

BIOMASS TREATMENT

- Organic matter in trees, agricultural crops and other living plant materials
- Made up of carbohydrates – organic compounds formed in growing plant life
- Biomass is solar energy stored in organic matter
- Process of photosynthesis uses energy from the sun to convert carbon dioxide into carbohydrates (sugars, starches and cellulose)
- When plants die, the process of decay releases the energy stored in carbohydrates and discharges carbon dioxide back into the atmosphere
- Biomass is a renewable energy source because the growth of new plants and trees replenishes the supply.
- Use of biomass Using biomass for energy causes no net increase in carbon dioxide emissions to the atmosphere and inhibits the risk of global climate change
- Growing plants remove (carbon dioxide) CO₂ from atmosphere through photosynthesis
- If the amount of new biomass growth balances the biomass used for energy, bioenergy is carbon dioxide “neutralized”
- Globally, biomass meets attains about 14 percent of the world’s energy needs
- Origination process of biomass:
$$6 \text{ CO}_2 + 6 \text{ H}_2\text{O} + \text{SUNLIGHT} = \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{ O}_2$$



Direct combustion of Biomass

- Combustion technologies convert biomass fuels into several of useful energy forms for commercial or industrial uses: hot air, hot water, steam and electricity
- A furnace is the simplest combustion technology:
- Biomass fuels burns in a combustion chamber
- Converting biomass into heat energy (hot gases contains 85 % of the fuel's potential energy)
- Either direct or indirect use of heat exchanger to use the hot gases in the form of hot air or hot water
- Combustion of wood can be divided into four phases:
 - 1) Drying: water inside the wood boils off
 - 2) Degasification: gas content is freed from the wood
 - 3) Gasification: the gases emitted mix with atmospheric air and burn at a high temperature
 - 4) Combustion: the rest of the wood (mostly carbon) burns



Benefits of Biomass Drying

It depends on process...

- Pelletizing requires drying
- Gasification and pyrolysis generally requires drying
- Not required for direct combustion, but can result in the following benefits:
- Improved efficiency: 5%-15%
- Increased steam production: 50%-60%
- Reduced ancillary power requirements
- Reduced fuel use
- Lower emissions
- Improved boiler operation



KAPA ENGINEERING DRYING SYSTEM



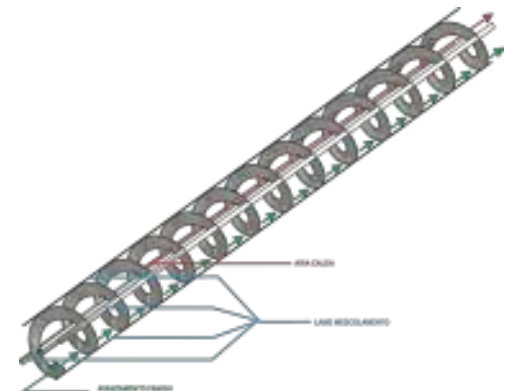
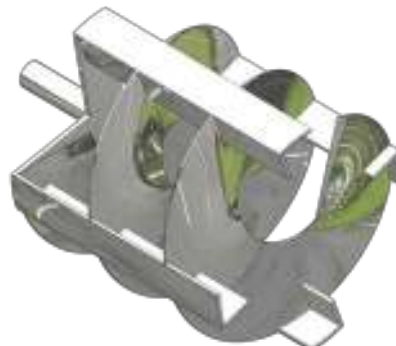
The innovative system developed by Kapa Engineering presents advantages over all existing drying systems.

- ABLE TO TREAT BIOMASS OF ALL KINDS. SUITABLE FOR OLIVE POMACE BY THREE OR TWO PHASES PROCESSING.
- SEPARATES PULP FROM (BY THE) HUSK. PRODUCT OF EXCELLENT QUALITY INIBBING (WITHOUT CHANGING COLOR) COLOUR CHANGING OF THE MATERIAL AND SMELL OF THE NATURAL ODOUR.
- WITHOUT EMISSION POLLUTION OR SMELL AT THE ENVIRONMENT.



The innovative system prevents caramelization.

- Caramelization is a phenomenon which appears in the sugar- materials that are heat treated creating a darker color to the product. This happens to the sugar content of the ketones and glucose, that exists in olive pomace. Generated by high temperatures (for wet pomace over 400 Celsius degrees), releasing pigments and smell of rotten fruit. Caramelization creates a hard crust on the outer surface of the granule so the water remains trapped in the core. The common rotary dryers introduce the heat exactly in their entry -the main entrance of the material-, thereby creates a thermal shock to the olive pomace so the outer layers of the granule present the effect. To release the trapped water in the heart of granule, requires more heat that intensify the effect, creating a vicious circle from which, the result is bad drying, enormous consumption, intolerable odors in the environment at very long distances, and tanning of the material. At the conventional dryers the moisture is forwarded mixed to the material from the entry to the exit. The dry material is mixed with moist air, absorbing again and again the moisture, creating a vicious cycle.
- Our driers use low temperatures for drying that do not present caramelization effect. Instead, provide large amounts of dry air that is the vehicle for moisture removal. The dry air enters every meter of the processing path and cleared at each line. So with minimal consumption as the required heat is minimal, achieve an excellent drying result without discolouration of the pomace, that maintains it's natural smell without bad odours even in the same room of the process.



The innovative system has minimum consumption



- As mentioned, the conventional dryers have enormous requirements (needs) of heat, using exclusively the heat to drying. Let us remind ourselves, for example, something familiar to all of us in order to understand the problem and its solution: Many times in the winter we place clothes on a radiator or near a heat source to dry them. After a long staying there, drying seems impossible, while the heater temperature is often more than 70 degrees. During summertime, is enough a while in the air to dry the clothes with a temperature of 30 degrees. On days with lower temperatures but more windy, clothes dry very quickly. This is because it is not enough using high temperature but also using air, which is the vehicle that transports away the moisture from the materials
- The innovative driers of our company use low thermal energy and large quantities of hot, dry air in which the material is agitated during the entire duration of treatment. Moist air streams, are discharged every 6 meters of path, eliminating requirements for minimum fuel for thermal energy.
- The large amount of heat at the conventional rotary dryers emits large volumes of flue gas. Besides the smell of scorched material (see caramelization), emit odours and smoke in large quantities that make them undesirable in any area, even far away from residential zones. It is common the fire of the material due to the direct introduction of the flame in the drying chamber and too high temperatures.
- Dryers do not emit any kind of pollutant. Smells are not present in the environment. The chimney leaves only the steam which may be condensed also, so to be discharged only water from the condenser. In case of different materials, optional equipment can be installed to drive the flow gases in an incineration chamber.

Topics to explore in future joint Horizon 2020 projects

- Finding partners to develop integrated power systems. Pre-drying and post-drying technologies.