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Organic waste Cellulose: the new way to save our crops

Ethanol's production by cellulose from agricultural waste feedstock is an alternative to Mexico's energetic necessity.

From the first generations, human beings have been facing and adapting the conditions the planet has imposed on them. But nowadays man is the one who is changing life conditions creating a risk to loose control. Green house effect is a clear example of human activities consequence. The polluting gases produced by human beings especially by fossil fuels (carbon, metano, oxido nitroso, hidroflluoruro de carbon, perfluoruro de carbono y hexafluoruro de azufre) have been degrading our ozone layer provoking green house effects.

Because of that society is trying to give solutions to diminish our world's degradation. Kyoto's protocol is a commitment that some countries signed to diminish green house gas production. This commitment established that every country has to reduce from 25% to 40% green house gas emissions for 2020 in relation to 1990 rate. United States, China and Australia are countries that didn't sign Kyoto's protocol even though they are the main producers of green house gases. Although United States is looking for new alternatives for biofuel's production, they make so not to reduce greenhouse gas emissions but to complete the fossil fuel requirement production.

According to Kyoto's protocol commitment the need for an alternative energy production appears, being biofuels a viable answer. So every country is establishing a new way to produce and use biofuels; biofuels have two main goals: to substitute fossil fuels and, to reduce green house gases that are the main responsible.

A biofuel is the one that is taken from biomass which is transformed into an energy source. In the energetic production the best known biofuel is the ethanol. Ethanol is an alcohol that can be taken from sugar fermentation. We can find this sugar in the glucose chains located in maize, sugar cane, sugar beet, barley, wheat and sorghum. This alcohol brings important benefits because it reduces pollution emissions from traditional motors. We can have the next products made by ethanol: E5 (5% of ethanol and 95% of normal gasoline), E10 (10% of ethanol and 90% of normal gasoline), E85 (85% ethanol and 15% of gasoline in this case we have modified cars named flexible fuel vehicles that accept gasoline and ethanol in many percentages) and finally we have E95 and E100 (95% and 100% of ethanol). This combination has the purpose of growing the octane number giving better results in gasoline's combustion.

Alternative energies are also needed in Mexico. They propose maize as a posible crop for obtaining ethanol, but it had several unfavorable situatons for maíz ethanol production. The main problem is the agroindustrial low productivity. The small or none subsidy government pay for agricultural production. Most of the crops are too small or they are used for self comsumpción. Our production has to have bigger crops and this may provoke our natural resources devastattion, use of soil increasing pressure applied to soil. Other problem might be the use of transgenics; because for most of the Mexican population think the use of tranogenics might disturb our cultural origins taking the risk of loosing our maize diversity that has been croped seens prehispanic cultures. This leads us in a historic-cultural problem because for our mesoamerican ancestors' maize has a religios meaning The Popol Vuh, sacred Mayan book, tell's a story: God knead maiz and created men. That's why Mexico is so familiarized with maize culture. And finally tortillas are an important part of day a day Mexicans' diet. So it would be risky to move these crops to ethanol production because we will decrease Mexicos's food security.

Even though, Mexico imports 25% of white corn and 30% of yellow corn, so we should look for new possibilities of alternative energie production. That's why Mexico is so affected with the 23% increase for 2008, because the imported maize is going to be used for ethanol production having as consequence the tortillas price goes up. So we have to save our crops to avoid falling into a food security risk.

Due to all this problems Mexico has to look for different possibilities of alternative energie production. What if we could convert organic waste cellulose into ethanol? Processing it will produce ethanol, useful for biofules market. The use low cost feedstock brings products into highly efficient markets that provide a viable business.

United States had been developing different mechanissms of biomass procesing. One example is Arkenol's conversion technology (pilot plant in Southern California) known as concentrated acid hydrolisis so that the process is ready for comercial implementation, so sugar is converted in an economically viable manner.

The feedstock used includes:

- Agricultural residues (straws, corn stalk and cobs, bagasse, cotton gin trash, palm oil wastes, etc.),
- Crops grown specifically for the biomass (grasses, sweet sorghum, fast growing trees, etc.)
- Paper (recycled newspaper, paper mill sludge's, sorted municipal solid waste, etc.)
- Wood waste (prunings, wood chips, saw dust, etc.)
- Green wastes (leaves, grass clippings, vegetable and fruit wastes, etc.)

The process is simple and efficient and it consists in five basic unit operations:

1. Feedstock preparation.
2. Decrystallization/ hydrolysis reaction vessel.
3. Solids/liquid Filtration.
4. Separation of the acid and sugars.
5. Fermentation of the sugars.(ethanol, yeast and water mixture)
6. Product purification.

Biomass feedstock is cleaned to reduce the particle size for the process equipment. Then is dried to a moisture content with the acid concentration requirements for decrystallization (The process separates biomass into two main components: cellulose and hemicellulose from lignin), then it's hydrolyzed (to degrade every chemical from the cellulose) and hexose and pentose sugar is produce and prepared for fermentation. Meanwhile lignin is processed and into fuel that may be useful for producing a 70% of the energy the machine needs.

The remaining acid-sugar solution is now separated by an Arkenol's technology that consists in an ion exchange to separate but avoid diluting the sugar. The separated sulfuric acid is reused for the decrystallization and hydrolysis steps. To ferment the mixed sugars (pentose and hexose) Arkenol cultivate their own yeasts, they mixed it with nutrients and added to the sugar mixture having an efficient conversion of pentose and hectose to a fermentation beer (ethanol, yeast and water) and carbon dioxide. By a centrifuge system the yeast culture is separated from fermentation beer and it's taken to fermentation tanks for reuse. Ethanol separated from the fermentation beer by conventional distillation technology, finally to produce the final ethanol product is denatured with a 5% of gasoline. The still bottoms that contain principally water and unfermented pentose sugar is returned to the process for economic water use for further convention of the pentose sugar.

Yeast would be grown at the same place. The use of water will be minimal because it recycles water in incoming materials.

The process machine would use approximately five hectares for the complete process, feedstock intake, preparation and short term storage, product load out facilities, CO₂ processing, administration and laboratory buildings.

This kind of mechanism may use lignin or natural gas for its boiler, and there for will need air permits for their exhaust. It won't have combustion emissions because of the use of the same power plant steam.

As we have seen we can use new methods to produce biofuels and save our Mexican crops, protect our food security and diminish our polluting gases production by fossil fuels.

Looking for new sources for producing ethanol is what nowadays will save our planet. Ethanol taken from cellulose is a new way for covering our energy requirements and it's actually the only way that may give a great solution for not using our maize crops, stop degrading our soil and will stop with biodiversity destruction because of soil for crop production.

Our produced ethanol is used as a biofuel, as we have seen we can use it in different percentages in mixture with gasoline giving us E5, E10, E85, E95, E100 and also we might look for new alternatives as the production of biodiesel done with a 45% of ethanol, 45% of vegetal oils that had been used (kitchen used oil) and a 10% so its an economic way to stop using gasoline at all.

Arkenol's technology is actually one of the best, economically and ecologically speaking, of ethanol production because is self-sufficient so it doesn't produce pollution that will benefic green house effect.

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