



ETHANOL PLANT



INDUSTRIAL USES OF **SWEET SORGHUM**

- Ethanol
- Renewable Electricity
- Vinasse
- Astaxanthin
- Synthetic Diesel
- Bio-Isoprene
- Plastics
- Butynol
- Fiber
- Fuel Pellets



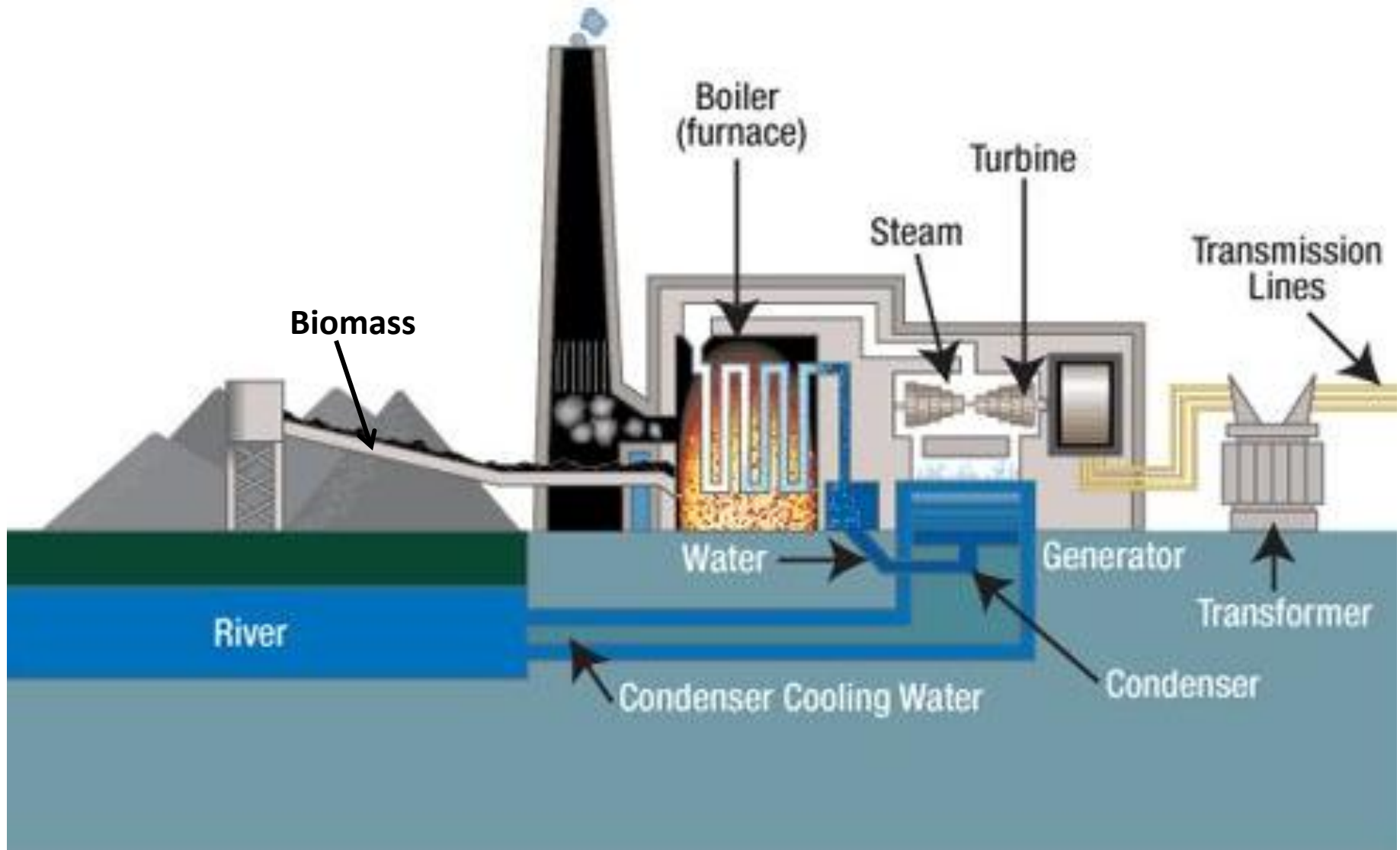


ETHANOL

- **Sweet Sorghum Sugars can be Fermented to Produce Advanced Biofuel Ethanol**
- **Most U.S. Gasoline Contains a Percentage of Ethanol**
- **Less Energy Intensive to Produce Than Corn Ethanol**
- **Reduces Greenhouse Gas Emissions**



Renewable Electricity





VINASSE



- **Organic Rich Waste Water**
- **Waste Product of Fermentation**
- **Must be Treated to Reduce BOD and COD Levels**
- **Ideal for Fertilizers**





Astaxanthin



- Natural Dietary Component
- Found in Krill, Shrimp and Crayfish
- Turns Salmon's Flesh Pink and Flamingo's Feathers Pink
- High Value Product
- Produced Similarly to Ethanol



SYNTHETIC DIESEL

- **Alternative to Fossil Fuel Diesel**
- **Sulfur Free, Clean Burning**
- **Produced From Organic Waste Streams**
- **Higher Cetane (octane) Rating**
- **Can be Blended With Conventional Diesel**



**SYNTHETIC
DIESEL**



**CONVENTIONAL
DIESEL**

BIO-ISOPRENE

- **Isoprene Key Ingredient in Rubber Tire Production made from petroleum bi-product**
- **Bio-Isoprene is Renewable, Sustainable, Eco-friendly Alternative**
- **Bio-Isoprene Offers Price stability**
- **Can be Produced From Sweet Sorghum Sugars**





PLASTICS

- **Bio-Plastics Can be Produced From Sweet Sorghum Sugars**
- **Bio-Plastics Can Compete With Petroleum Based Plastics**
- **Can be Bio-degradable**
- **Use of Bio-Plastics Expected to Quadruple in Next Five Years**





BUTYNOL

- **Sweet Sorghum Sugars Can be Fermented Using Different Microbial Hosts to Produce Butynol Jet Fuel**
- **Non-Corrosive and can use Existing Pipelines**
- **US Military Committed to using Renewable Fuels**
- **High Value Incremental Product**





FIBER

- **Sweet Sorghum Bagasse is an Ideal Source for Fiber**
- **Fiber Used in Fabrics, Pulp & Paper Industry, Building Products**
- **Global Demand for Non-Wood Fibers is Increasing**
- **Environmentally Conscience is a Real Concern for Industry**





FUEL PELLETS

- Renewable Fuel Pellets are replacing Coal in many EU's Power Plants
- EU has mandated strict carbon emission reductions (20% by 2020 & 30% by 2030)
- Fuel Pellets have low moisture levels & low ash
- BTU value similar to coal
- Sweet Sorghum Bagasse ideal for pellet production
- High valued product, \$150 - \$175 per ton

