineration: is a chemical process of combustion of the organic waste that is transformed into oxidized compounds.

Incineration process

The beginning of the video is centred on the uses of the thermal energy released during the process of waste combustion (production of electricity, district heating).

The video shows the waste being processed by the system, (organic fraction of municipal solid waste that is the result of its treatment), to be later sent to the combustion chamber where the incineration process takes place. The waste moves over a grid and passes through the combustion chamber encountering increasingly high temperature areas, reaching 1000 °C, when the complete combustion begins. The energy released by the combustion process is used to produce energy.

Through this process we obtain two main residues: a solid fraction that is selected for density and a gaseous one. The solid fraction is about 20%, 30% of the total waste and should be disposed in special landfills. The exhaust gases of combustion are treated with different types of technology to reduce the components that are harmful to human health and only after these treatments the residual gases are released into the atmosphere. Moreover the process uses water to cool the system. This water is contaminated and should be purified before discharging it.

ANNEX 3

Energy production from waste

This simple flowchart explains that we can obtain thermal or electric energy by incinerating waste. It is a complex process and it must be carried out carefully, in order for toxic substances not to be released into the environment, or only in very small amounts which do not create problems for the people living near the incinerators.
Different types of technologies exist to treat different types of exhaust gases produced by waste combustion; moreover, there are primary (using particular care during waste combustion) and secondary prevention measures treating the residues of the combustion process. There are regulations at national and European level dictating limits on the number of emission of toxic substances into the atmosphere. These were established considering the impact of toxic substances on human health. During waste incineration, toxic emissions are controlled at regular time intervals dictated by law to ensure that the emissions of gas released through combustion do not endanger the population. Before building a new incinerator it is important to carry out an Environmental Impact Evaluation because if the area where the incinerator will be built is already polluted, administrators should consider that the incinerator's emissions would be added to existing pollutants. So even if the incinerator's emissions are under law limits, if they are combined with air pollution of the area, law limits can be exceeded.