Energy from local woody green waste

in Metropole Rouen, France

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The French government and the energy agency ADEME have a clear strategy of using local biomass, which would otherwise just rotten and compost - emitting large amounts of methane gas and CO_2.

The large energy company Dalkia is operating the district energy plant in Metropole Rouen, France. They wanted to support the national strategy and examined the opportunities for optimizing the sourcing of biomass fuel within a radius of 100 km from the heating plant.

They found the solution in a new biomass gasifier furnace system (BGFS) from Dall Energy that enables utilizing a wide range of fuels, even cut-off green park and garden biomass with moisture levels up to 60%. Their decision points were fuel flexibility, low air emissions, and fast response to fluctuating heat demands as the district heating (DH) network in Metropole Rouen has no buffer tanks.

The French legislation requires the biomass used in heating plants to come from sources within a close distance of the plant - an eco-friendly rule preventing emissions from transporting biomass over long ranges

The history of updraft gasification

The principle of updraft gasification has been known for centuries and was used in Europe from the 1850s for city gas production based on hard coal.

In the 1980s, several updraft gasifiers entered commercial operation in Scandinavia, but this required heavy maintenance because of the external combustion of the gases.

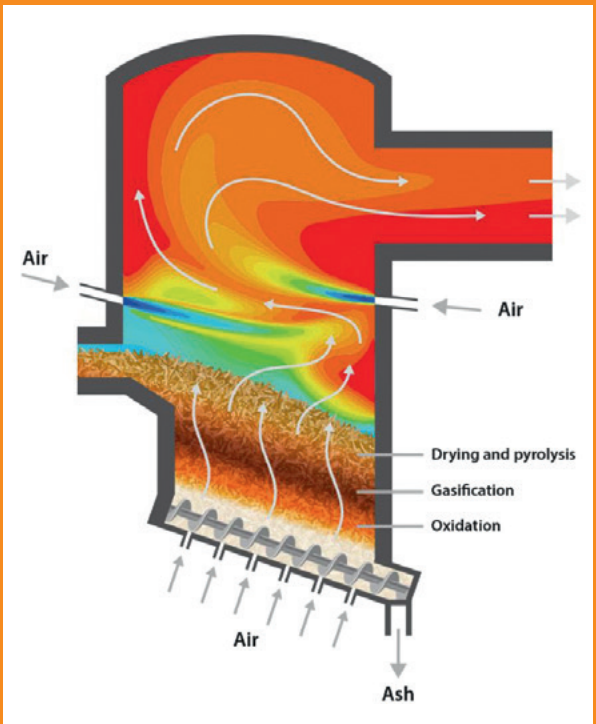
The new Biomass Gasification Furnace System

The Dall Energy furnace combines updraft gasification with gas combustion in the same chamber, which results in full performance and environmental benefits without the historical problems related to external combustion.

In the new BGFS, biomass is dried and pyrolyzed at the top of the fuel layer. Further down, the biomass is converted into a burnable gas and fine ash. The heat for the drying and pyrolysis process combines convective heat from the gasification gases below and radiation heat from the gas combustion part above. Primary air injection is about half of what is used in traditional grate incineration, and, with a large furnace bottom-area, the gas velocity in the bottom part is low. Consequently, particles remain here, and dust emission from the furnace is very low too. Gas from the bottom part is combusted in the top section. The gas combustion (flow, temperatures, emissions, etc.) is stable and is controlled via flue gas recirculation. The control allows operation with lower excess air ratios resulting in higher overall efficiency.

THE PETITE BOUVERIE HEATING PLAN IN ROUEN, FRANCE

- **Supplies up to 17 MW DH**
- **42 km long network**
- **+ 7,000 operation hours per annum**
- **Providing 17,000 households with green DH**



The patented Dall Energy biomass furnace combines updraft gasification with gas combustion.

The technology has advantages compared to traditional grate fired plants:

- A broad and mixed range of biomass can be used simultaneously, allowing for cost-savings
- Biomass with up to 60% humidity can be utilized
- Low emission levels of dust, CO, NOx. 95% less dust than in grate-fired plants
- The ash is clean and can be used directly in the fields
- Ability to ramp quickly up and down from 10-100%, allowing for regulating according to heat demand without accumulator tank
- Maintenance costs are 30% lower, as there are no significant moving parts exposed in the furnace and no bag filters needed
- High availability and stability of operation – no unscheduled stops
- The furnace can operate for up to 18 hours even if the fuel supply fails

The gasification furnace as thermal oxidizer

Thermal oxidizers are used to destroy Hazardous Air Pollutants (HAPs) and Volatile Organic Compounds (VOCs) from industrial air streams. These pollutants are generally hydrocarbon-based, and when they are destroyed via thermal combustion, they are chemically changed to form CO_2 and H_2O. Historically, propane or natural gas was widely used as fuel for thermal oxidizers, but with the new BGFS it is CO_2-neutral. The first Dall Energy biomass-based thermal oxidizer was installed at Warwick Mills, New Hampshire, USA, in 2014. The plant operates with a VOC destruction efficiency exceeding 99.8%, which is higher than fossil fuel-based oxidizers.

Circular use of local biomass also in Denmark

It is not only in France energy companies look to source biomass locally. For example, in Sorø, Denmark, the local utility company Sorø Fjernvarme has conducted extensive studies to lower their prices for DH and reduce the environmental footprint.

Consequently, they are now constructing a new 12 MW CHP plant utilizing 100% woody green waste collected from 20 local recycling stations and 11 garden waste landfills. A biomass gasification furnace with staged combustion will convert the surplus biomass into green electricity and sustainable heat for the DH network. According to AffaldPlus, who owns Sorø Fjernvarme, they expect to see prices reduce by 25%.

"We calculated different energy source scenarios and found the garden and park waste was the cheapest option - and by far the best option for the climate," says the head of Energy at AffaldPlus, Ole Andersen.

Danish law adjusted to support the green transition

The Danish Council on Climate Change and the Danish Energy Agency reclaimed the benefits of waste biomass energy and has just updated the law to allow easier approval for future heating plants using garden and park waste as a fuel.

The change in the law is in line with the Danish Environmental Protection Agency and the Danish Government's Climate Partnership for Waste, Water, and Circular Economy. They emphasize that composting residual biomass results in significant methane gas releases, a highly harmful greenhouse gas. So, if the local garden and park waste are used as an energy resource instead, it benefits the climate, the environment, and the economy.

The symbiosis of local waste utilization

Many countries, regions, and municipalities can utilize their garden and park waste — the leftover wood from forestry likewise. It is just waiting to be adequately exploited and reused in the local communities creating the waste – and contributing to the local circular economy.

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