EXPLORING ALTERNATIVE ENERGY SOURCES FOR THE PECAN INDUSTRY

Gary L. Hawkins
Biological and Agricultural Engineering
University of Georgia
Tifton GA

INTRODUCTION

In the world today there is a lot of talk about alternative energies. Alternative energies can be defined as finding a source of energy for heat, electricity or liquid fuels to replace what is currently being used today. For example, if you are burning propane to heat a building, can you use wood or pecan shells instead? This is only one example of alternative energy. As we all know all energy starts with the sun and is captured and stored in some form or fashion for use later. If we are using natural gas, generally that was produced over years from the breakdown of organic materials to form a gas. Oil is the same process, but instead of a gas it is a liquid. If we burn coal or wood the sun's energy is stored in a form that can be used to release the energy for heat. This heat from burning the wood, coal, oil, or natural gas can then be used for heating a space, heating water for steam or converting the steam energy into electricity. Alternatively, renewable energy is energy that is collected from the sun or other processes and can be produced from day to day without the need to have a stored material. An example of this is solar energy collected for hot water production or electricity.

As we start looking for alternative energies for the pecan industry, one place to look is at the product we grow and how can we use that product or more accurately, the waste products, as an alternative energy source. The objective of this paper is to explore sources of alternative and some renewable energy sources. These sources will be explained as to how they are being used without pecan input, but then also with the input from pecan products.

SOURCES OF ENERGIES ORIGINATING FROM SUN

As we look for alternative energies the first thing is look at the ways the sun produces the sources of alternative or renewable energies. The suns energy can be the source of wind, the growth of renewable crops, steam formation, ocean

temperature changes and direct conversion in solar cells. As we look at the possible sources of alternative and renewable energies the main ones we will concentrate on here will be renewable crops and solar cells.

Growth of renewable crops:

Pecan trees have three main parts that can be used for the production of alternative or renewable energies. These are the shells and hulls, the wood and the meat. The different parts would not be used for the production of energy directly, but however it would be used indirectly this is related to the use of waste materials or by-products of different processes such as the shelling process, culling of bad meat material or direct production such as solar power. The different parts of the pecan tree and products will be discussed in more detail in the following sections as well as the direct production of energy.

Shells and Hulls: The shells and hulls from the process of shelling the pecans can be used for various uses. These uses includes additives for milk cows for better production, an additive to sandblasting sands, paint fillers, drilling mud additives and mulch in landscapes. These are not alternative or renewable energy sources. Uses of energy from shells and hulls are such that the materials are pelletized and used in pellet burners. The shells can be used in boilers as a direct fuel source. The hulls likewise can be used to form pellets or can directly burned for heat or the production of steam. Pecan shells and hulls are attractive in that the heat content has been shown to be close to that of pine. Also, the materials can be processed and formed into pellets and used in specially designed pellet burners or directly burned in boilers or heaters.

Wood: The wood can be used for various final products some of which includes wood for making cabinets, flooring or can be used as a veneer. The production of these products can be good if there is a market available for them. Wood is like the shells and hulls in that it can be made into pellets, fire logs or burned directly. The burning of all of these products can produce heat, steam needed for other processes, greenhouse heating, home heating, electricity production and the production of hot water. Like the shells, the wood is only good if there is a market for the wood. One use of the wood materials that has recently been being discussed is the production of ethanol from cellulosic materials. The process as of the date of this publication has been in the initial stages of development, but the process is getting closer to a stage that can be used to produce ethanol. The use of pecan trees can potentially be one of the feedstocks to be used for the production of this renewable or alternative energy. This like the other materials can be a potential source of feedstock for such an industry as the industry advances.

Pecan Meat: Pecan meat has many different uses other than the production of alternative energy or renewable energy with the best known is direct consumption as a snack, in pies and other consumable foods. The pecan is a good source of nutrients and therefore is sold as a food source. However, the culled meat can be used as a direct consumable food for animals. The pecan meat can

also be pressed and the oil used for the production of bio-diesel. The bio-diesel produced from pecans has not been produced on large scales, but has the potential to be a good feedstock for the production of bio-diesel.

Solar Power: Solar power is not a direct or indirect product of the pecan tree, but the sun is needed to grow the trees. Solar power is a direct collection of the suns power to product electricity or hot water. As far as the pecan industry, the capture of the sun energy through solar photovoltaic cells or solar thermal systems can potentially be very useful. Solar photovoltaic cells can be used in orchards where the sun is uninterrupted or in areas where there is unusable land areas or maybe even large ponds. Solar electric systems can be used on various scales. Solar can be used on small scales (orders of less than 1-3 kW) for small orchards or larger systems (>200 kW) can be installed to produce electricity. Generally speaking, larger systems would be used to produce electricity for direct sale to the power company. If this option is being considered the producer needs to consult and work with their local power provider to determine rates of power purchase, needed agreements and other aspects unique to the power provider. The solar electric systems are generally not considered to be profitable unless there are incentives, rebates or grants available to install systems. Solar thermal systems, the production of hot water, can be a very good use of renewable energy if there is a need for hot water in a production. If there is available land and there is a need for hot water in the local area this maybe an option, otherwise, this would not be a useful technology.

SUMMARY

As we start looking for uses of the waste or by-products from the pecan tree there are many different uses such as using the shells and hulls as well as the wood for direct production of heat. This can be done by direct burning or formation into pellets and then used. The produced heat can be used for steam production, greenhouse heating, home heating, electricity production or hot water production. All of these are dependent on the availability of a viable market for the products. Solar electric or solar thermal are also viable options for producing electricity or hot water if there are agreements with power providers or there is a need for hot water. These two options are currently cost prohibitive unless the potential installer has some form of rebates, incentives or grants to assist with the purchase of the systems.