Opinion

Biomass use as a unique source of renewable thermal energy and potentials for its optimization.

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Abstract : Biomass is an renewable source of energy. Its availability though is relatively limited when compared with other alternative energies. The problems of its unchecked use are several, but the options for its optimization are more and more developed.

The first evidence of early human use of fire, arguably around 1 million years ago, includes the discovery of charred bones and stone tools, as well as ancient hearths and fire pits found at archaeological sites.

The controlled use of fire was a significant turning point in human evolution as it allowed our ancestors to cook food, keep warm, and create new tools and materials. It also helped to expand our diets and diversify a wider range of nutrients, and by processing previously inedible species had a lasting impact on the importance and viability of agriculture as an alternative means of feeding our species. These agricultural practices were then refined over time to produce more reliable and efficient food production systems, leading to the development of complex societies and civilizations.

From that moment on to the creation of cities and the enormous changes to human society is widely known and part of our shared History. From another perspective the control and use of fire, if a motor for human development was also the main and first mode of environmental destruction. The means of mitigating and even reversing the negatives effects of a tool that has allowed humanity to control, alter and reshape nature and the habitat (like deforestation) are nonetheless within our reach due to technological advances.

Not surprisingly the first energy source that Man used to fuel fire was biomass and it has been used uninterruptedly since. It is essential to note that although the technologies used to transform biomass into energy have evolved and although today biomass can be the base for generating heat electricity and cold its specificities in relation to other renewable energies and fuels must be taken in consideration and be the base of a serious reflection. Two factors are at the base of any honest and realistic analysis:

1 - its limited availability - according to the International Energy Agency (IEA), the potential supply of biomass for energy purposes is estimated to be between 150-300 EJ/year globally. However, not all this biomass is currently financially viable due to

factors such as low energy content, high transportation costs, and competition with other uses such as food and feed.

2 - the fact that it is the only sustainable source of renewable thermal energy – solar, wind or hydric, and other technologies such as hydrogen, nuclear etc. are viable and commercially in use for electric power generation but not for steam and other thermal energy needed for various processes within industries and cities.

These two factors condition the use of biomass mainly in the sense that it should not be used in any manner that wastes its energy potential. Biomass consumption should be optimized in every stage of its cycle - the sourcing, the distance to points of consumption and the efficiency of the technologies used to generate energy. And for the same reasons clearly thermal energy generation should be prioritized.

Given that power production from biomass still has a very low level of efficiency – in average below 30% - and the finite nature of available biomass on Earth (unlike wind and solar) this is one field where the use of biomass optimization needs the most care.
Another potential consequence of a unchecked use of biomass for energy is related to the impact on human and animal food markets, like what happened with biodiesel at the beginning of the 2000's. Biodiesel production competed with food markets and land use for food production, raising the prices of feed stock (in this case vegetable oils). So to minimize the impact of biomass on forest and agriculture products, be it for land use competition or direct use of feedstocks, it is unavoidable to promote sustainable biomass production practices, sourcing and efficiency.

Using biomass for electricity generation can have environmental benefits, as it can reduce greenhouse gas emissions compared to fossil fuel-based power generation. However, the sustainability of biomass as a renewable energy fuel depends on how and where it is sourced and managed. Using biomass from sustainable sources such as forestry or agricultural waste can help ensure that its use for electricity generation is environmentally responsible.

Energy sources should be sustainable, diversified, produced and consumed locally. A strong connection and commitment to forest and agricultural production led us to focus on biomass. It is our aim to bring biomass based fuels to the market in the most efficient manner - that is - for thermal energy, or for very finely tuned co-generation or CHP. A model of forest-factory-thermal central was based on these principles in which the harvesting of biomass, processing plant and consumers are all within a radius of 50 miles.

Effective biomass management systems, including efficient collection and transport, can help ensure the sustainability and cost-effectiveness of biomass energy systems. Overall, biomass can play a role in helping to make cities more sustainable and energy-efficient, provided that its use is carefully planned and managed. Power generation and grid infrastructure is developed in a way that supports Local economy and high quality-of-life while integrating more renewable energy sources than ever before, and radically reducing our cities impact on the environment. solutions focused on sustainability but also on cost

reduction by implementing the most economically effective balance between installation Costs/profitability of the power generation system.

There are various efficient uses of waste heat that can help reduce energy consumption and increase the sustainability of industrial processes a few examples of already used methods for waste heat recovery:

1. District heating: Waste heat from industrial processes can be used to provide heat to nearby buildings through district heating networks. This can help reduce the energy required for space heating and hot water in those buildings, while also reducing the amount of waste heat that is released into the environment.
2. Power generation: Waste heat can be used to generate electricity through various technologies such as steam turbines, organic Rankine cycles, and thermoelectric generators. This can help increase the energy efficiency of industrial processes while also providing an additional source of renewable energy.
3. .Process heating: Waste heat can be used directly for process heating in industrial processes, reducing the need for additional energy sources such as natural gas or electricity. This can help increase the energy efficiency of the process while reducing operating costs.
4. Cooling: Waste heat can also be used for cooling purposes, such as in absorption refrigeration systems. These systems use waste heat to drive the refrigeration process, reducing the energy required for cooling.
5. Hydrogen: Green hydrogen can be generated from industrial waste heat and depending on the waste heat source using a technology like high-temperature electrolysis (HTE). Thermochemical water splitting:,steam methane reforming (SMR), which is a widely used method to produce hydrogen from natural gas. High-temperature electrolysis: Pyrolysis a process particularly useful for the conversion of biomass waste into hydrogen gas.

Conclusion: Overall, efficient use of biomass can provide significant energy savings and reduce greenhouse gas emissions. It can also help increase the sustainability of industrial processes and reduce the reliance on fossil fuels, if waste heat is reused, in parallel with what should happen with every type of waste from human activity.