

# The waste-to-energy process

## CONTROL AND DISCHARGE

Access to the waste-to-energy plant of the vehicles transporting the waste takes place through the control portal for the control of any radioactivity, after which the vehicles are weighed and registered. Next, they enter the foredeep where, through one of the wolf's mouths available, the waste is unloaded into the bunker.

## LOADING AND COMBUSTION

The waste is taken from the bunker with one of two grapples and deposited in one of the three loading hoppers that convey to one of the combustion grids. Here the waste burns due to spontaneous combustion at approximately 1,000°C for about an hour. Methane is used to start the combustion or in case the temperature in the combustion chamber drops below 850°C - minimum limit permitted by the regulation.

## STEAM GENERATION

The gases generated from combustion rise up and enter the channels of the boiler placed over each grid. Each boiler contains vertical tubes (heat exchanger tube banks) within which pressurised water circulates - which becomes water steam as it is heated by effect of the heat of the gases.

## ENERGY RECOVERY

The pressure of the steam activates the turbine that, connected to an alternator, produces electric energy. A part of the vapour that passes through the turbine is taken and sent to heat the water of the district heating network.

## FLUE GAS TREATMENT 1 ELECTROSTATIC FILTER

The combustion gases coming out of the boiler at approximately 200°C are treated following a four-phase process that starts from the electrostatic filter, device that, thanks to the creation of an electromagnetic field, withholds almost all of the solid particles (fly ashes) later stocked in specific silos.

## FLUE GAS TREATMENT 2 DRY REACTOR

The gases then go through the dry reactor where sodium bicarbonate and active carbon are released which react with the substances still remaining (acid gases, dioxins, furans and heavy metals).

## FLUE GAS TREATMENT 3 BAG FILTER

The bag filter captures the products formed through the reactions which took place in the dry reactor: the materials withheld, the residual sodium chemicals, RSC, are then stocked in specific silos.

## FLUE GAS TREATMENT 4 SCR REACTOR

In the SCR reactor, the last treatment phase, ammonia is injected to break down the nitrogen oxides that are broken down into molecular nitrogen and water vapour - two natural elements present in the atmosphere and, therefore, without any environmental impact.

## RELEASE OF FLUE GASES

Suctioned by a draught fan, the flue gases that enter the three chimney pipes, one for each combustion line, are released into the atmosphere at approximately 120°C at a height of 120 meters.

## EMISSION MONITORING SYSTEM

Before being released into the atmosphere, the flue gases are analysed by the emission monitoring system: here the values of the residual substances are measured to verify compliance with emission limits.

## RESIDUAL WASTE MANAGEMENT

The waste-to-energy process generates residual waste from combustion (bottom ashes and ferrous materials) and from the treatment of the gases (fly ashes and RSC). Bottom ashes are not dangerous waste and weigh approximately 20% of the waste coming in. They represent the inflammable part of waste: once fallen from the grid, they are cooled and deposited in an accumulation pit through conveyor belts. During the path, two electromagnets separate any ferrous materials that are then stocked to be recycled. The bottom ashes are treated by specialised companies that process them to be re-used as building material. The fly ashes, approximately 2% of the weight of the initial waste, come from

the activity of the electrostatic filter while the RSC (approximately 1.5%) are made up of what is withheld in the bag filter. Both of these types of waste are dangerous, and once stocked in the silos, they are transported to plants authorised to treat them, inert and, therefore, sent to recovery or disposal.

