**Waste to energy exercises**

Find the latest environmental report of your nearest waste incinerator.

1. Do you sort waste better than people in Karelia? How do you recycle your waste? What should be done that recycling could be better?

|  |  |
| --- | --- |
| **Waste fraction** | **(%) 2017** |
| Biowaste | 19,78 |
| glass and ceramics | 1,62 |
| Metal | 2,91 |
| Big pieces | 0 |
| Soil | 1,39 |
| Energy waste | 45,01 |
| not usable plastic | 0,84 |
| waste wood | 1,35 |
| waste paper and cardboard | 12,7 |
| ungraded sorted waste | 0 |
| WEEE (waste electrical equip.) | 0,11 |
| Textile and diaper | 16,3 |
|   |   |
| Avarage moisture | 37,3 |

1. Compare flue gas emission concentrations. Are the limits same in EU?



1. Compare annual emissions results. Compare results to the E-PRTR threshold value too.









1. Compare the results if the incineration process generates wastewater.



Source: RIIKINVOIMA OY EKOVOIMALAITOS Ympäristöluvan mukainen vuosiraportti 2017

1. Calculate the effective calorific value of the woodchips in the arrival state when the effective heat value of the dry matter is 19 MJ / kg. The moisture content of the chips is 55%. (answer: 7,2 MJ / kg)

$$q\_{p,net,ar}=q\_{p,net,d}\*\left(\frac{100-M\_{ar}}{100}\right)-0,02443\*M\_{ar}$$

qp,net,ar = effective calorific value at arrival, MJ/kg

qp,net,d = effective calorific value in the dry matter, MJ/kg

Mar = fuel humidity on arrival state, wt%

Where 0,02443 is the evaporation enthalpy correction factor.

1. Calculate the effective heat value of the woodchips in the arrival state, taking into account the water phase changes. Chip temperature is -20 oC. The moisture content and the effective heat value of the dry matter are the same as in heating of ice c=2,09 kJ / kg oC, melting of ice c = 333 kJ / kg, heating water c=4,19 kJ / kg oC, water evaporation c=2260 kJ / kg. (answer: 6,9 MJ / kg)
2. As in exercise 6 but the chips have a temperature of 25 oC. (answer: 7,1 MJ / kg)